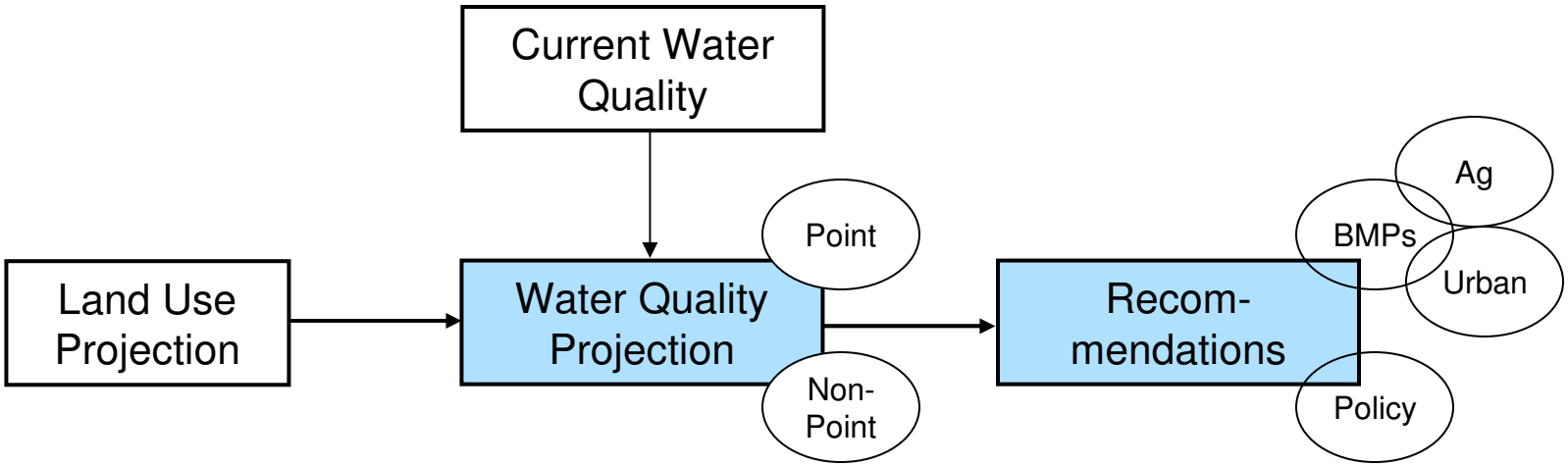
Chicago Metropolitan Agency for Planning

Pollutant Loading and Green Infrastructure in the Beaver Creek Watershed

February 21, 2008

Process


Current Water Quality
Land Use Projection
Water Quality Projection
Point
Non-Point
Recom-mendations
Ag
BMPs
Urban
Policy

Understanding the project

- Two objectives:
  - Fix existing water quality problems
  - Prevent future problems
- Two main types of pollution:
  - Point source
  - Nonpoint source

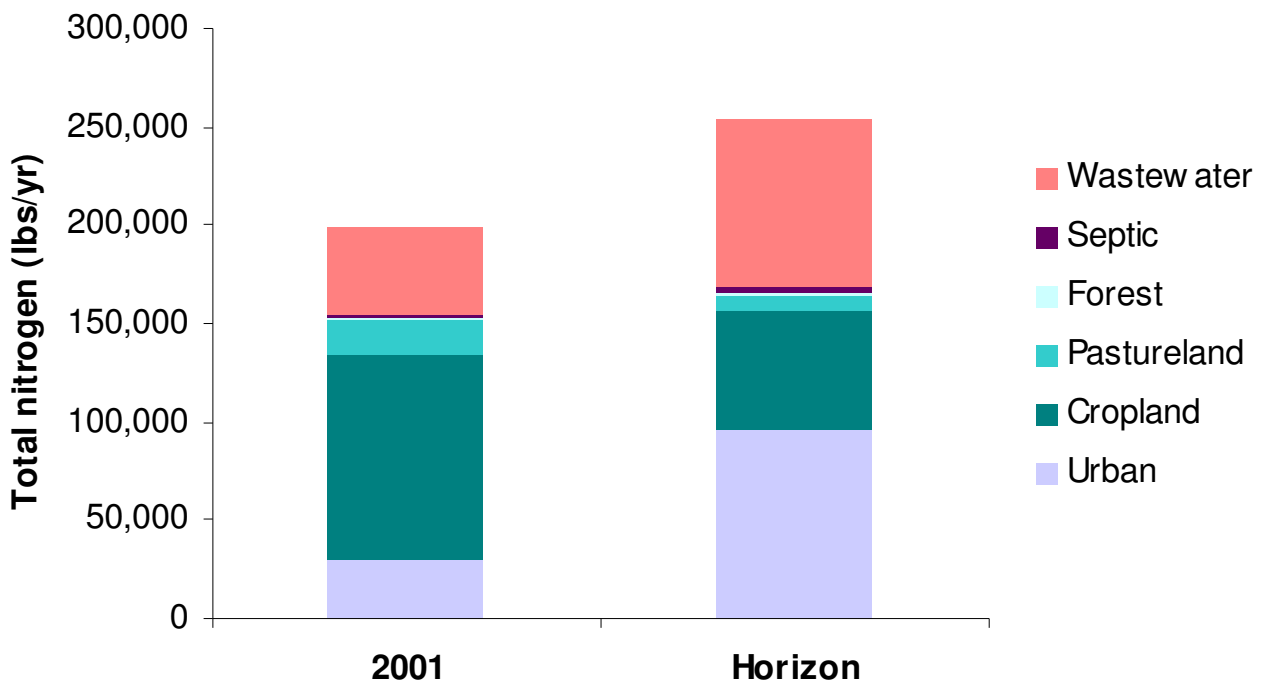
Model

- STEPL
  - http://it.tetratech-ffx.com/stepl/models$docs.htm
- Estimates nonpoint loads and contribution by source
- Does *not* yield predictions of instream concentration or load duration
- Wastewater contribution calculated separately

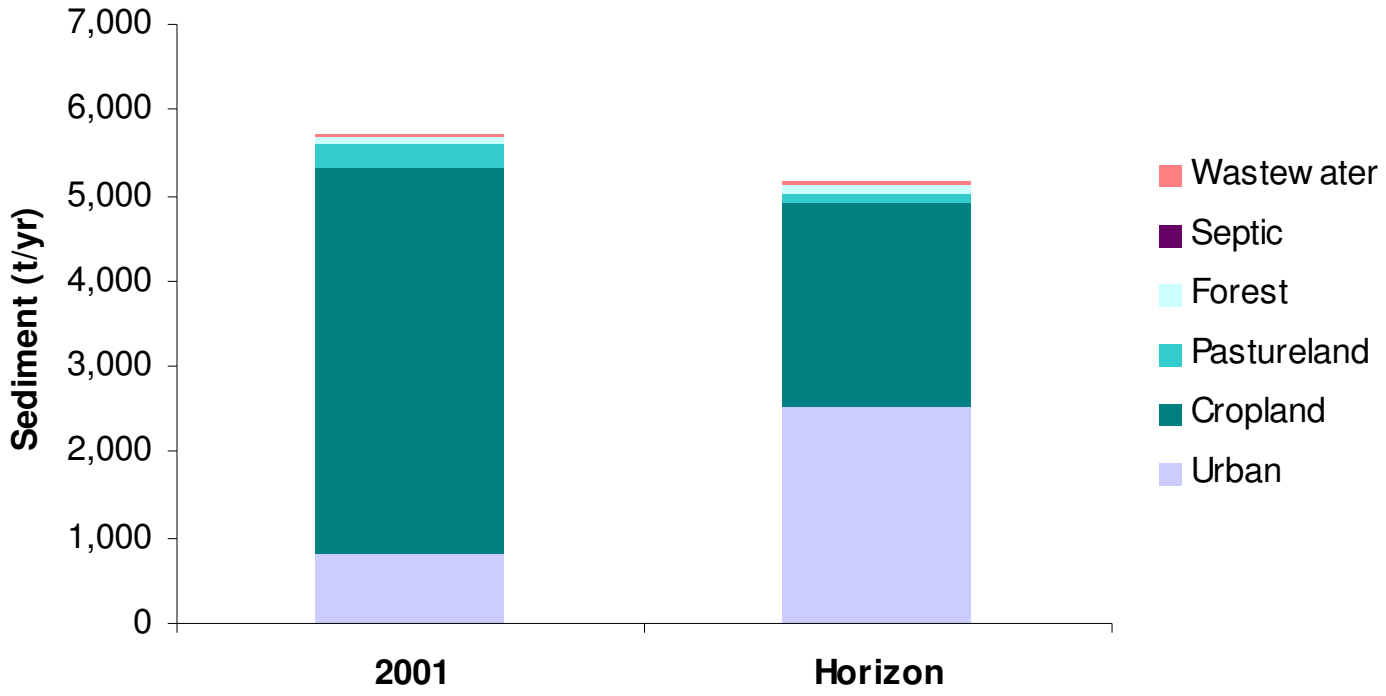
Causes of impairment

- Beaver Creek is not considered impaired, but experience suggests the following would be issues:
  - Sedimentation
  - Nutrient enrichment
  - Riparian area degradation

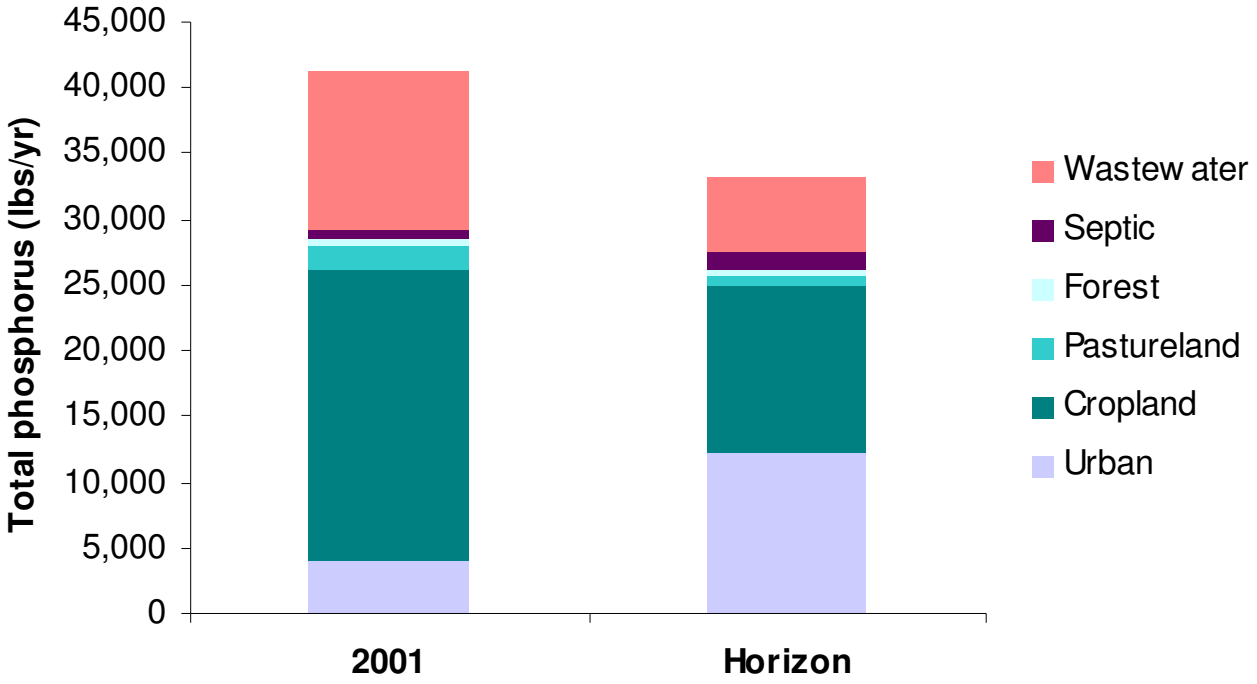
Nitrogen


300,000
250,000
200,000
150,000
100,000
50,000
0
Total nitrogen (lbs/yr)
2001
Horizon
Wastew ater
Septic
Forest
Pastureland
Cropland
Urban

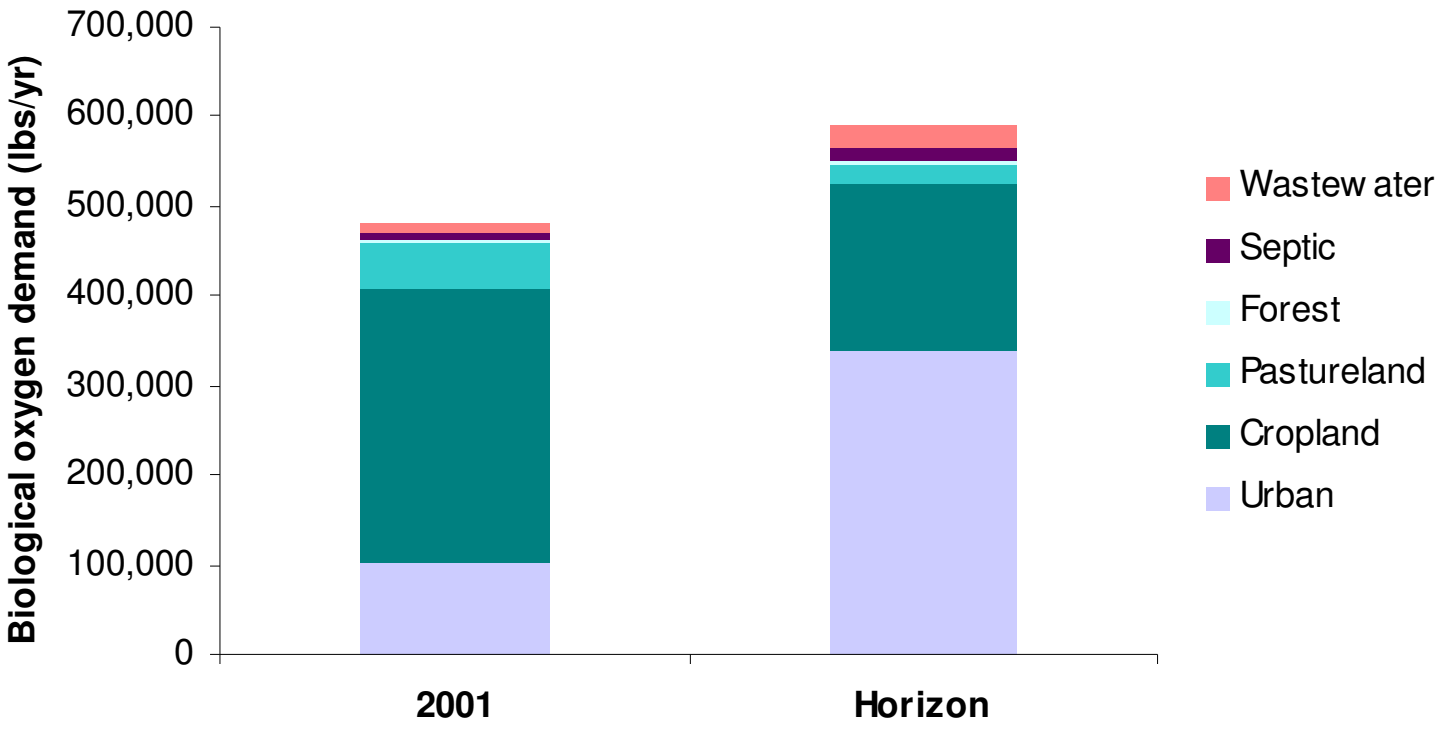
Sediment


7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Sediment (t/yr)
2001
Horizon
Wastew ater
Septic
Forest
Pastureland
Cropland
Urban

Phosphorus


45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Total phosphorus (lbs/yr)
2001
Horizon
Wastew ater
Septic
Forest
Pastureland
Cropland
Urban

Biological oxygen demand



A rough estimate

- No load estimates for streambank or gully erosion
- Groundwater/subsurface flow contribution ignored
- Contribution from construction neglected (mainly relevant for sediment)

Wastewater current conditions

		Capron	Pop Grv N	Pop Grv S	Candlewick	Oak Lawn	Schlichting	Total
TSS	t/y	1.3	0.9	1.5	4.9	0.3	15.1	24.1
Ammonia	lb/y	194	608	876	565	--	--	2,243
BOD	lb/y	1,885	1,356	1,927	6,501	833	--	12,502
Flow	mgd	0.17	0.14	0.12	0.52	0.03	0.72	1.70

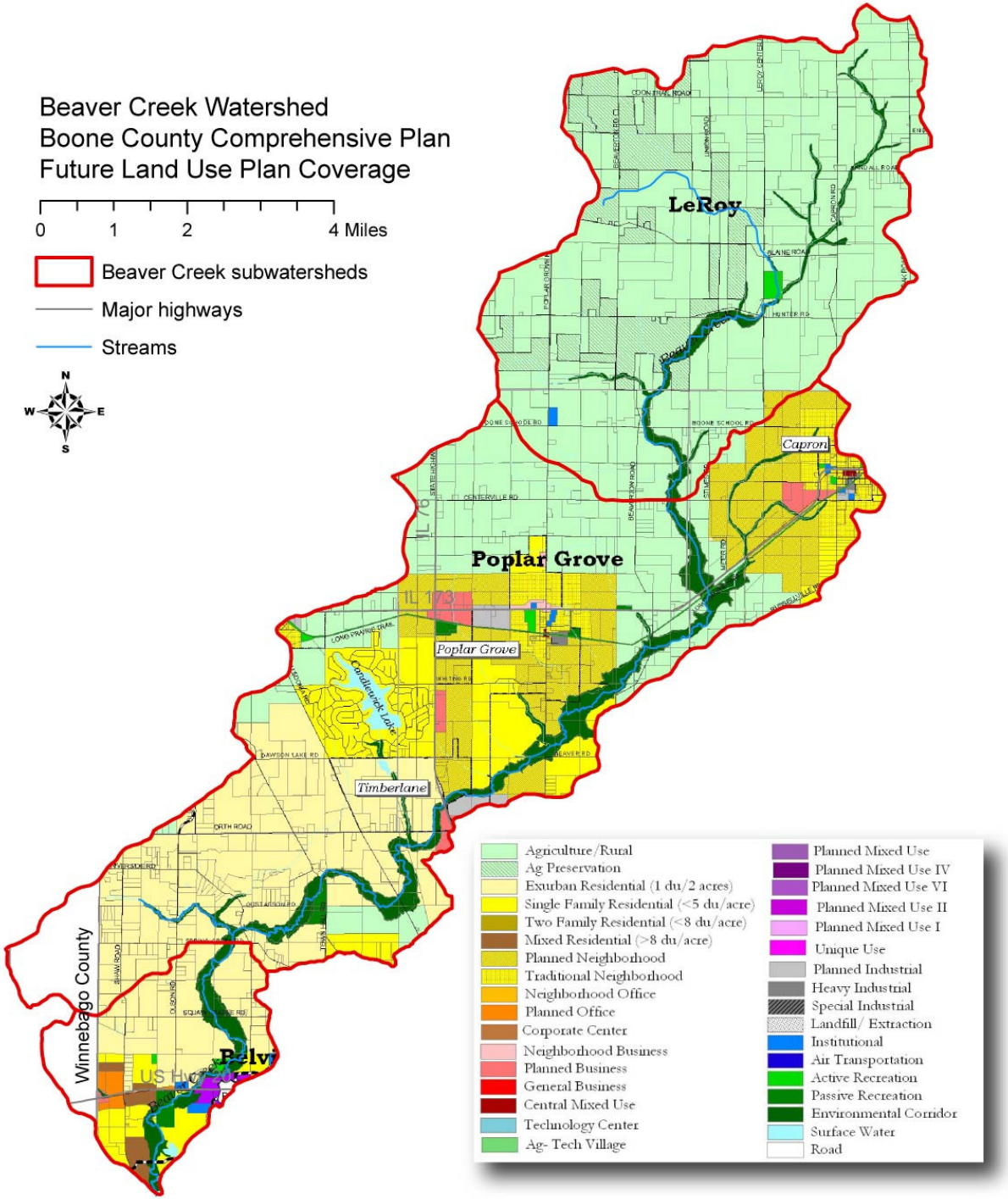
Assumptions about wastewater

- Nitrogen concentration in effluent is 15 mg/L
- Phosphorus concentration in effluent is 4 mg/L
- Poplar Grove South will have a flow rate of 1 mgd at comprehensive plan buildout
- All treatment plants will be compliant with 1 mg/L phosphorus standard at comprehensive plan buildout

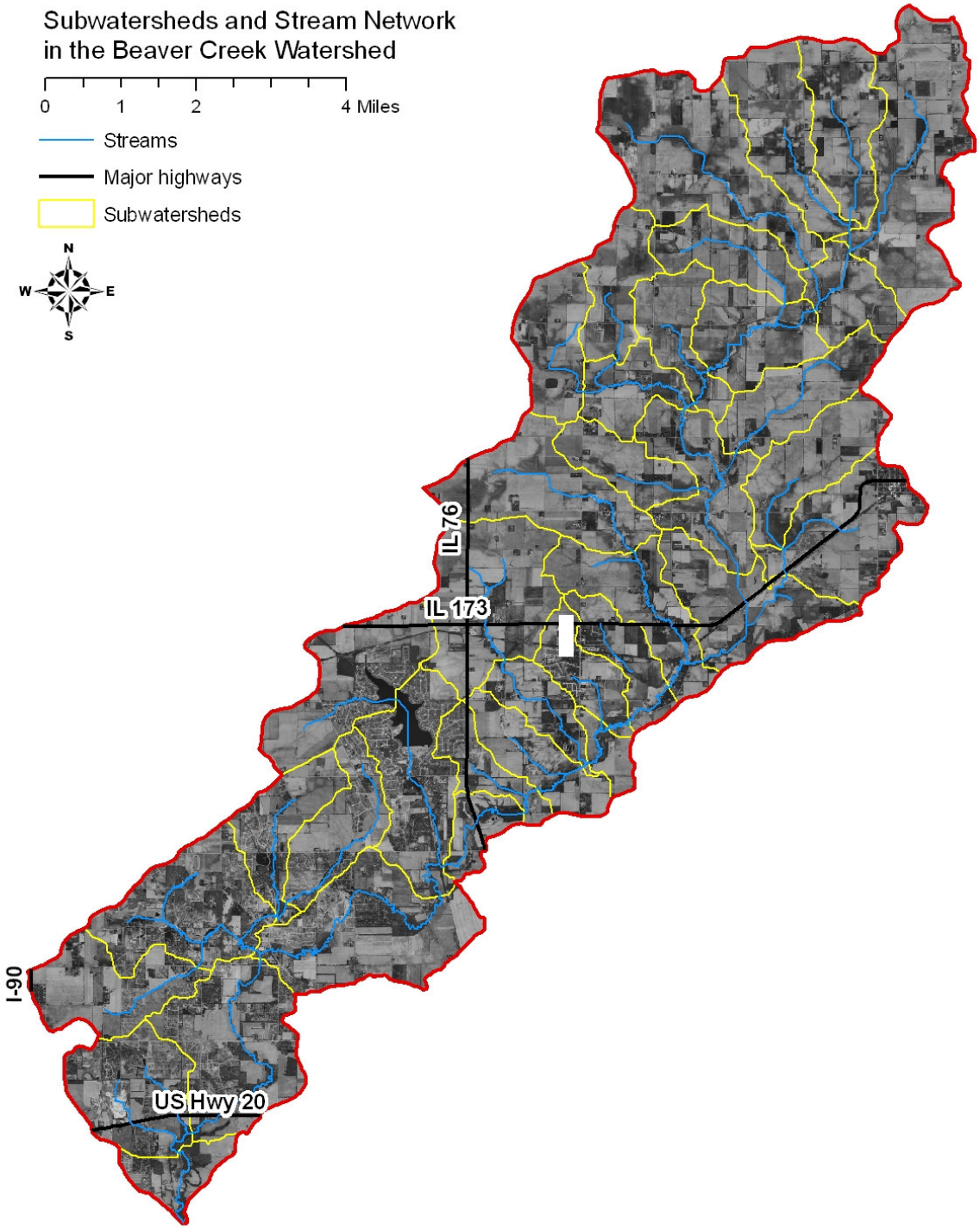
Consistency

Model	Annual Average Discharge (ac-ft)	Ratio	Annual Average Wastewater (ac-ft)	Total discharge including wastewater (ac-ft)	Ratio including wastewater
STEPL	31,355	0.85	1,904	33,260	0.90
ISWS	36,995		(Included)		

Future land use from Boone County Comprehensive Plan



Target sub-watersheds for current loading



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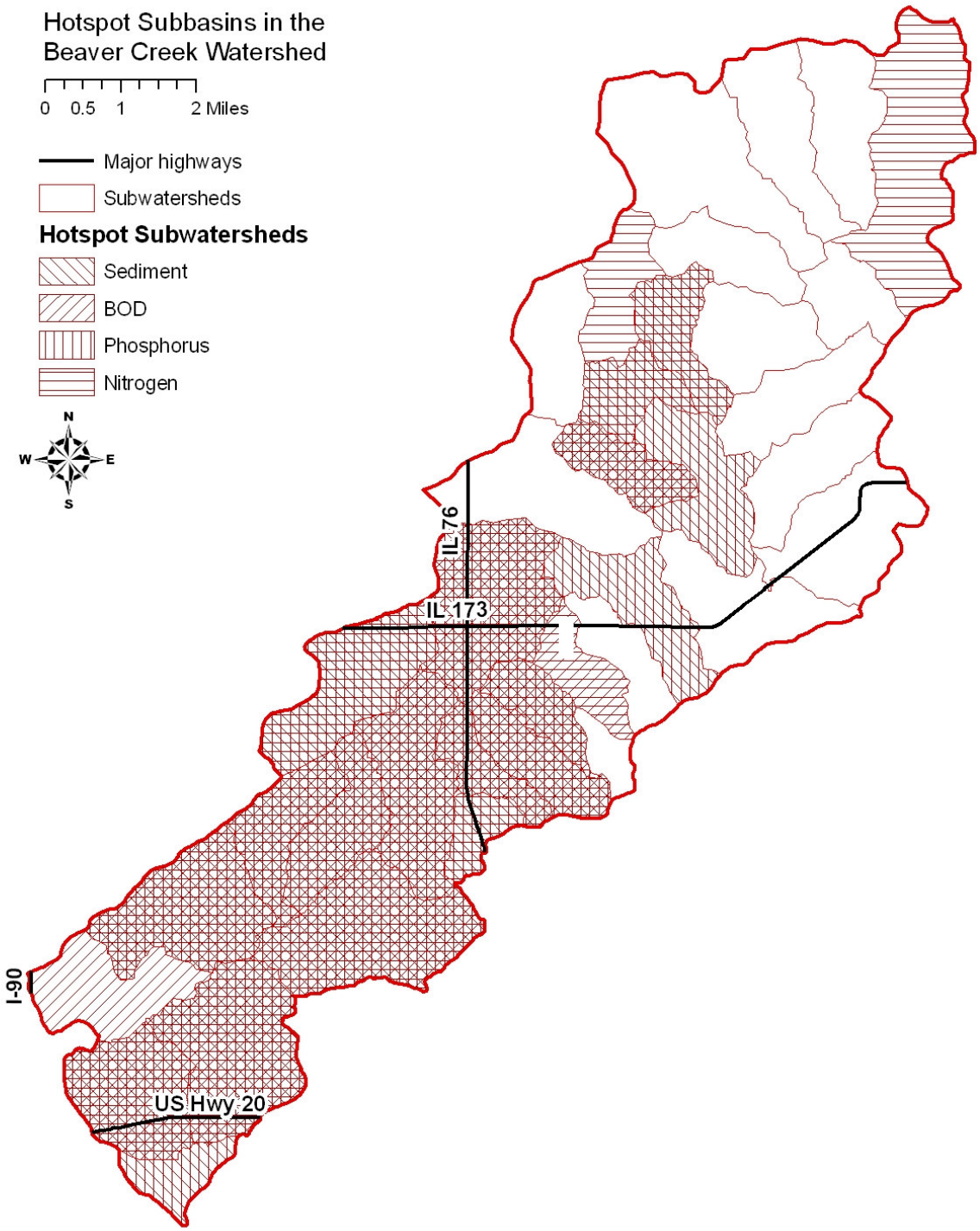

Natural Area Conservation

- Two forms:
  - Riparian area
    - The “skeleton,” the “last line of defense”
    - Habitat protection for both terrestrial and aquatic species
  - Remaining “green infrastructure”