



Chicago Metropolitan  
Agency for Planning

# WATERSHED PLANNING AND WATER QUALITY MODELING

*SILVER AND SLEEPY HOLLOW CREEK WATERSHEDS*

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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

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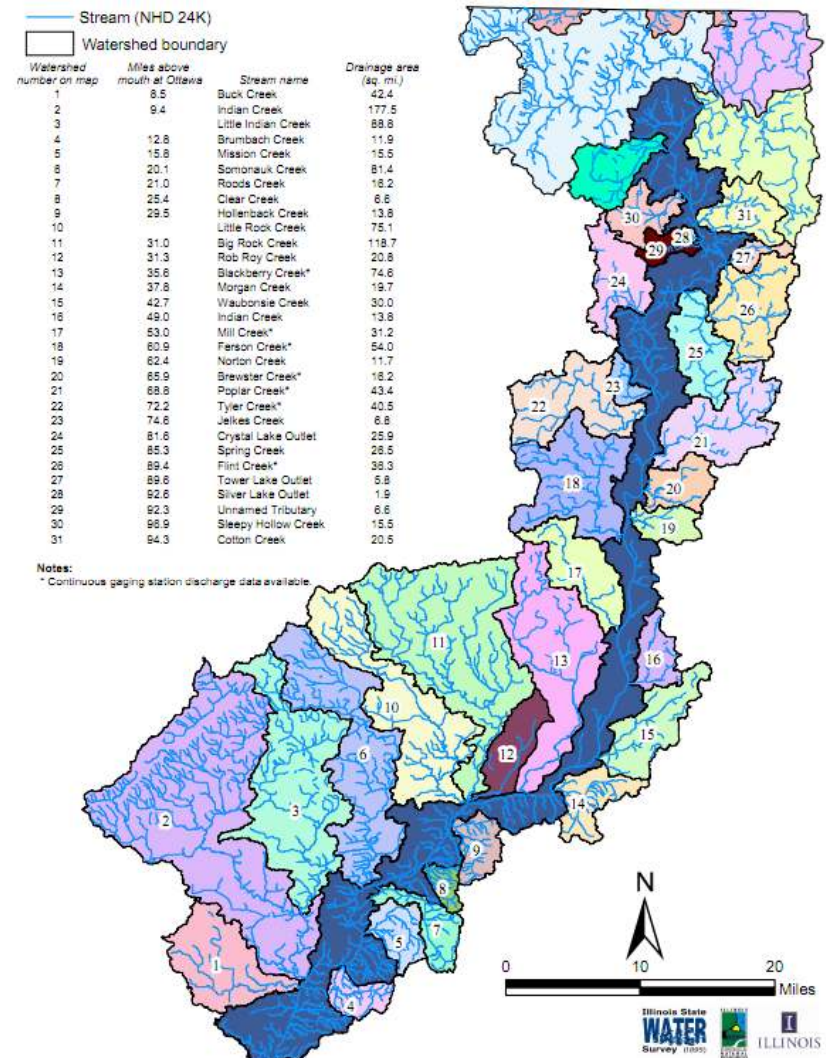
- Currently considering a combination of tools:
  - Hydrological Simulation Program - Fortran (HSPF)
  - Spreadsheet Tool for Estimating Pollutant Load (STEPL)
  - Long Term Hydrologic Impact Assessment Tool (L-THIA)



# HSPF Model

- Fox River Study Group
- Illinois State Water Survey
- Simulates watershed hydrology and water quality
  - ▣ Total Nitrogen
  - ▣ Total Phosphorus
  - ▣ Fecal Coliform
  - ▣ Total Suspended Sediment/Solids

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



# L-THIA

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



# Preliminary Results

## SLEEPY HOLLOW DRAFT

Pollutants	Annual Load	Unit Area Load
Total Nitrogen	159,226 (lb./year)	13 (lb./acre-year)
Total Phosphorus	24,352 (lb./year)	2 (lb./acre-year)
Total Sediment	2,092 (tons/year)	329 (lb./acre-year)
Fecal Coliform	535,572 ( $10^6$ colonies/yr)	42 ( $10^6$ colonies/acre-year)
<b>Total Runoff</b>	<b>11,008 (acre-feet)</b>	<b>----</b>

*Draft results estimated from STEPL and L-THIA*



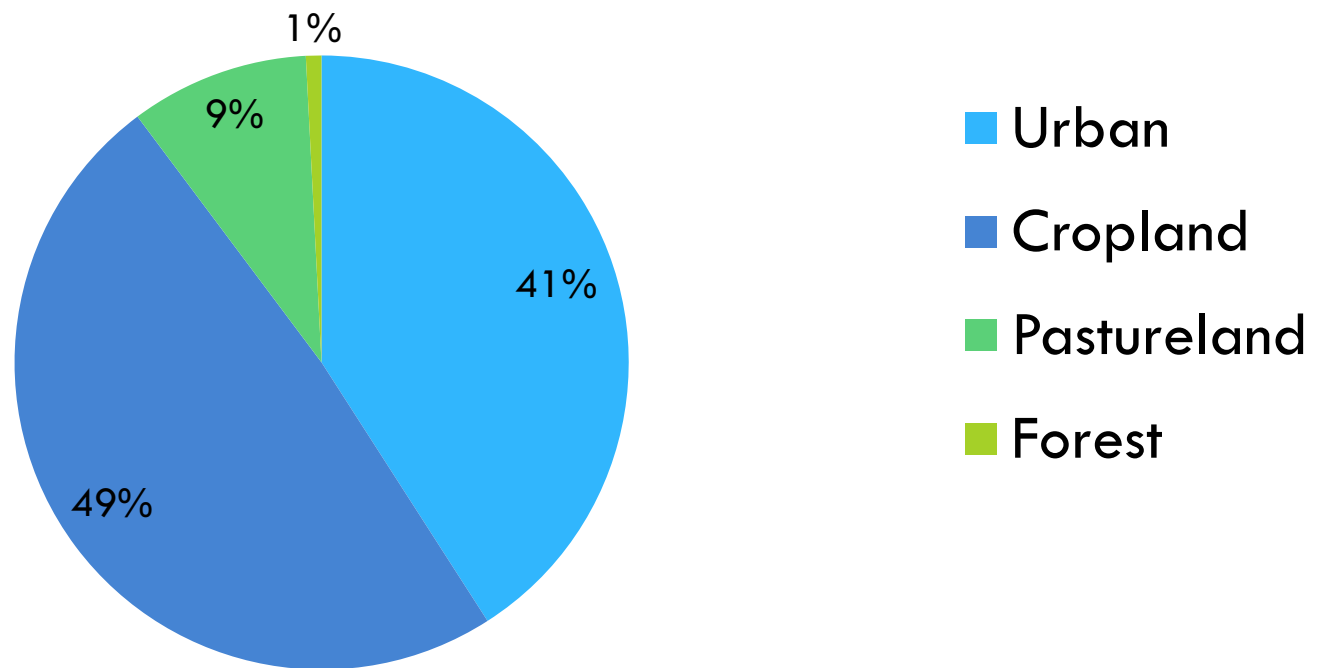
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# Preliminary Results

# SLEEPY HOLLOW DRAFT

## DRAFT Sediment Load



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## 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	0.08
Total Nitrogen	1.59

Draft Aggregations of Level III Ecoregions for the National Nutrient Strategy



# Illinois EPA 2006

## ILLINOIS INTEGRATED WATER QUALITY REPORT AND SECTION 303(d) LIST - 2006

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

*Water Resource Assessment Information  
and Listing of Impaired Waters*

### 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 Heltschmidt 8th Grade St. Daniel the Prophet School  
Finalist in the Illinois EPA's "Poster, Poetry/Poem Contest"  
<http://www.epa.state.il.us/kidscontest/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.

# Summary of Recommendations and Standards

Source	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Fecal Coliform (cfu/100 mL)	Total Suspended Solids (mg/L)
US EPA	1.59	0.08	N/A	N/A
Illinois EPA	7.8	0.61	200-400	116
Beaver Creek Watershed	1.59	0.08	N/A	N/A
<b>CMAP Recommendations</b>	<b>1.59</b>	<b>0.08</b>	<b>400</b>	<b>116</b>



# What does this Mean?

**SLEEPY HOLLOW  
DRAFT**

## Load Reduction Required from Current Conditions

Parameter	Reduction Needed	% Reduction
Total Nitrogen (lb./year)	111,758	70%
Total Phosphorus (lb./year)	21,964	90%
Total Sediment (lb./year)	720,913	17%
Fecal Coliform ( $10^6$ colonies/year)	264,170	49%

# 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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