SW AT MODEL SUMMARY AND RESULTS

Arkansas and Oklahoma
Illinois River Watershed

Content

Model Setup

Inputs

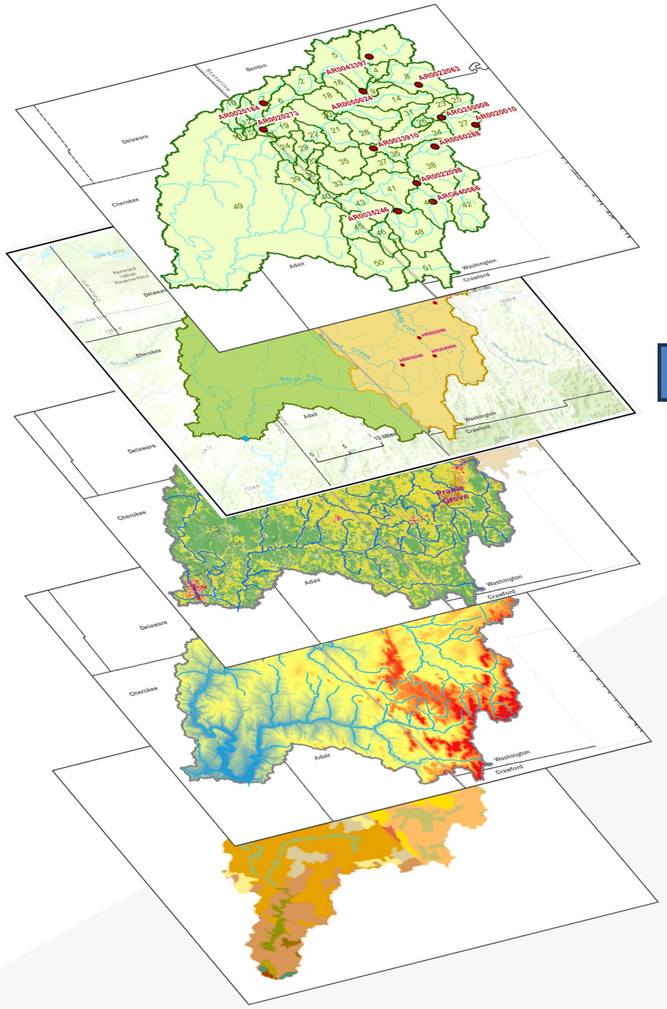
Point Sources

Weather Data

Land Use
(NLCD 2019)

Topography
(DEM)

Soils
(SSURGO)



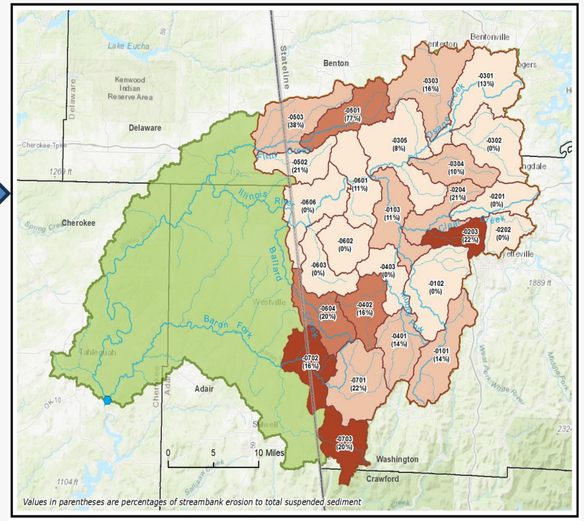
SWAT Model

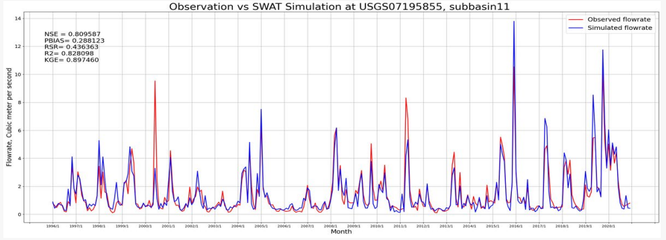
Soil & Water Assessment Tool | SWAT

Land Management Practices

Output

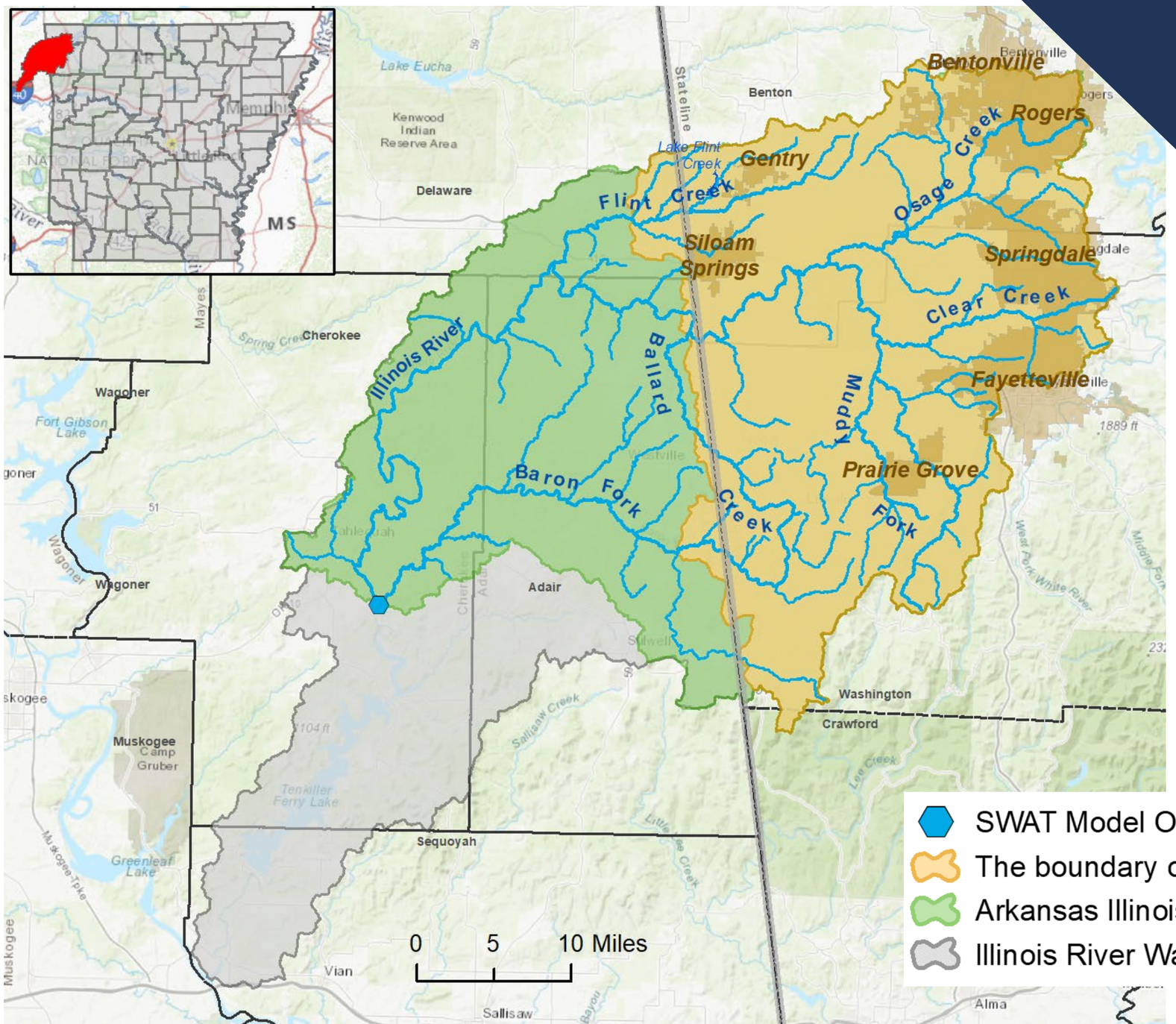
Sediment and Nutrient Loads





Model Setup

Geographic Extent



- SWAT Model Outlet
- The boundary of HUC12s with more than 50% of area in Arkansas
- Arkansas Illinois River Model Extent
- Illinois River Watershed HUC8

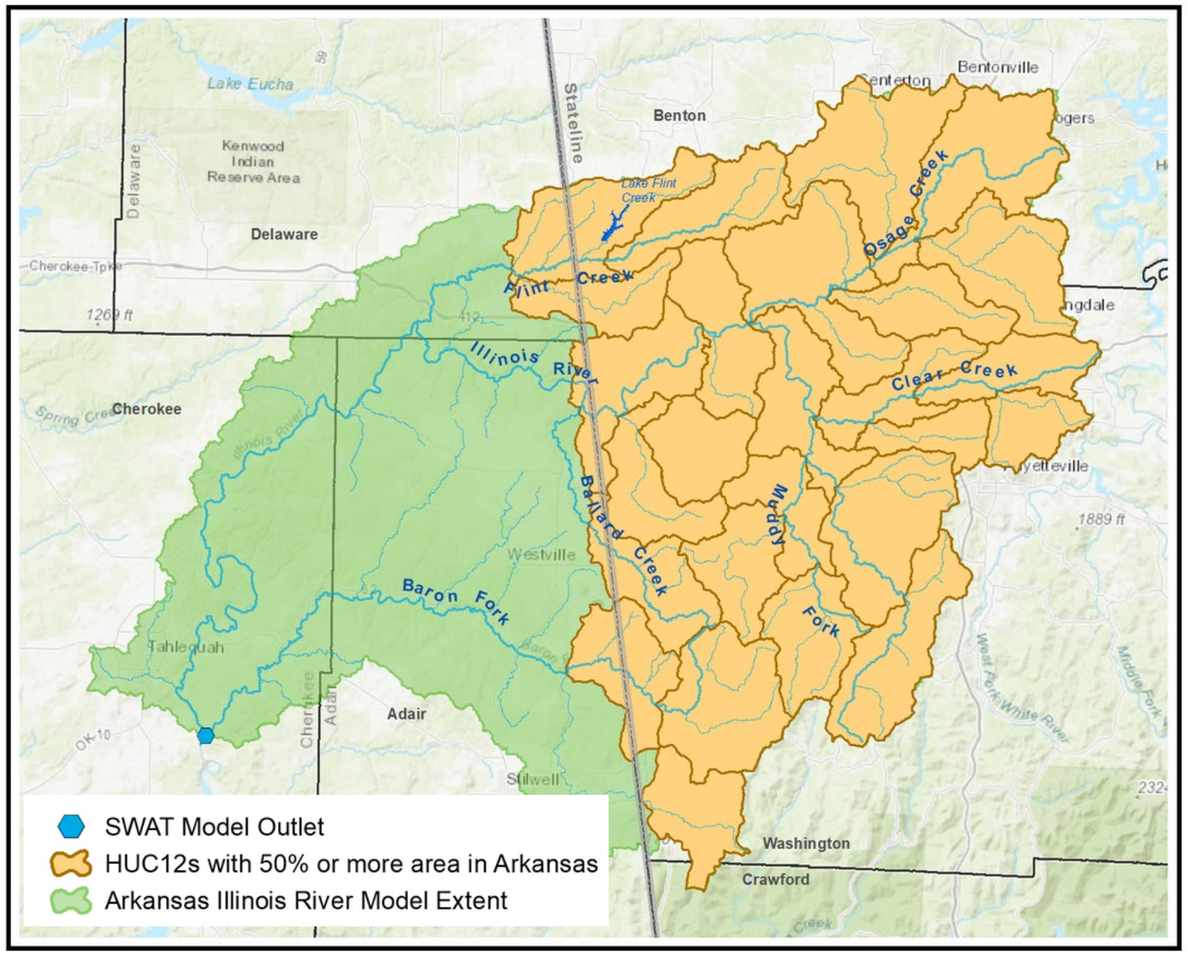
Model Setup

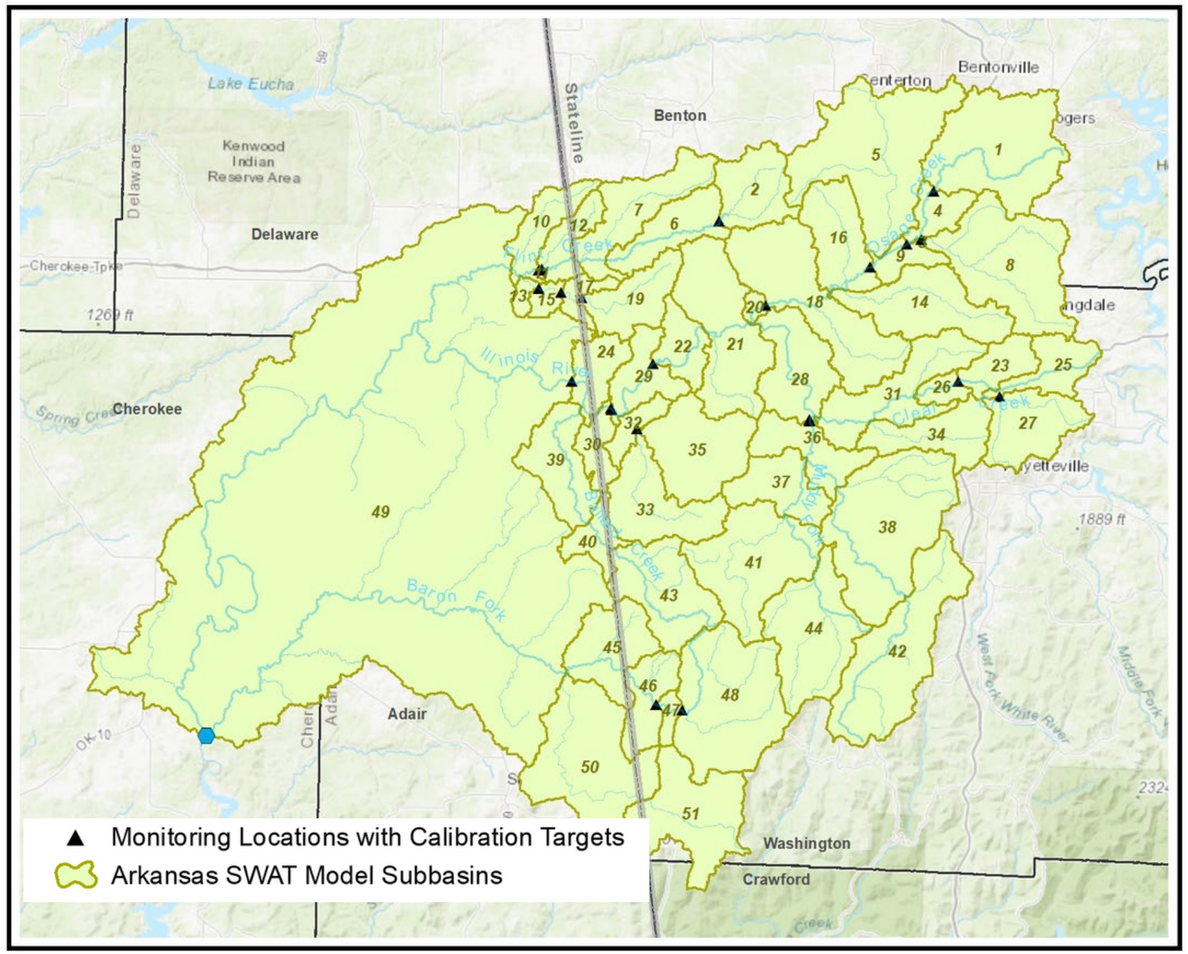
28
HUC12s in AR

51
SWAT Subbasins

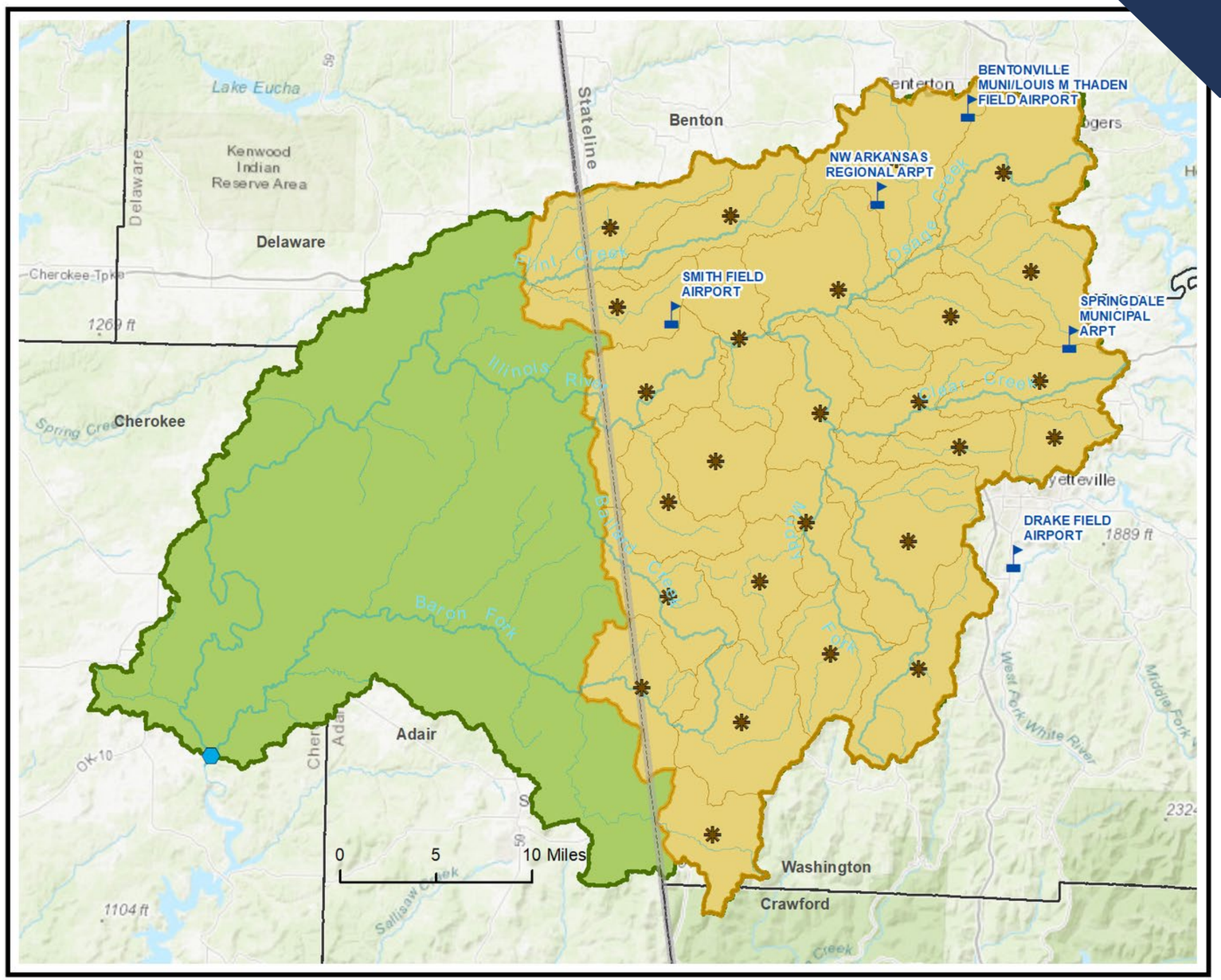
2515
HRUs

Geographic Extent





Inputs



Weather Data

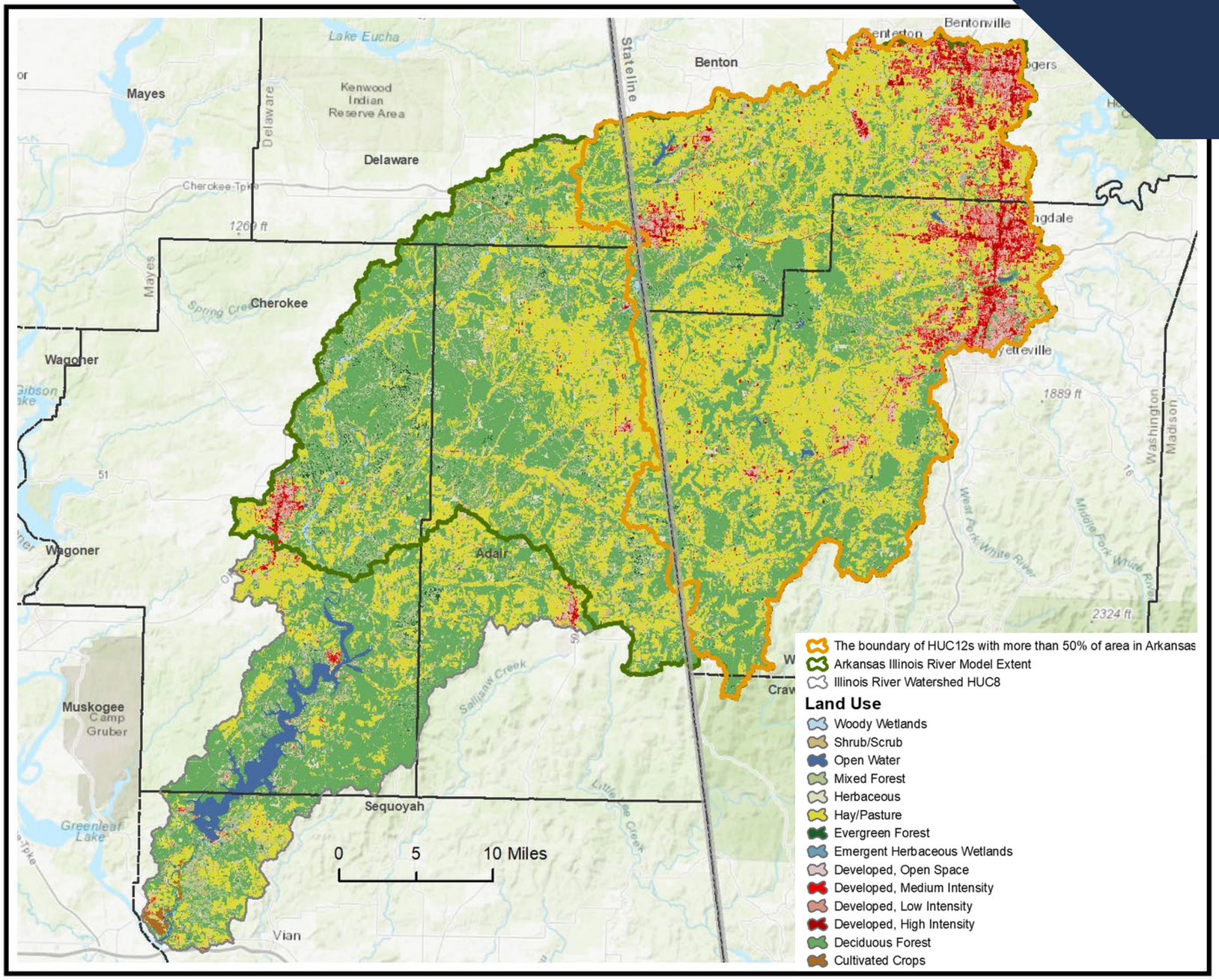
Daily Precipitation

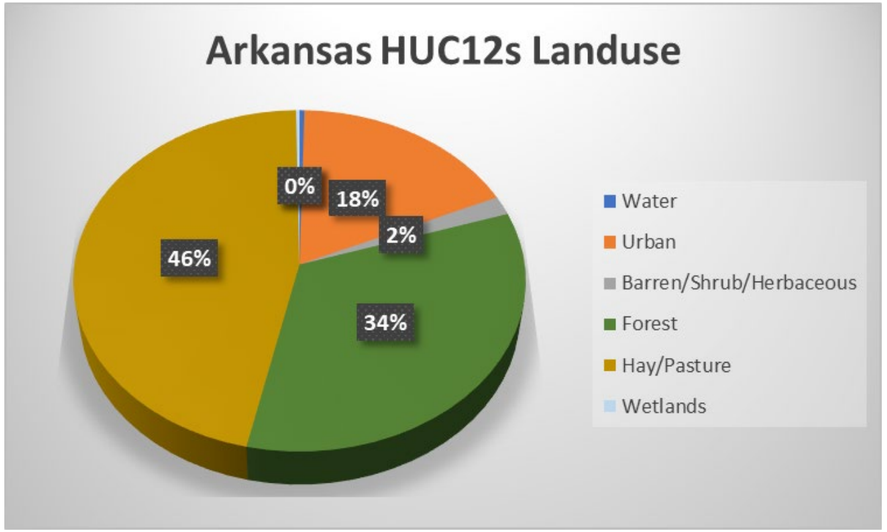
Temperature

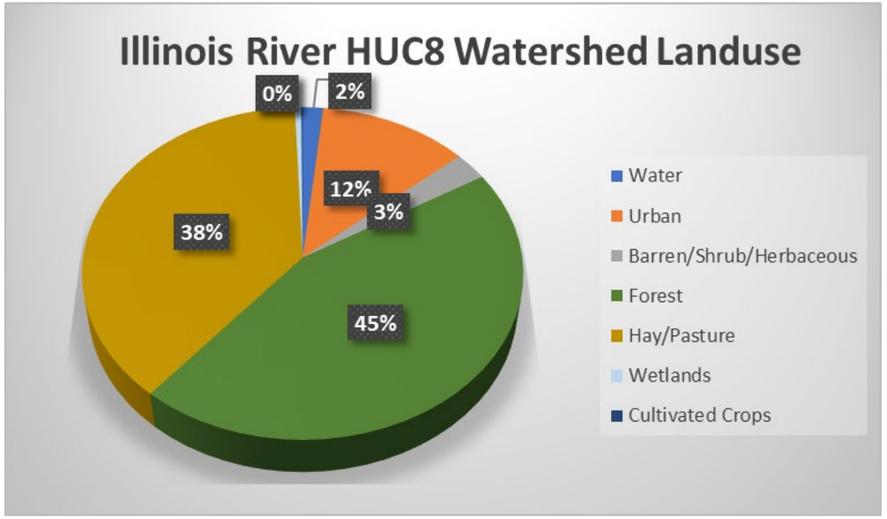
Dew Point Temperature

Wind Speed

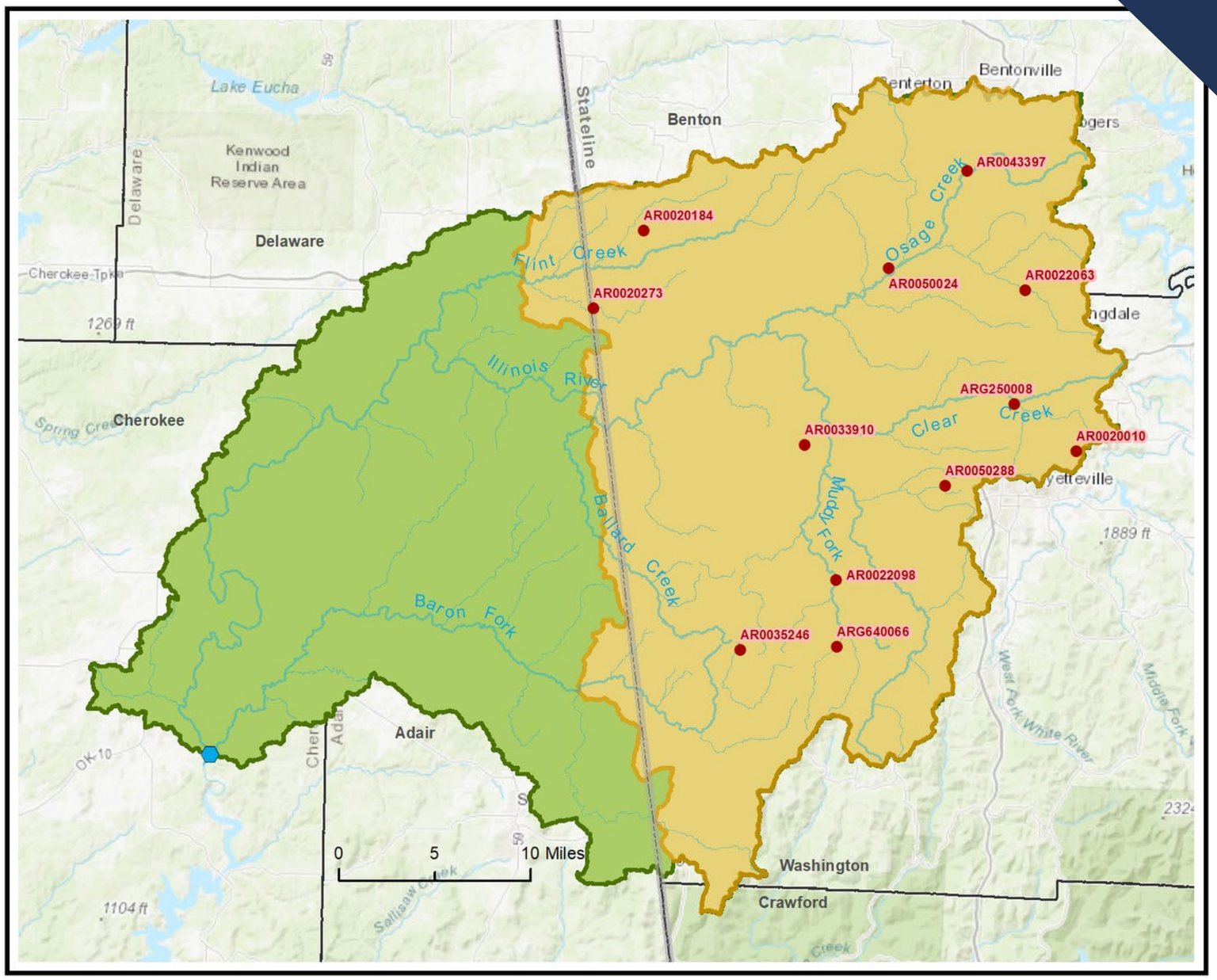
Inputs


Lake Eucha
Mayes
Kenwood Indian Reserve Area
Delaware
Stateline
Benton
Bentonville
Cherokee
Wagoner
Adair
Muskogee
Camp Gruber
Sequoyah
Greenleaf Lake
Vian
Spring Creek
Sallisaw Creek
Little Lee Creek
West Fork White River
Middle Fork White River
Washington
Madison
0 5 10 Miles
The boundary of HUC12s with more than 50% of area in Arkansas
Arkansas Illinois River Model Extent
Illinois River Watershed HUC8
Land Use
Woody Wetlands
Shrub/Scrub
Open Water
Mixed Forest
Herbaceous
Hay/Pasture
Evergreen Forest
Emergent Herbaceous Wetlands
Developed, Open Space
Developed, Medium Intensity
Developed, Low Intensity
Developed, High Intensity
Deciduous Forest
Cultivated Crops


Arkansas HUC12s Landuse
0%
18%
2%
46%
34%
Water
Urban
Barren/Shrub/Herbaceous
Forest
Hay/Pasture
Wetlands


Illinois River HUC8 Watershed Landuse
0%
2%
12%
3%
38%
45%
Water
Urban
Barren/Shrub/Herbaceous
Forest
Hay/Pasture
Wetlands
Cultivated Crops

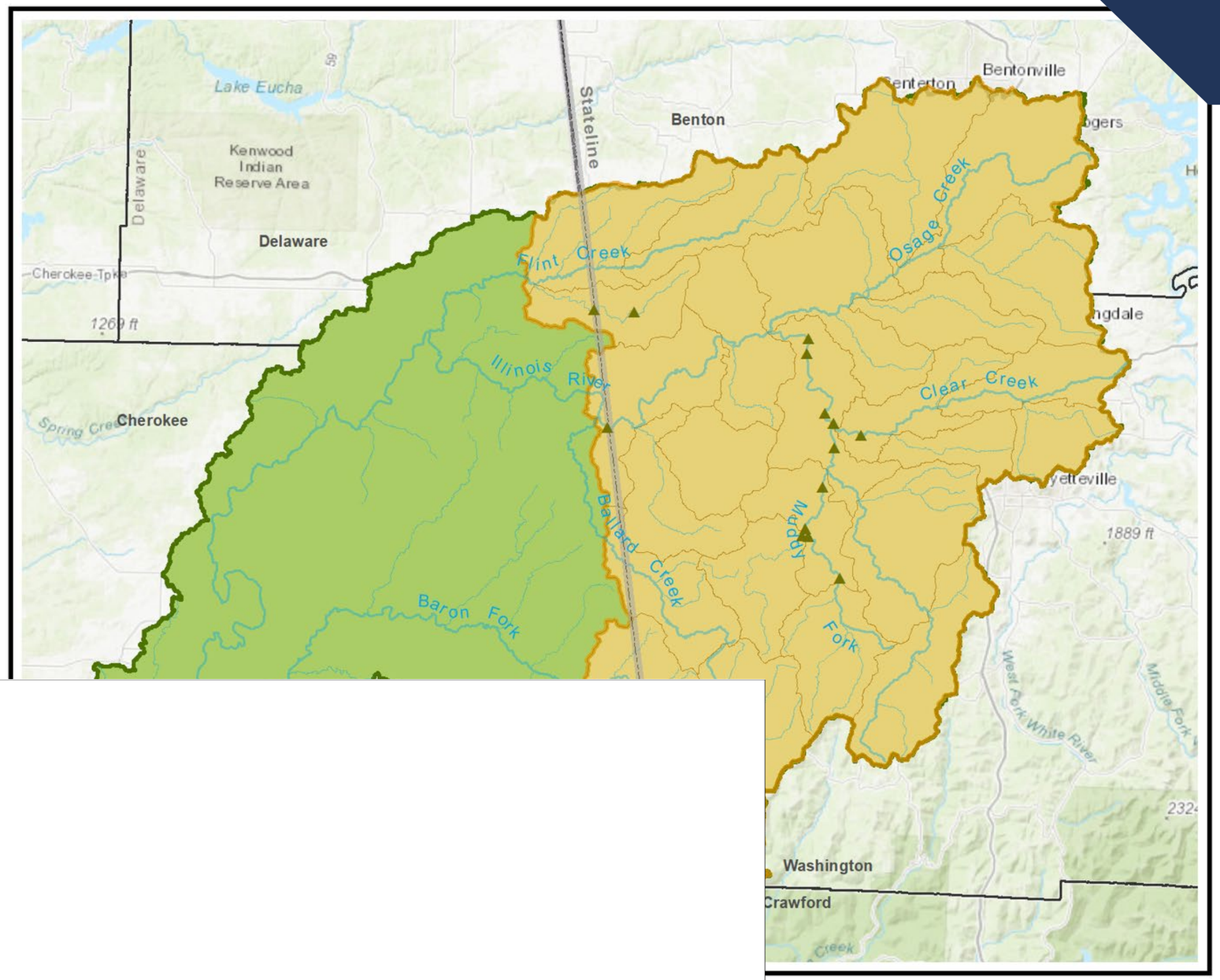
Inputs



Point Sources

NPDES Permit No.	Facility
AR0020184	City of Gentry WWTP
AR0020273	City of Siloam Springs WWTP
AR0022063	City of Springdale WWTP
AR0022098	City of Prairie Grove WWTP
AR0033910	USDA Forest Service – Lake Wedington Rec Area
AR0035246	City of Lincoln WWTP
AR0043397	City of Rogers WWTP
AR0050024	Northwest Arkansas Conservation Authority – Regional WWTP
AR0050288	City of Fayetteville West Side WWTP (starting June 2008)
ARG250008	Americold – Johnson
AR0020010	City of Fayetteville Noland WWTP Outfall 002 (ending June 2008)
ARG640066	City of Prairie Grove Water Treatment Plant (Filter Backwash)

Inputs



Streambank Erosion

Simplified Bagnold method used.

Streambank Erosion was not calibrated, but evaluated with observed, available data.

Management Practices

Urban Land Management

Fertilization, lawn mowing, watering practices were applied according to previous studies and models.

Cattle Grazing

Modeled on applicable pasture lands based on cattle numbers.

Dairy and Hog Farms

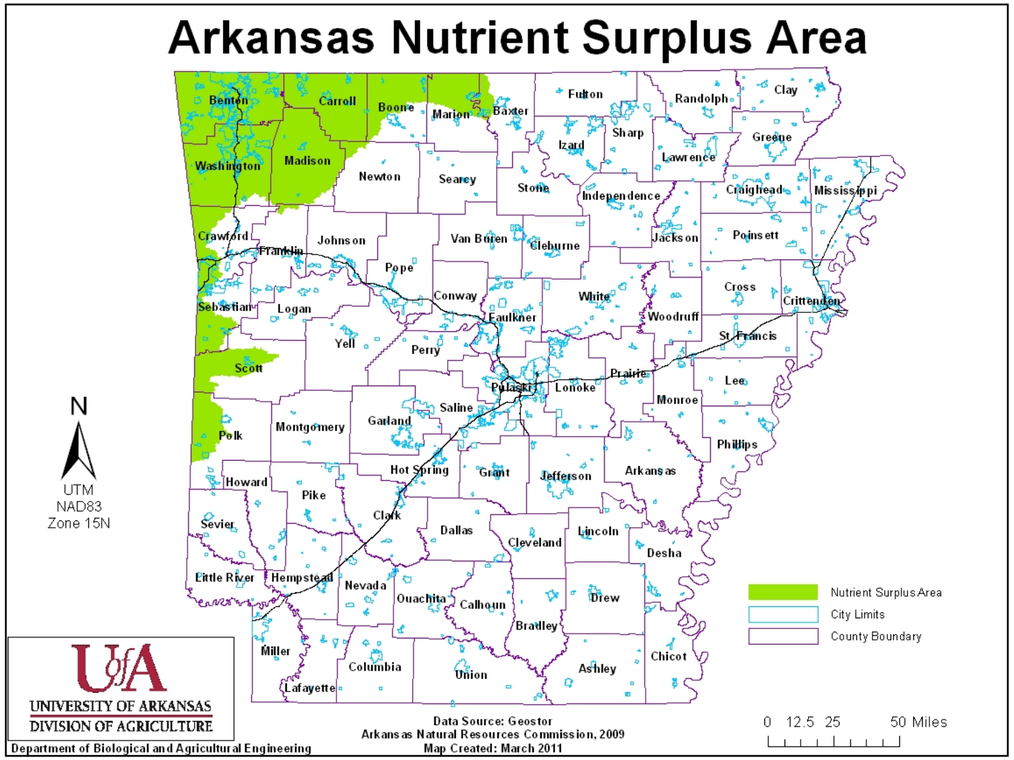
Dairy and hog farm manure application based on ADEQ Permit Data System.

Poultry Litter Application

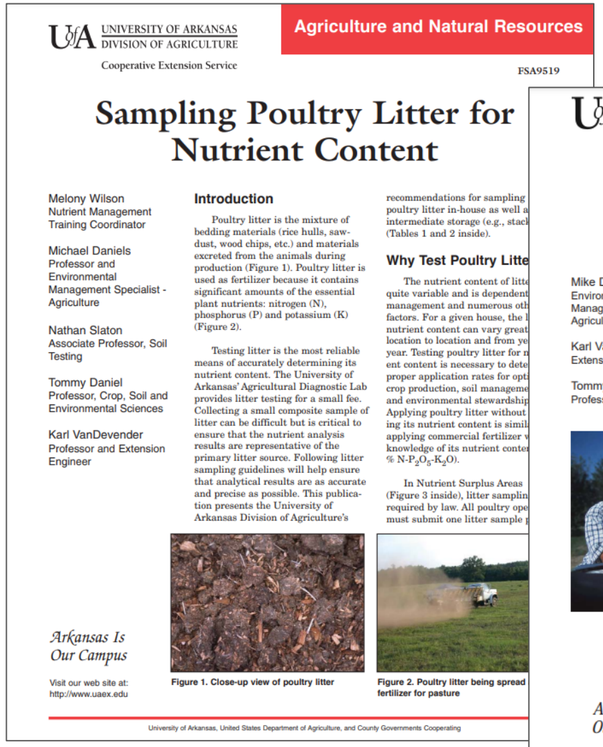
Acreage and amounts based on data reported by landowners with Nutrient Management Plans in 2019.

Inputs

Total of Poultry Litter Applied Acreage:	24,263
Total of all pasture acreage, only Arkansas HUC12s:	235,455
Percentage of Pasture receiving Poultry Litter:	**10%**



Poultry Litter Application


UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE
Cooperative Extension Service

Agriculture and Natural Resources

FSA9519

Sampling Poultry Litter for Nutrient Content

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Karl VanDevender
Professor and Extension Engineer

Introduction

Poultry litter is the mixture of bedding materials (rice hulls, sawdust, wood chips, etc.) and materials excreted from the animals during production (Figure 1). Poultry litter is used as fertilizer because it contains significant amounts of the essential plant nutrients: nitrogen (N), phosphorus (P) and potassium (K) (Figure 2).

Testing litter is the most reliable means of accurately determining its nutrient content. The University of Arkansas' Agricultural Diagnostic Lab provides litter testing for a small fee. Collecting a small composite sample of litter can be difficult but is critical to ensure that the nutrient analysis results are representative of the primary litter source. Following litter sampling guidelines will help ensure that analytical results are as accurate and precise as possible. This publication presents the University of Arkansas Division of Agriculture's recommendations for sampling poultry litter in-house as well as intermediate storage (e.g., stack (Tables 1 and 2 inside).

Why Test Poultry Litte

The nutrient content of litte quite variable and is dependent management and numerous oth factors. For a given house, the nutrient content can vary great location to location and from ye year. Testing poultry litter for n ent content is necessary to dete proper application rates for opt crop production, soil manageme and environmental stewardship Applying poultry litter without ing its nutrient content is simil applying commercial fertilizer knowledge of its nutrient conte % N-P_2O_5-K_2O).

In Nutrient Surplus Areas (Figure 3 inside), litter samplin required by law. All poultry ope must submit one litter sample

Figure 1. Close-up view of poultry litter

Figure 2. Poultry litter being spread fertilizer for pasture

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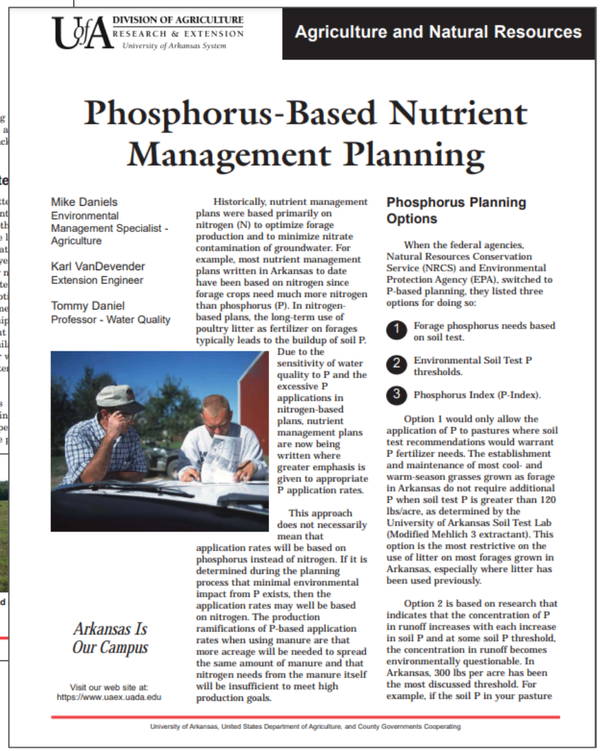
DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

Phosphorus-Based Nutrient Management Planning

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Historically, nutrient management plans were based primarily on nitrogen (N) to optimize forage production and to minimize nitrate contamination of groundwater. For example, most nutrient management plans written in Arkansas to date have been based on nitrogen since forage crops need much more nitrogen than phosphorus (P). In nitrogen-based plans, the long-term use of poultry litter as fertilizer on forages typically leads to the buildup of soil P. Due to the sensitivity of water quality to P and the excessive P applications in nitrogen-based plans, nutrient management plans are now being written where greater emphasis is given to appropriate P application rates.

This approach does not necessarily mean that application rates will be based on phosphorus instead of nitrogen. If it is determined during the planning process that minimal environmental impact from P exists, then the application rates may well be based on nitrogen. The production ramifications of P-based application rates when using manure are that more acreage will be needed to spread the same amount of manure and that nitrogen needs from the manure itself will be insufficient to meet high production goals.

Phosphorus Planning Options

When the federal agencies, Natural Resources Conservation Service (NRCS) and Environmental Protection Agency (EPA), switched to P-based planning, they listed three options for doing so:

1. Forage phosphorus needs based on soil test.
2. Environmental Soil Test P thresholds.
3. Phosphorus Index (P-Index).

Option 1 would only allow the application of P to pastures where soil test recommendations would warrant P fertilizer needs. The establishment and maintenance of most cool- and warm-season grasses grown as forage in Arkansas do not require additional P when soil test P is greater than 120 lbs/acre, as determined by the University of Arkansas Soil Test Lab (Modified Mehlich 3 extractant). This option is the most restrictive on the use of litter on most forages grown in Arkansas, especially where litter has been used previously.

Option 2 is based on research that indicates that the concentration of P in runoff increases with each increase in soil P and at some soil P threshold, the concentration in runoff becomes environmentally questionable. In Arkansas, 300 lbs per acre has been the most discussed threshold. For example, if the soil P in your pasture

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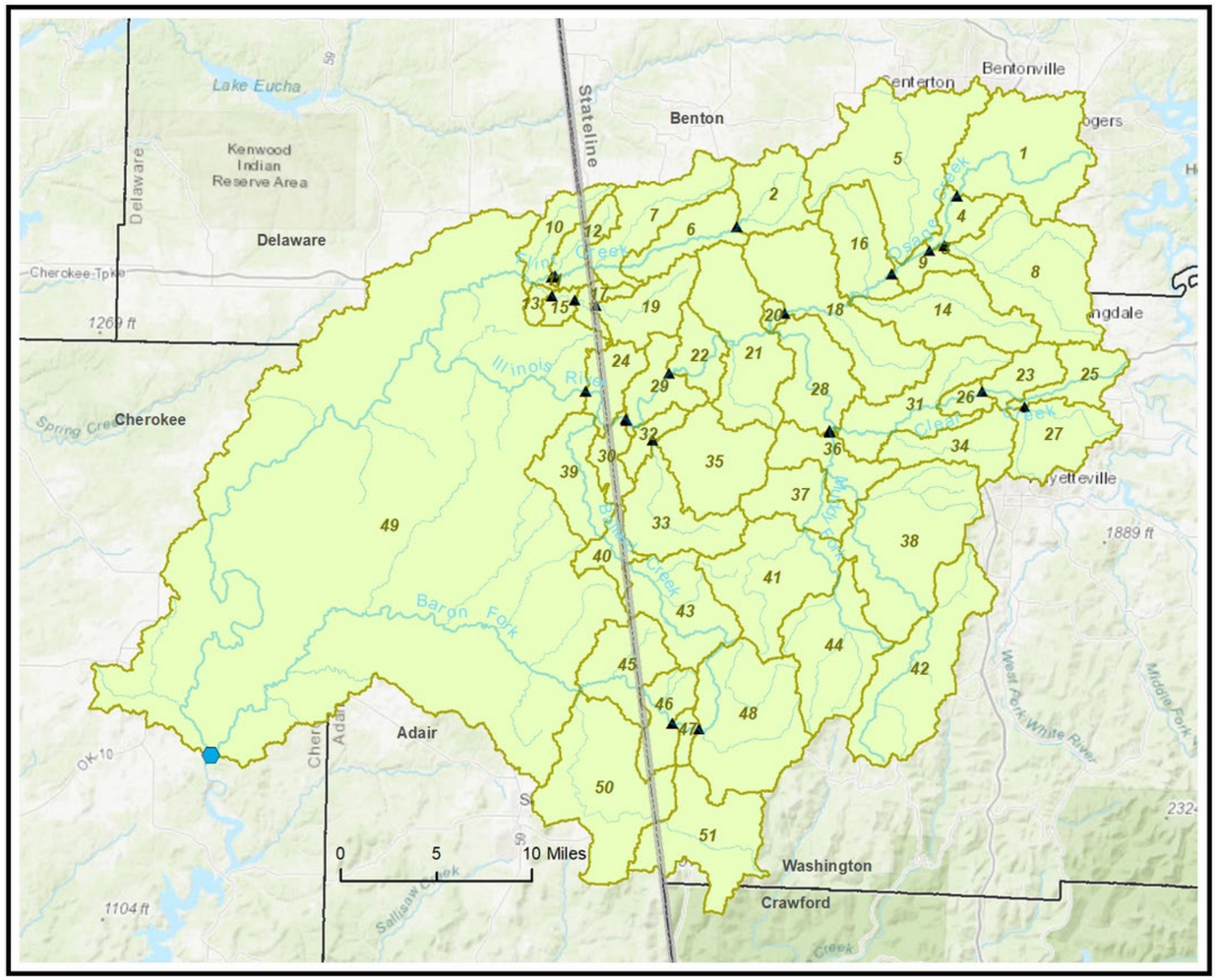
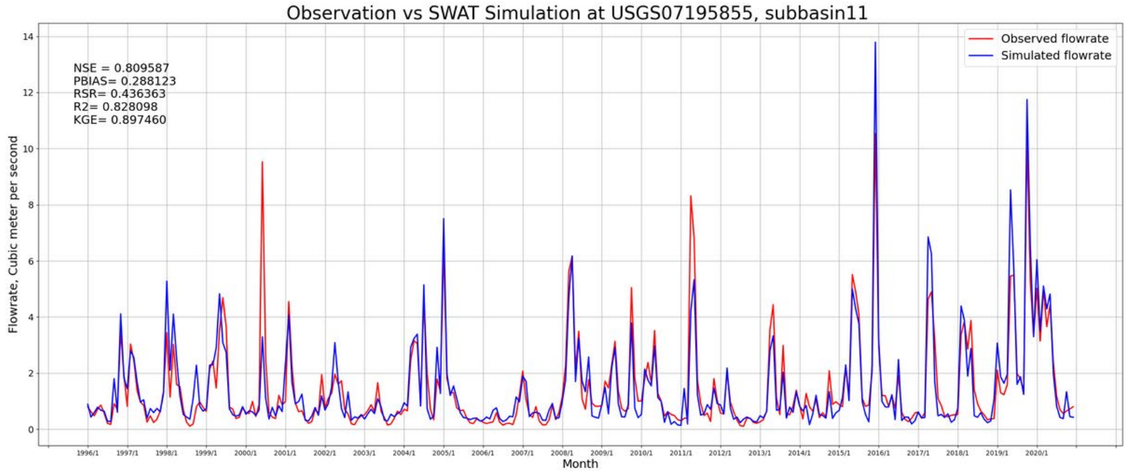
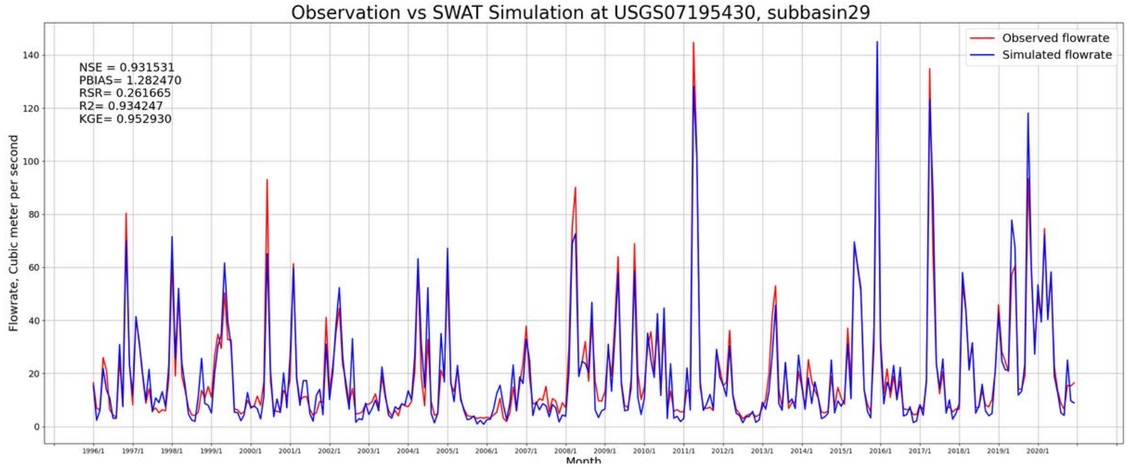
Calibration

1990 -2020 simulated

1996-2020 calibrated





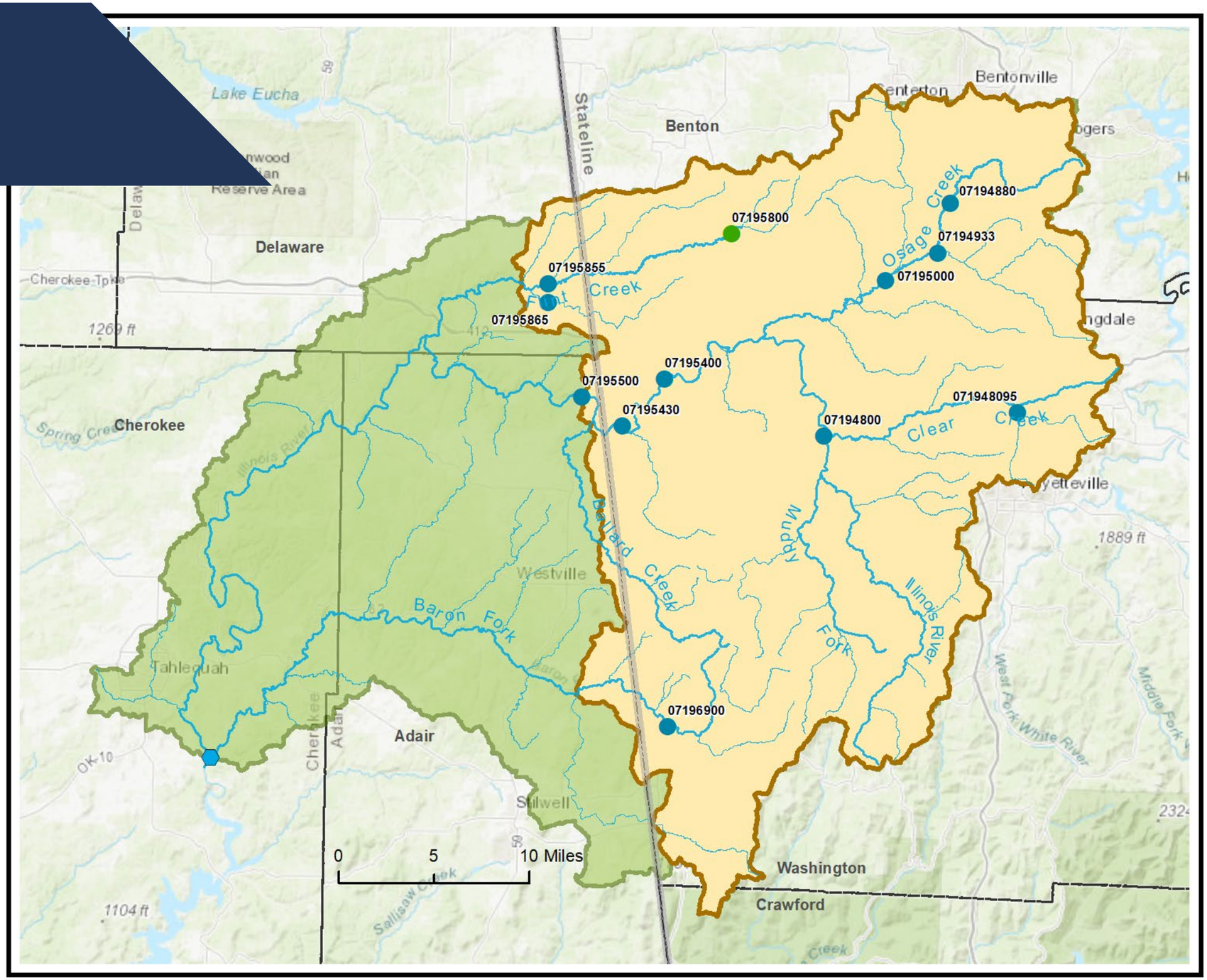


Calibration

Stream Flow

Calibrated Model Performance Category

- Unsatisfactory
- Satisfactory
- Good
- Very Good

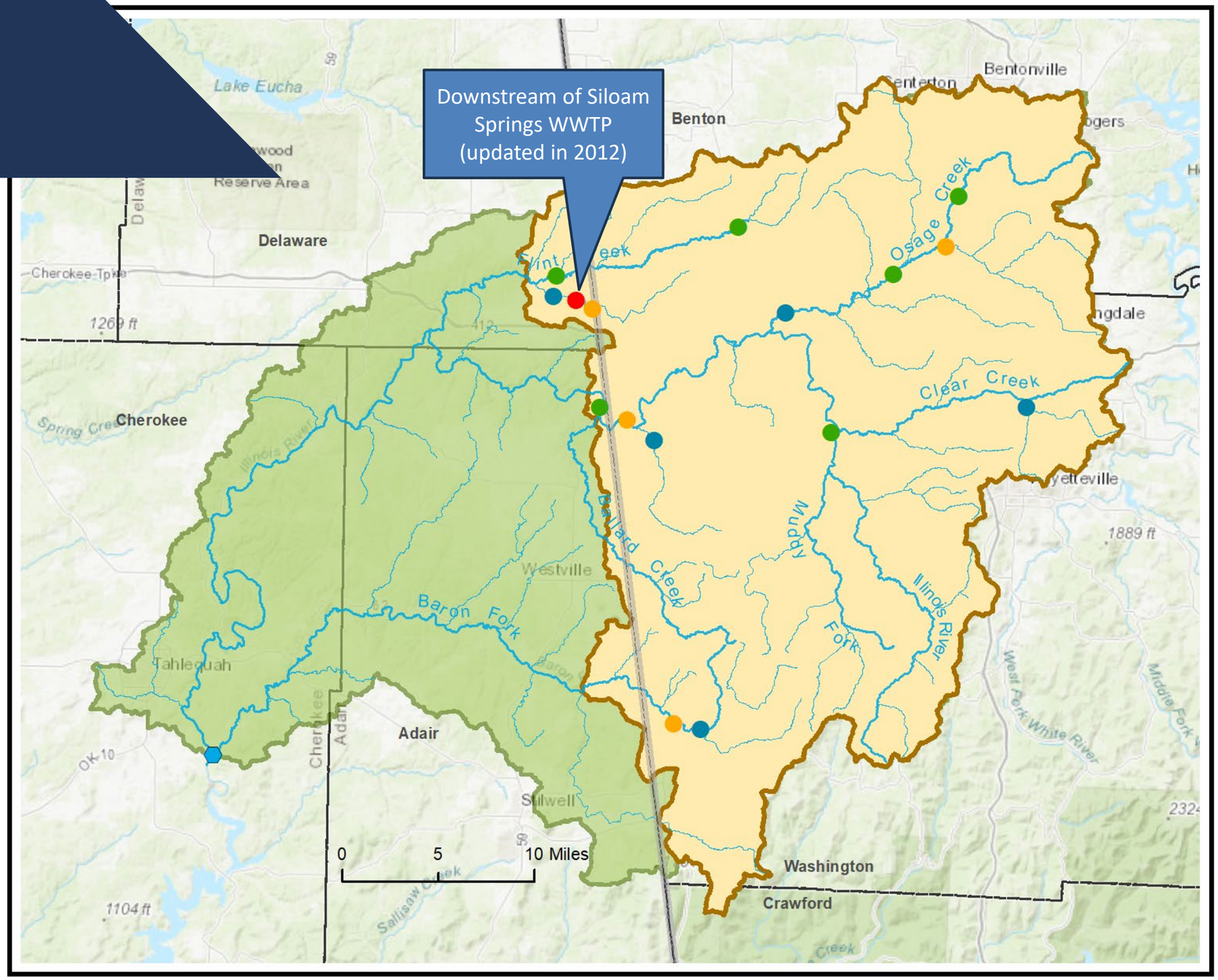


Calibration

Suspended Sediment Load

Calibrated Model Performance Category

- Unsatisfactory
- Satisfactory
- Good
- Very Good

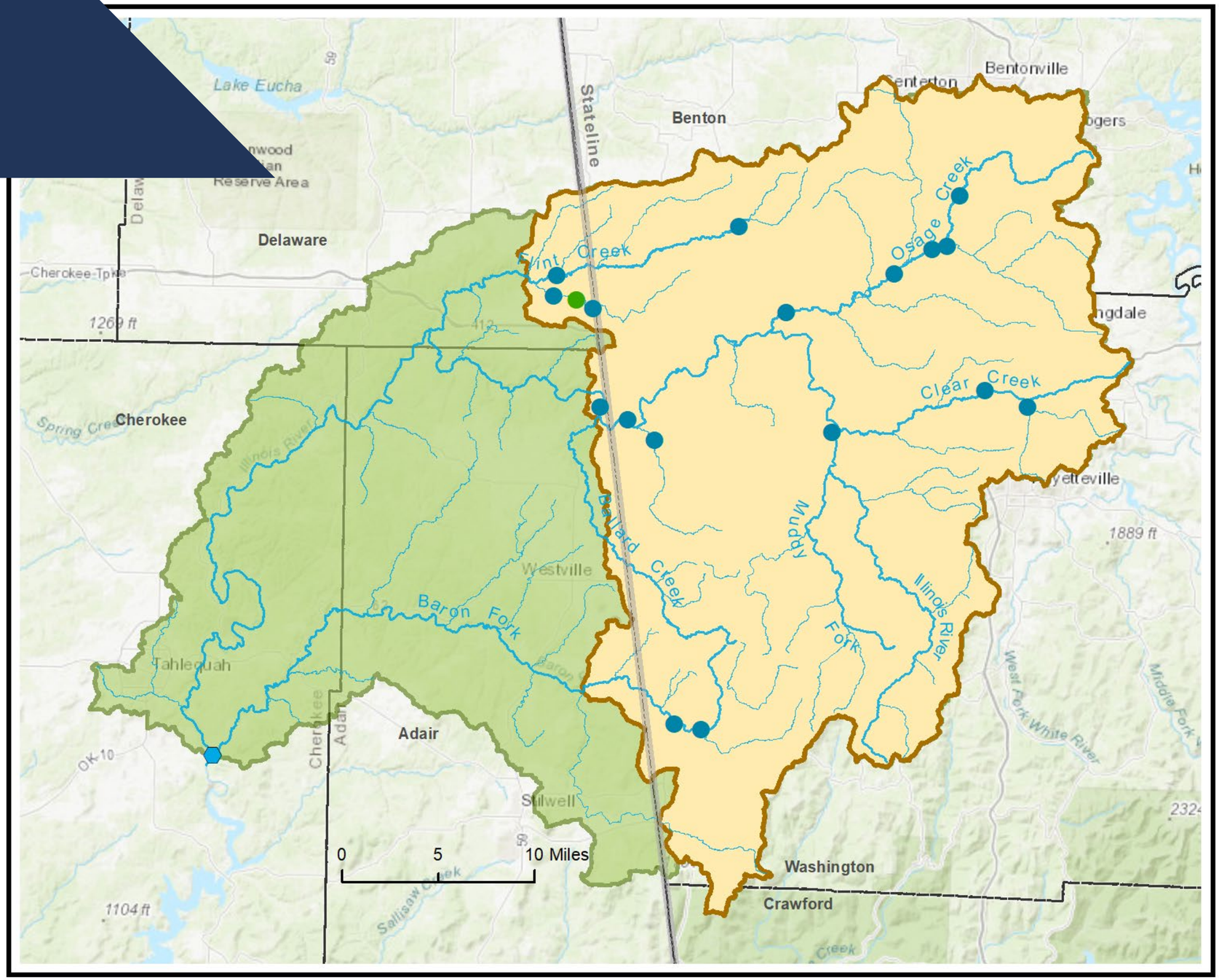


Calibration

Total Nitrogen

Calibrated Model Performance Category

- Unsatisfactory
- Satisfactory
- Good
- Very Good

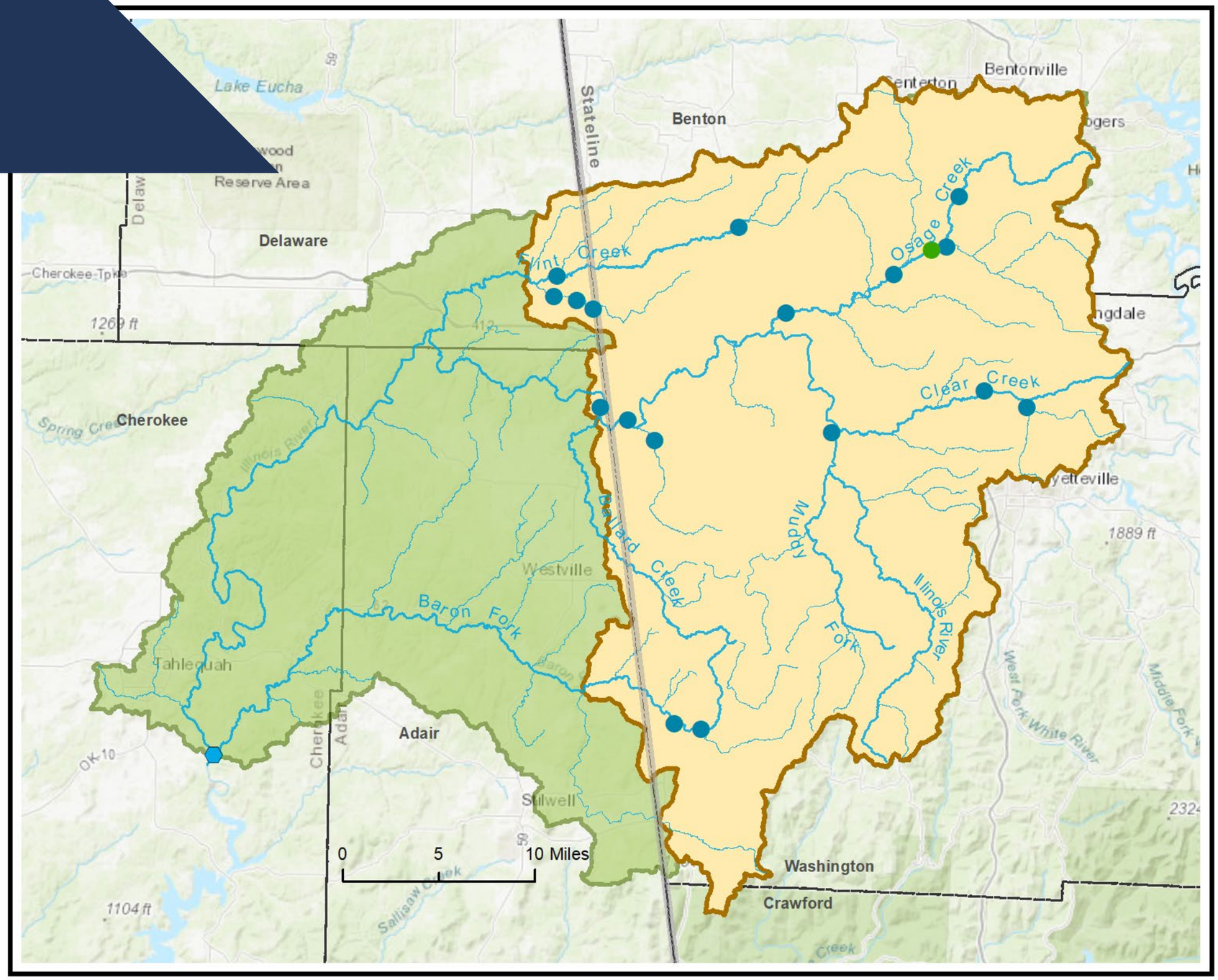


Calibration

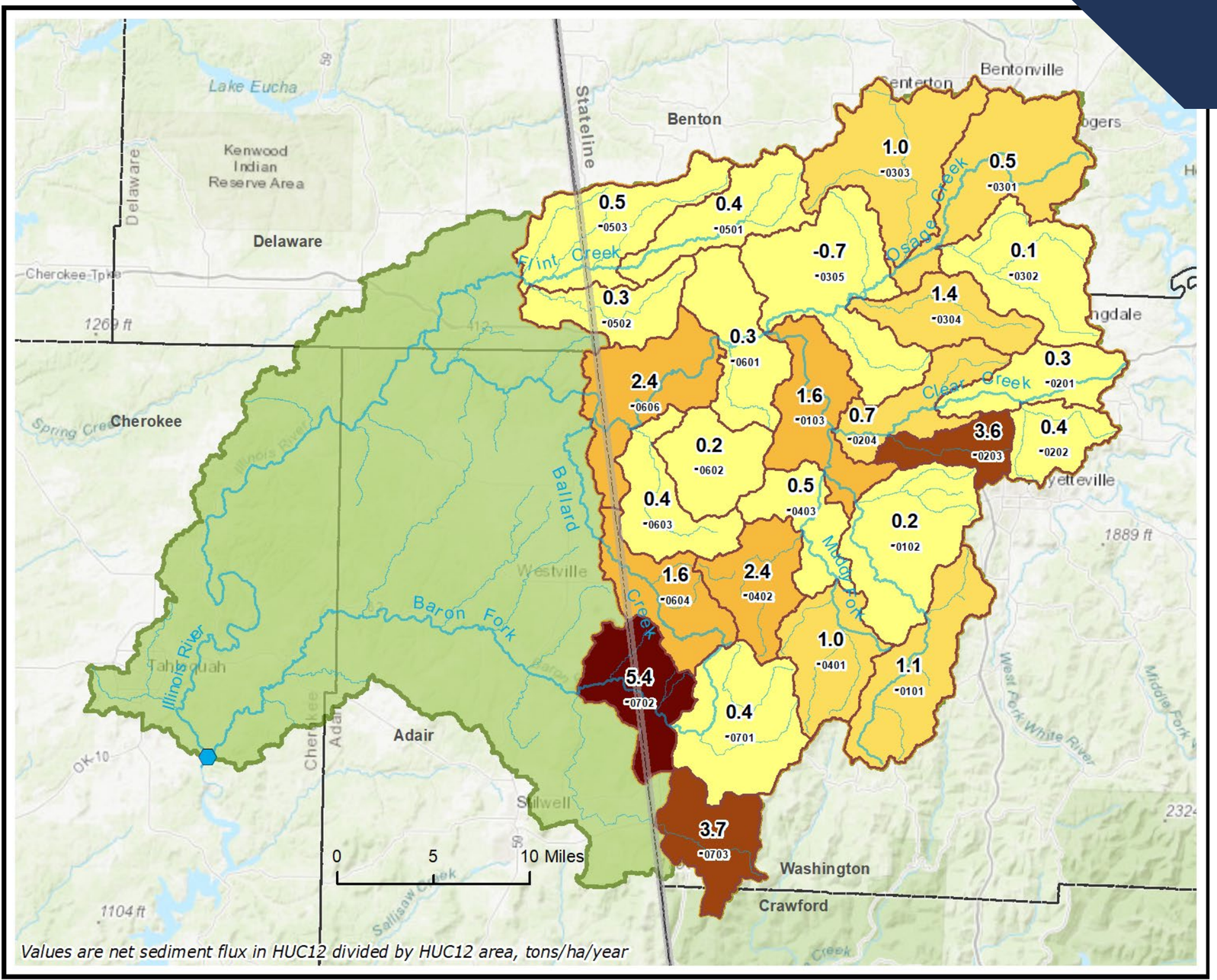
Total Phosphorus

Calibrated Model Performance Category

- Unsatisfactory
- Satisfactory
- Good
- Very Good



Results



Values are net sediment flux in HUC12 divided by HUC12 area, tons/ha/year

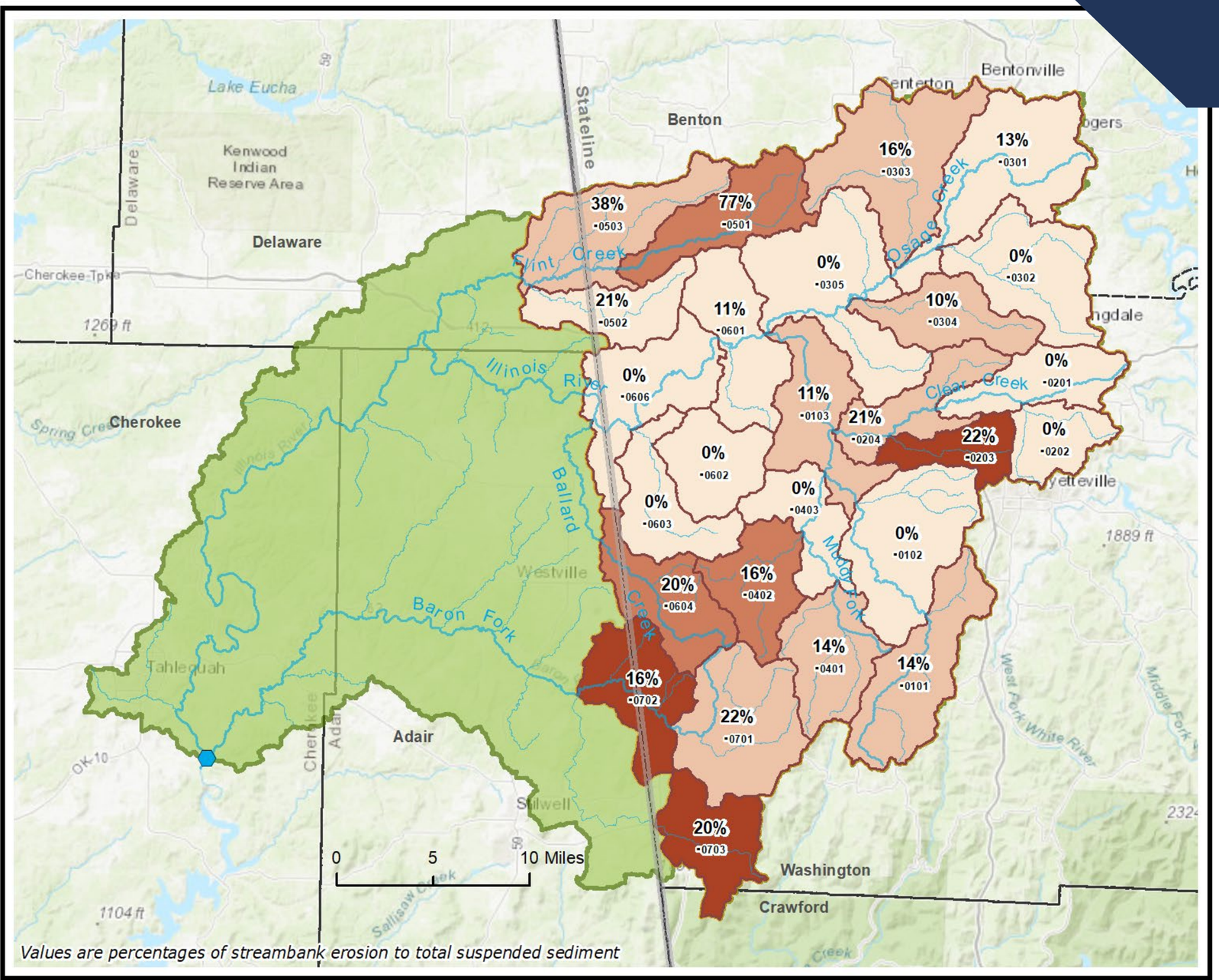
Suspended Sediment

Arkansas Illinois River Watershed
HUC12 Suspended Sediment

Net Sediment Flux Divided by HUC12 Area, metric tons/ha/year

- <0.5
- 0.5-1.5
- 1.5-2.5
- 2.5-3.5
- 3.5-4.5
- 4.5-5.5

Results



Streambank Erosion

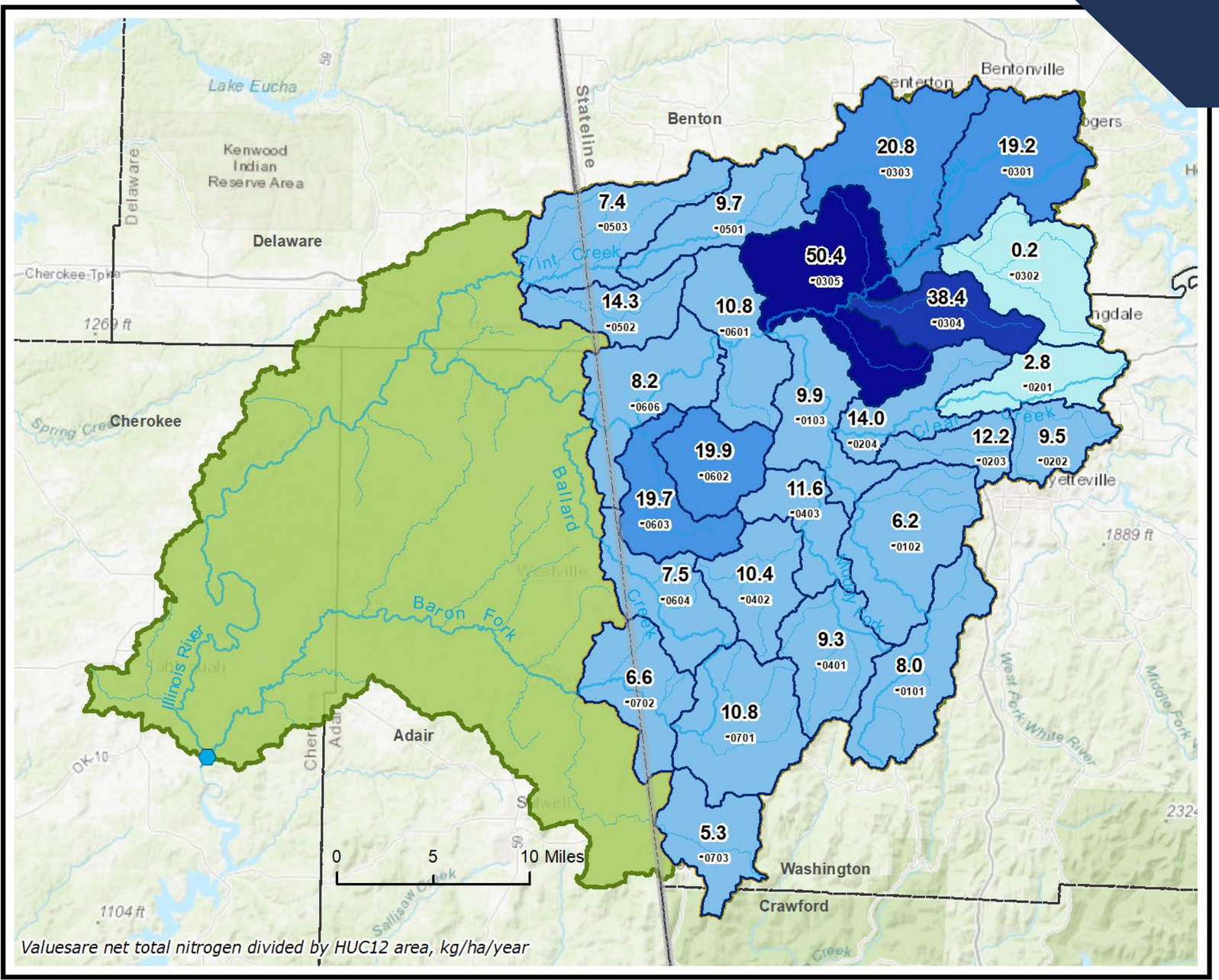
Arkansas Illinois River Watershed
HUC12 Streambank Erosion

Streambank Erosion Divided by HUC12 Area, metric tons/ha/year

- 0.0-0.1
- 0.1-0.2
- 0.2-0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-0.85

Results

Total Nitrogen

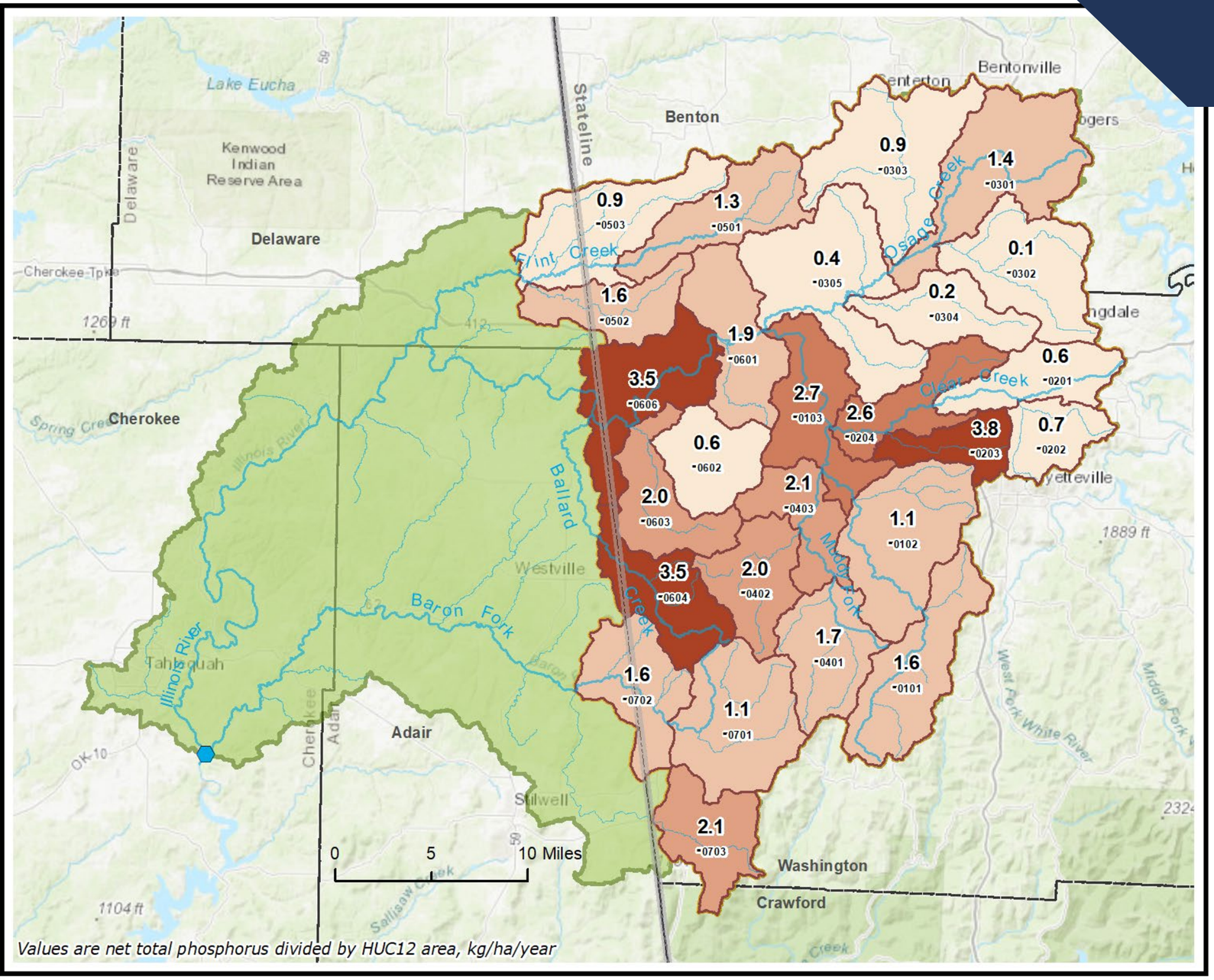


Arkansas Illinois River Watershed
HUC12 Total Nitrogen

Net Total Nitrogen Divided by HUC12 Area, kg/ha/year

- 0-5
- 5-15
- 15-25
- 25-35
- 35-45
- 45-55

Results



Total Phosphorus

Arkansas Illinois River Watershed
HUC12 Total Phosphorus

Net Total Phosphorus Divided by HUC12 Area, kg/ha/year

- 0.0-1.0
- 1.0-2.0
- 2.0-2.5
- 2.5-3.0
- 3.0-3.5
- 3.5-4.0

SWAT Model

SWAT Result is just one component of overall HUC12 Ranking for prioritizing subwatersheds

WATERSHED MANAGEMENT PLAN

Subwatershed Ranking

Other Criteria

Other criteria might include water quality impairments and NRCS resource concerns

THANK YOU

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