

**NCTWQP
Cedar Creek Reservoir Watershed
Protection Plan
Steering Committee Meeting**

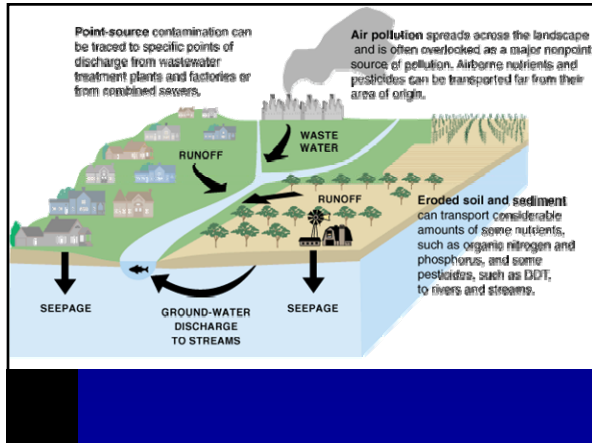
**Water Quality Modeling
101**

David Harkins, Ph.D., P.E.

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Overview

- Basic watershed water quality.
- What are water quality models?
- Why are they needed?
- How are they used?
- Types of water quality models.



Water Quality Parameters

- pH
- Total Suspended Solids (TSS)
- Temperature
- Nutrients (N, P, Ammonium)
- Bacteria (*e-coli*)
- Algae

What are water quality models?

- Water quality models are mathematical representation or approximations of real-world conditions.
- Mathematical tools/equations to study:
 - Transportation
 - Distribution
 - Chemical Reaction
 - Ecological Impact of sediments and chemicals on water quality

Why do we need models?

- Sampling and monitoring is very costly
 - It is unrealistic to sample and monitor each field or stream segment in a large-watershed.
- To understand and learn from the events of past and plan for the future
 - Protection and sustainable use of water resources.
- To evaluate how changes in watershed, stream or reservoir characteristics change water quality
 - Assist in improving or preventing water quality problems.

How are these models used?

- *Status*: assess environmental conditions and reporting
- *Trend*: evaluate historical change
- *Prediction*: evaluate impact as a result of change
- *Decisions*: evaluate alternative management plans

Status

- What is the background (natural) loading from the watershed?
 - Important especially for TMDL's
- Identifying and quantifying sources of pollution
 - What is the contribution of non-point and point sources?

Trend

- Is there long-term accumulation of chemicals and nutrients in the watershed?
 - Natural degradation slower than accumulation or loading rate to the water body??
- Has the sediment or nutrient loading rate increased due to changes in climatic patterns (Dry and wet year cycles)?

Prediction

- Can the water quality be maintained 50 years from now with projected population growth?
- What is the impact of additional Waste Water Treatment Plant at a particular location in the watershed?
- What is the impact of land use change on water quality?

Decision

- What is the impact of management practices?
 - Converting pasture lands into improved pasture lands
 - Crop rotation and nutrient management practices
 - Urban sprawl, street cleaning, lawn fertilization improved sewage treatment etc.,
- Environmental laws and policies
 - E.g. Impact of Clean Water Act

Types of water quality models

- Watershed water quality
- Stream water quality
- Reservoir water quality
- Ground Water Quality (MODFLOW)
- Field-scale Vs Watershed-scale



Watershed Water Quality Models

- *Overland processes (SWAT)*
- *HSPF*
- *Others*



Stream Water Quality Models

- *Channel processes - River/In-Stream Water Quality (Qual2E, QualTX)*
- *HSPF*
- *Others*



Reservoir Water Quality Models

- *Lake Processes - Lake water quality (WASP)*
- *Bathtub*
- *CE-Qual-W2*
- *Others*



Questions?