



Chicago Metropolitan  
Agency for Planning

# WATERSHED PLANNING AND WATER QUALITY MODELING

*FERSON-OTTER CREEKS WATERSHED*

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# Why?

- EPA 9 Minimum Elements
  - ▣ Estimate pollutant reduction loads expected from implementation of plan recommendations
  
- Additional/Optional Regional Criterion
  - ▣ Set target pollutant-load reductions for impaired waters taking into account both point and nonpoint source pollution



# How Do We Start?

Evaluate Current Water Quality Conditions

# Methods

- Currently considering a combination of tools:
  - Hydrological Simulation Program - Fortran (HSPF)
  - Spreadsheet Tool for Estimating Pollutant Load (STEPL)
  - Long Term Hydrologic Impact Assessment Tool (L-THIA)



# What will we be modeling?

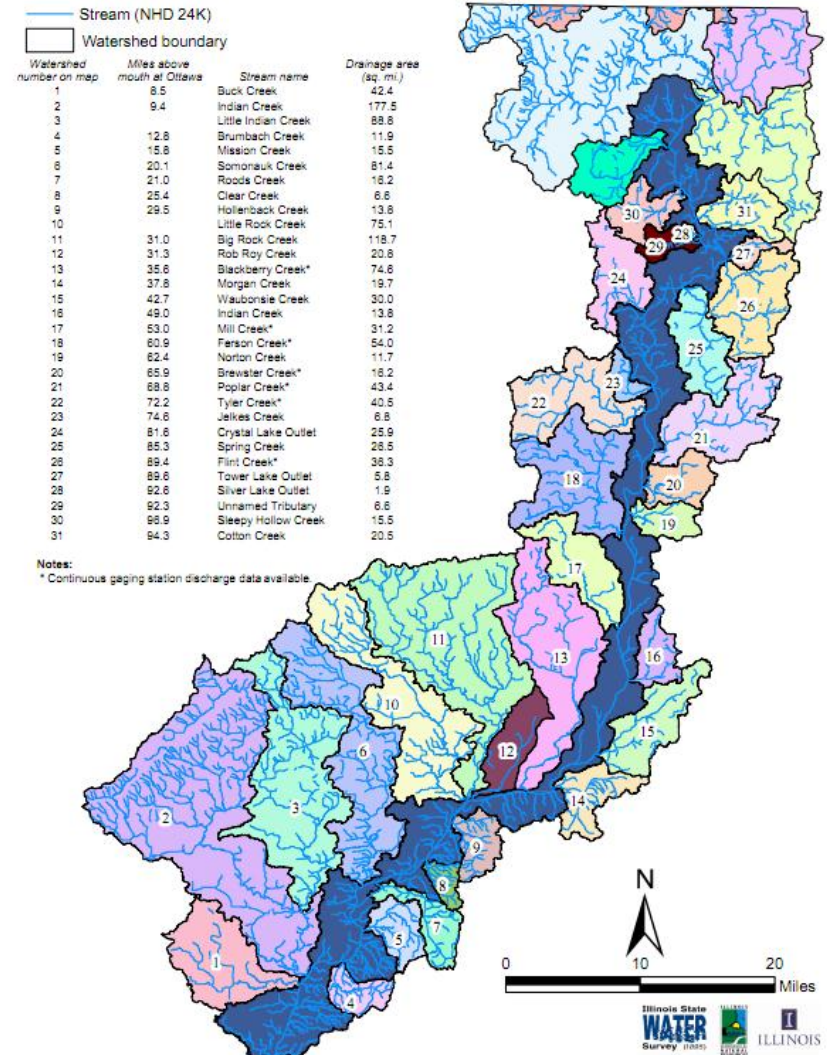
- Fecal Coliform
- Total Nitrogen
- Total Phosphorus
- Total Suspended Sediment/Solids



# HSPF Model

- Fox River Study Group
- Illinois State Water Survey
- Simulates watershed hydrology and water quality

Fox River Watershed





# STEPL

- Annual nutrient loading is simulated based on:
  - Runoff volume
  - Pollutant concentrations
    - Land use distribution
    - Management practices
- The annual sediment load is estimated based on:
  - Universal Soil Loss Equation (USLE)
  - Sediment delivery ratio



- Purpose of the model:
  - ▣ Estimate water quality impacts from land use change
  
- Uses land use and soil data to estimate:
  - ▣ Runoff
  - ▣ Nonpoint source pollution



## Regional Criterion # 2

Set target pollutant-load reductions for impaired waters taking into account both point and nonpoint source pollution

# US EPA Ecoregion Nutrient Recommendations

| Nutrient Parameter | Ecoregion Recommendation (mg/L) |
|--------------------|---------------------------------|
| Total Phosphorus   | 0.0725                          |
| Total Nitrogen     | 2.461                           |

*Draft Aggregations of Level III Ecoregions for the National Nutrient Strategy*



# Illinois EPA 2006

## Guidelines for Identifying Potential Causes of Impairment of Aquatic Life Use in Illinois Streams

| Parameter              | Statistical Guidelines (mg/L) |
|------------------------|-------------------------------|
| Total Phosphorus       | 0.61                          |
| Total Nitrogen         | 7.8                           |
| Total Suspended Solids | 116                           |



Artist: Bernadette Heitschmidt 6th Grade St. Daniel the Prophet School  
Finalist in the Illinois EPA's "Poster, Poetry/Prose Contest"  
<http://www.epa.state.il.us/kids/contest/index.html>

## Illinois Water Quality Standards

| Parameter      | General Use Standard | Calculation  |
|----------------|----------------------|--|
| Fecal Coliform | 200 (count/100 mL)   | Geometric mean based on a minimum of 5 samples taken over not more than a 30-day period. |
| Fecal Coliform | 400 (count/100 mL)   | Not to be exceeded by more than 10% of samples in any 30-day period.                     |

# Illinois EPA 2010

## Guidelines for Identifying Potential Causes of Impairment of Aquatic Life Use in Illinois Streams

| Parameter              | Non-Standards Based Criteria (mg/L) |
|------------------------|-------------------------------------|
| Total Phosphorus       | 0.61                                |
| Total Suspended Solids | 116                                 |

## Illinois Acute and Chronic General Use Water Quality Standards

| Parameter              | Acute Standard (mg/L) | Chronic Standard (mg/L) |
|------------------------|-----------------------|-------------------------|
| Total Ammonia Nitrogen | 15.0                  | 37.5                    |

ILLINOIS INTEGRATED WATER QUALITY REPORT  
AND SECTION 303(d) LIST - 2010

Clean Water Act Sections 303(d), 305(b) and 314

Water Resource Assessment Information  
and Listing of Impaired Waters

Volume I: Surface Water

April 2010

*Draft*

Illinois Environmental Protection Agency  
Bureau of Water

\*Fecal Coliform is the same standard as in 2006

# Summary Table

| Source                        | Total Nitrogen Guidelines/ Recommendations (mg/L) | Total Phosphorus Guidelines/ Recommendations (mg/L) | Fecal Coliform Standards (cfu/100 mL) | Total Suspended Solids Guidelines (mg/L) |
|-------------------------------|---|---|---------------------------------------|--|
| US EPA                        | 2.46 <sup>1</sup>                                 | 0.0725 <sup>1</sup>                                 | N/A                                   | N/A                                      |
| Illinois EPA                  | 7.8 <sup>2</sup>                                  | 0.61 <sup>2</sup>                                   | 200-400 <sup>3</sup>                  | 116 <sup>2</sup>                         |
| Lower DuPage Watershed Draft  | 3.2 <sup>1</sup>                                  | 0.0763 <sup>1</sup>                                 | 200 <sup>3</sup>                      | 75 <sup>4</sup>                          |
| Hickory Creek Watershed Draft | 2.46 <sup>1</sup>                                 | 0.61 <sup>2</sup>                                   | 400 <sup>3</sup>                      | 116 <sup>2</sup>                         |
| <b>CMAP Recommendations</b>   | <b>2.46<sup>1</sup></b>                           | <b>0.61<sup>2</sup></b>                             | <b>400<sup>3</sup></b>                | <b>116<sup>2</sup></b>                   |

<sup>1</sup> US EPA Ecoregion Recommendation

<sup>2</sup> Illinois EPA Guideline

<sup>3</sup> Illinois EPA Standard

<sup>4</sup> US EPA Fisheries Recommendation



# What does this Mean?

**FERSON-OTTER  
DRAFT**

## Load Reduction Required from Current Conditions

| Parameter                                 | HSPF %<br>Reduction | L-THIA %<br>Reduction |
|---|---------------------|-----------------------|
| Total Nitrogen (lb./year)                 | 85%                 | 80%                   |
| Total Phosphorus (lb./year)               | 85%                 | 85%                   |
| Total Sediment (lb./year)                 | -----               | 60%                   |
| Fecal Coliform ( $10^6$<br>colonies/year) | 98%                 | 90%                   |

# How will we meet reduction goals?

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## IMPLEMENT THE WATERSHED PLAN!



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## EPA Criterion # 2

Estimate pollutant reduction loads expected from implementation of plan recommendations



# For More Information...

- HSPF Model

<http://ilrdss.sws.uiuc.edu/fox/>

- STEPL Model

<http://it.tetrattech-ffx.com/steplweb/>

- L-THIA

<https://engineering.purdue.edu/~lthia/>

- USEPA Ecoregion Nutrient Criteria

[http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/ecoregions\\_index.cfm](http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/ecoregions_index.cfm)

- Illinois EPA Water Quality Standards

<http://www.epa.state.il.us/water/tmdl/303d-list.html>

# Questions or Comments?

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