Using the Soil and Watershed Assessment Tool (SWAT) to Prioritize Conservation Efforts for Maximum Water Quality Benefits in the Little Beaver Creek Watershed, OK

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Nation Water Quality Initiative: Background

- NRCS and partners work with producers and landowners to implement voluntary conservation practices that improve water quality in high-priority watersheds while maintaining agricultural productivity
- To date, at least 14 Watersheds have been delisting or have met treatment goals
- Most successful NWQI watersheds have a comprehensive watershed plan with well-defined water quality goals, and a strong partnership framework

NWQI State Survey: Key Results

- States like a targeted approach
  - Concentrate funding and efforts in small watersheds,
  - NWQI helped NRCS grow/support partnerships.
- Challenges
  - Lack of time for adequate planning and outreach
  - Maintaining participation in the program.
- Approximately 75% of NWQI watersheds have a plan
  - TMDL, TMDL implementation plan, 319 watershed plan, etc.
- Majority of plans were not appropriate scale for conservation planning

NWQI Pilot Program

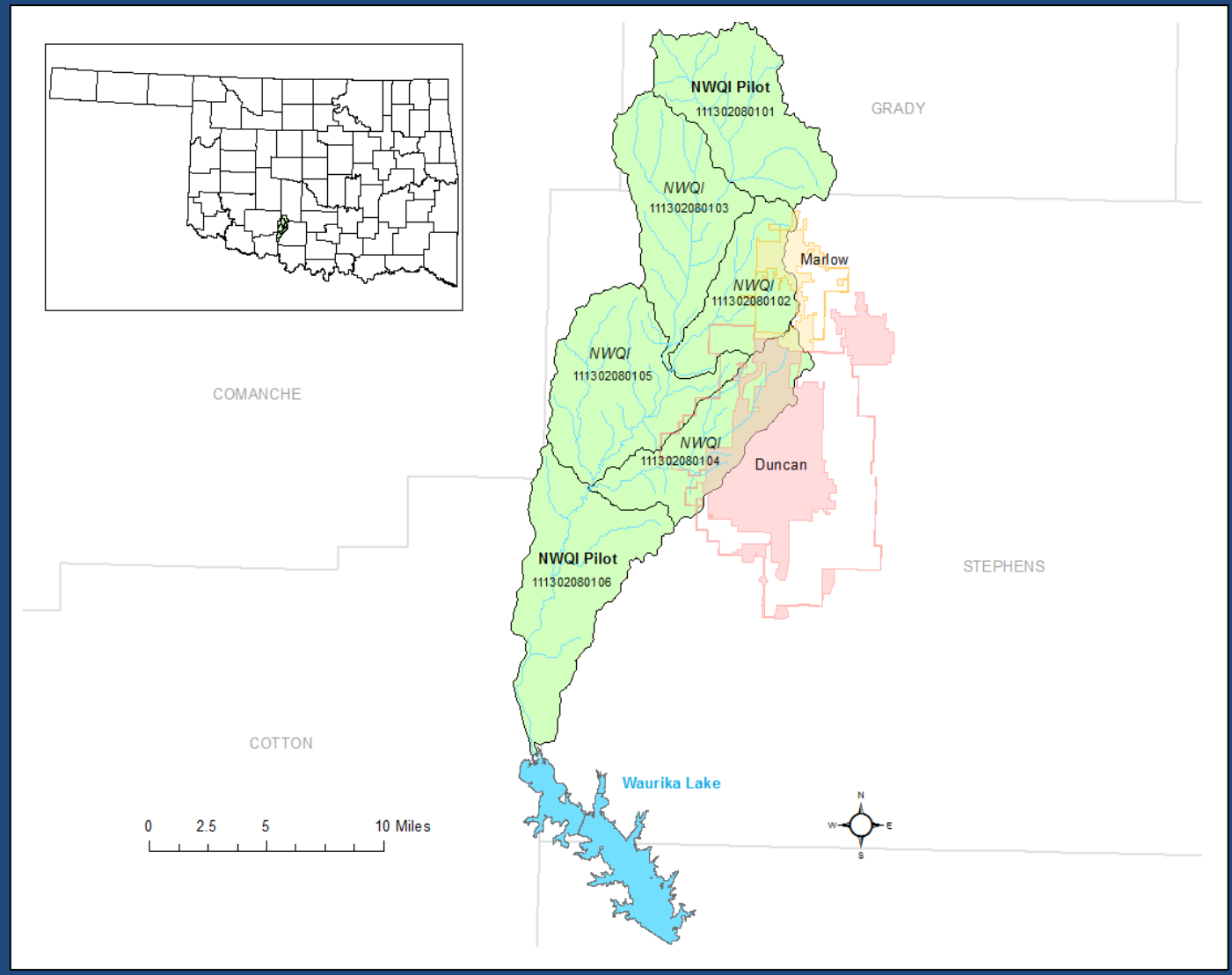
- Partner with OCC – Water Quality Division
- Develop an assessment and watershed based plan for two HUC 12 watersheds
  - Test watershed analysis tools
  - Vulnerable acres – runoff, sedimentation, lack of conservation practices
  - Identify causes
  - Plan
  - Solutions

NWQI Pilot Program

- **HUC 12 scale assessment**
  - **greater focus upon hydrologic processes**
  - **factors affecting hydrologic processes**
  - **resulting water quality conditions**
- **Outreach Plan**
  - **Use identified critical areas from the watershed assessment to target producers in those areas for elevated level of outreach.**

Watershed Characterization

- **Watershed WQ: constituents of concern**
  - **Turbidity/Total Suspended Solids**
  - **Bacteria: E. coli, Enterococcus**
  - **Total Dissolved Solids**
- **Modeling two watersheds**
  - **101 and 106**



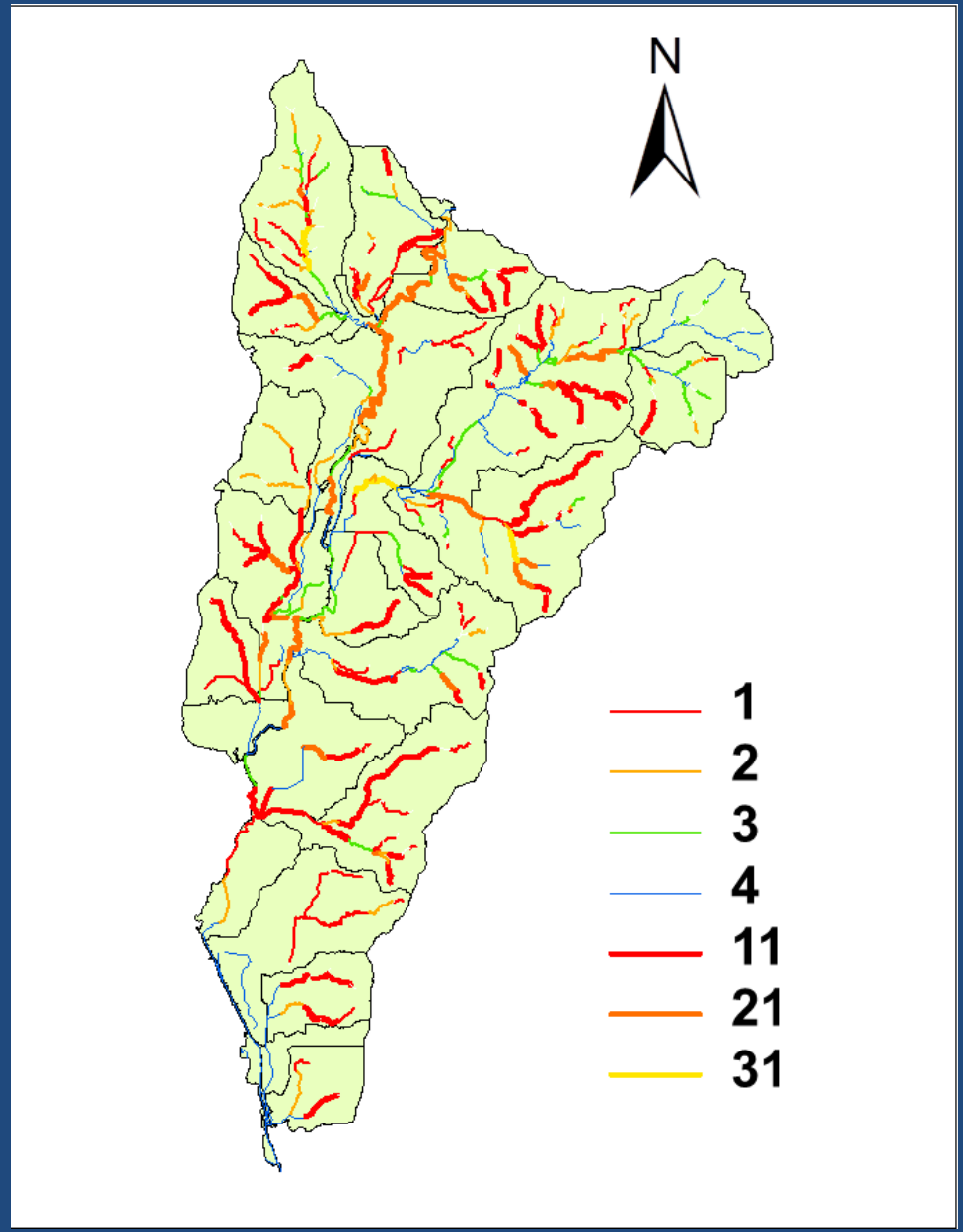
Little Beaver Creek Watershed (Note: includes subwatersheds under existing NWQI project area).

Analysis, Assessment and Planning

- Visual inspection
  - Riparian assessment
    - Aerial images
- Soil and Watershed Assessment tool (SWAT)
  - Data/inputs
    - High Resolution DEM’s
    - Landuse/Landcover
      - NLCD, CDL, NASS, user defined
    - Soil Maps
- On site inspections
- Input from local conservationists

Riparian Analysis

- Used NHD Hi-res flowline
- Created 15m buffer on either side
  - Estimate riparian buffer
  - Vegetative cover
  - General stability
- Using high resolution ortho-imagery (ESRI website live link)
  - At 1:3000 scale
  - Estimated for all stream reaches
    - Perennial, woody vegetative cover
    - 1 - None apparent
2 – Some apparent
3 – Mostly fills buffer
4 – Exceeds buffer
    - Active erosion, gullying, and/or trailing
    - Significant presence of either/both is indicated with a “1” after the riparian condition number (e.g., 11, 21, 31).

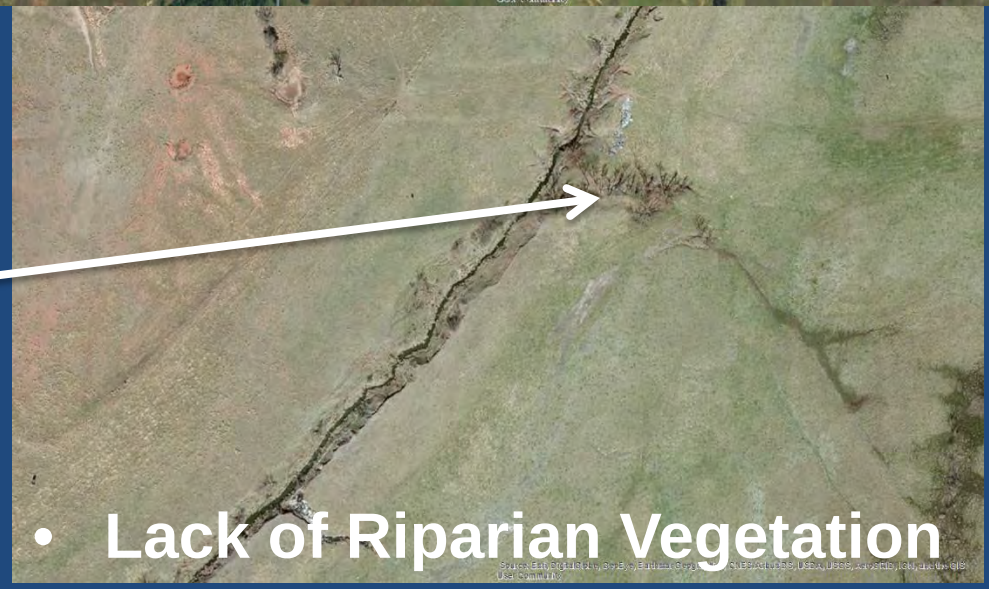


Riparian Analysis

- Road though creek

Cattle tracks

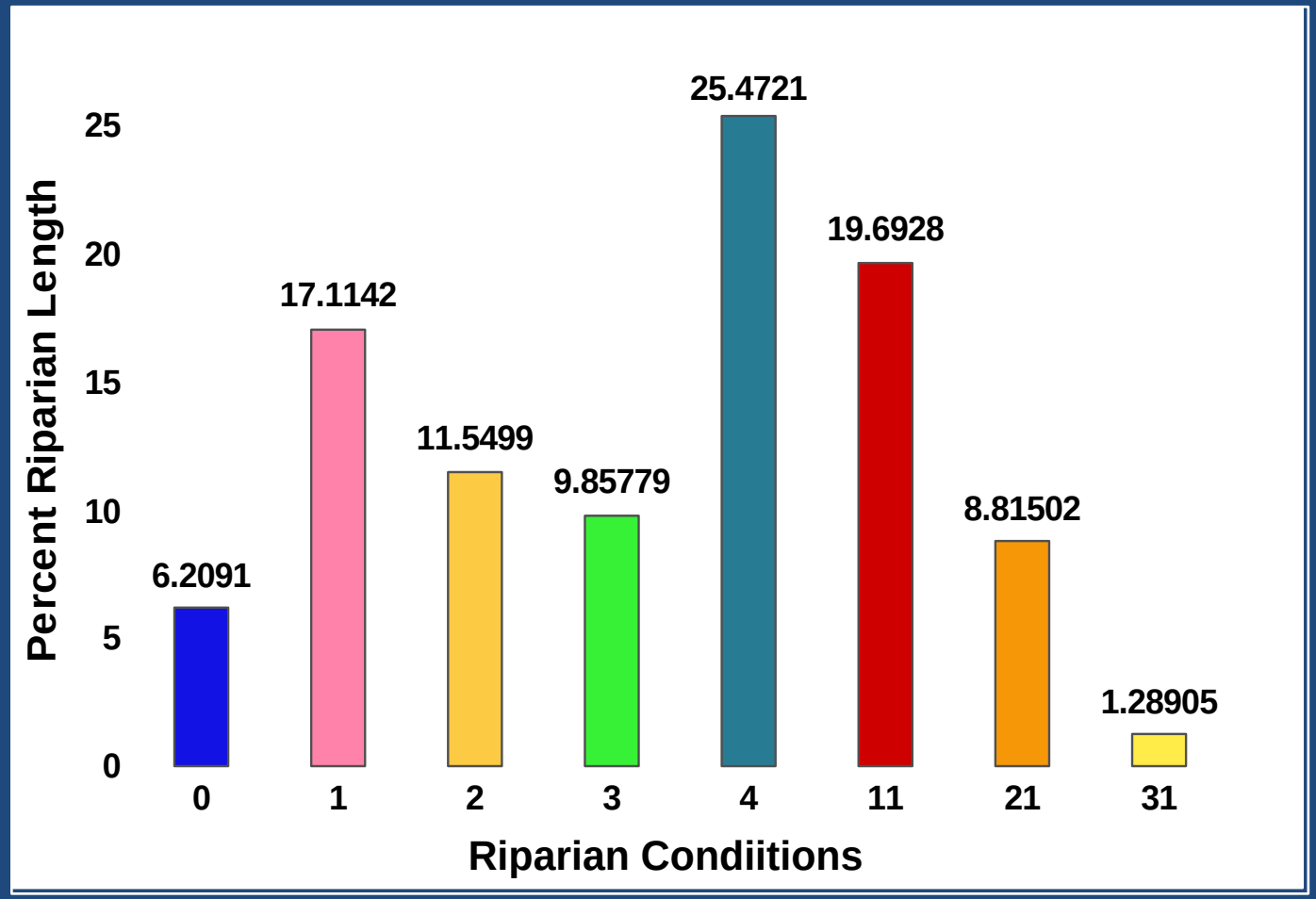
Gullies



- Lack of Riparian Vegetation

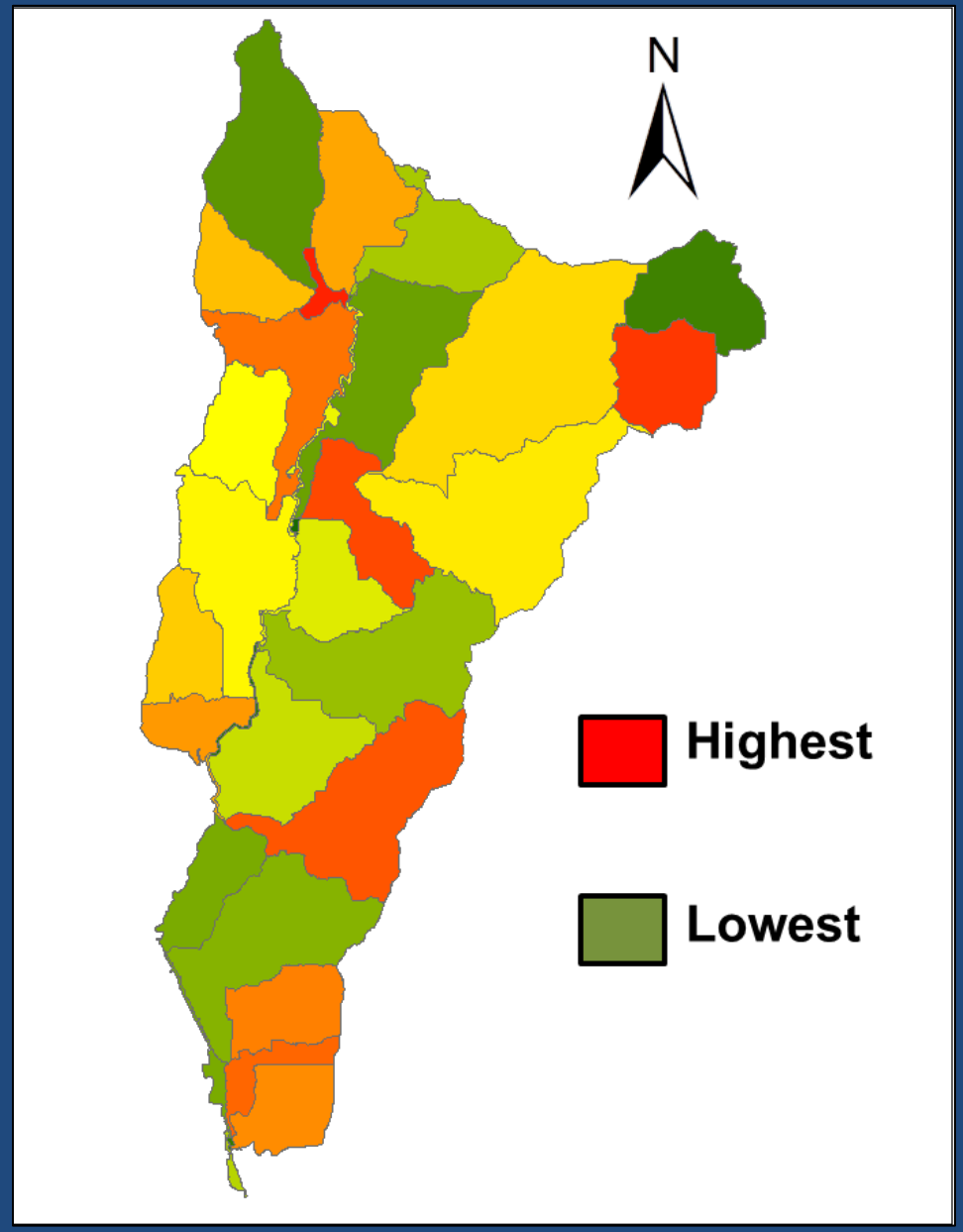
Riparian Analysis 106

- 29.8% of riparian areas have livestock present
- 19.7% is severely eroded with cattle present and little to no riparian vegetation
- Another 17.1% is severely eroded without cattle
- Only 25.5% of the riparian areas have vegetation cover and are livestock free



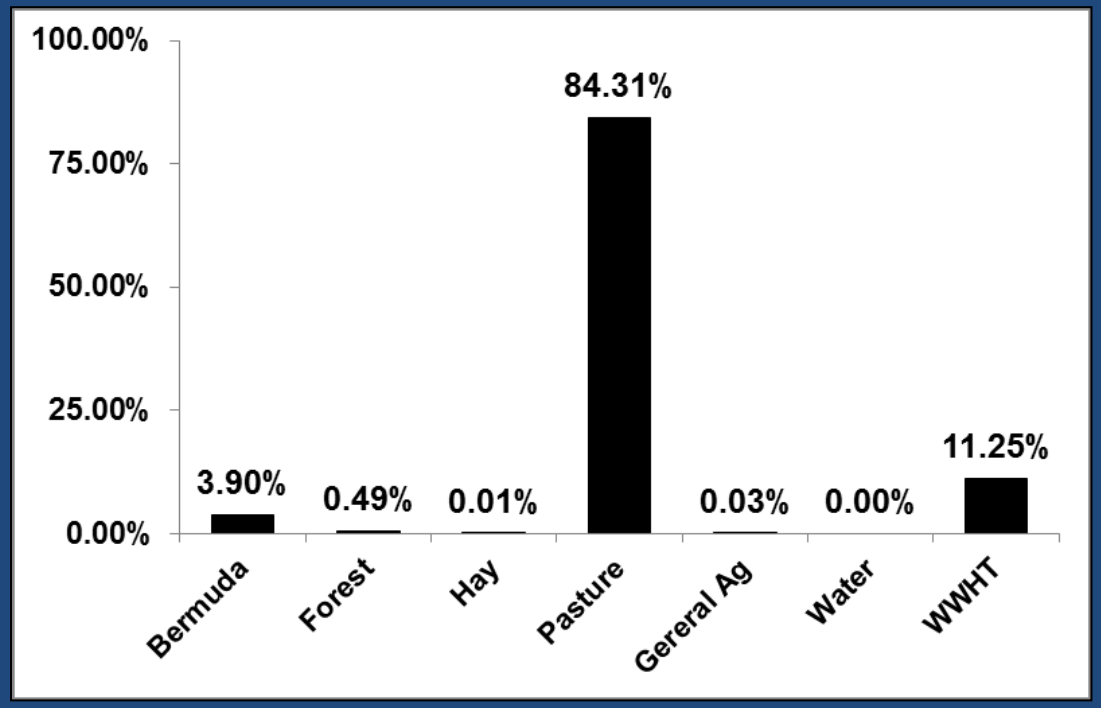
SWAT Analysis: Sub-basins

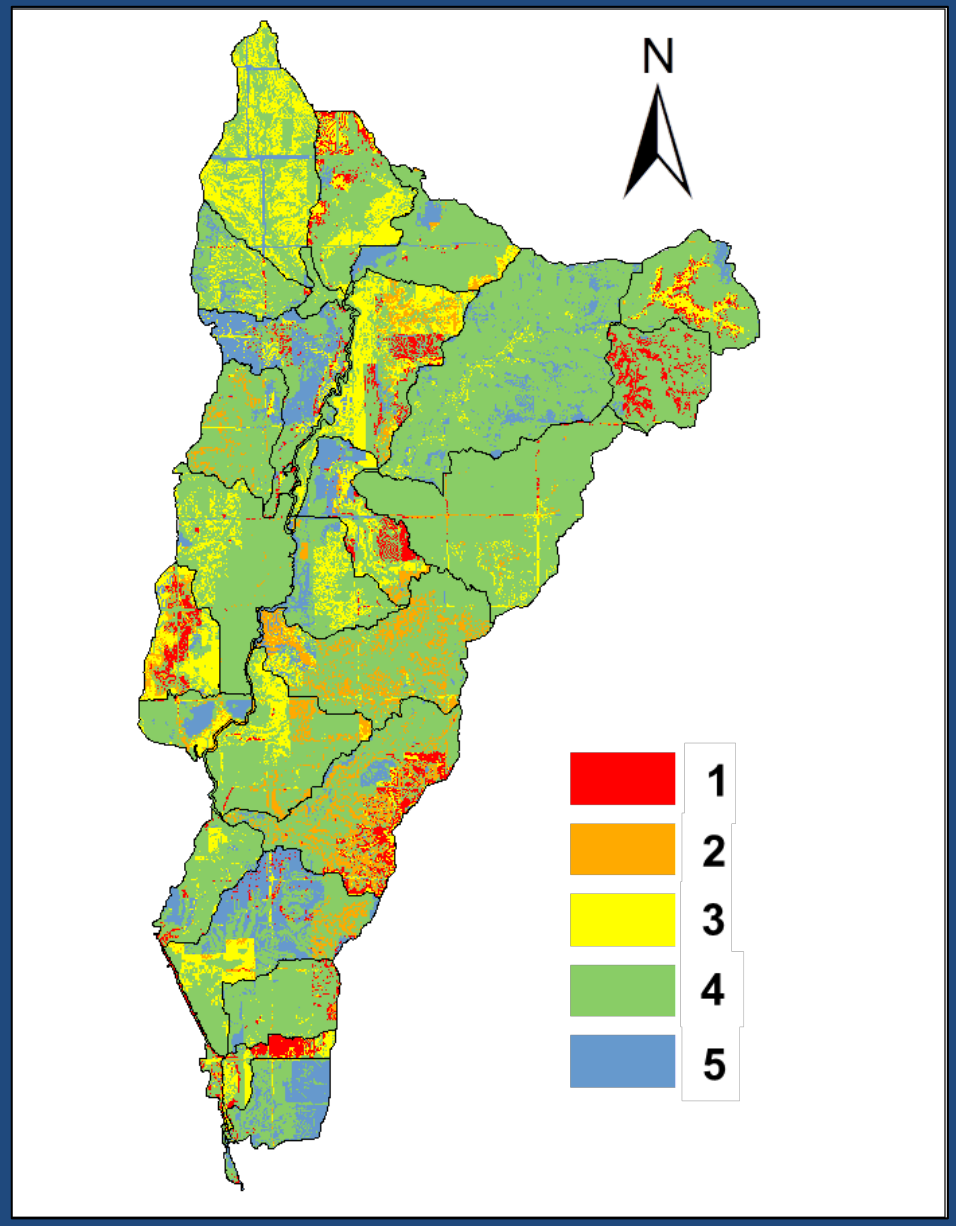
- Watershed ~ 40 mi^2
- 33 sub-basins
- Ranked high to low
  - Average annual predicted sediment output
  - Based on 41 year simulation (10 year warmup)



SWAT Analysis:

- 1167 HRU
- Ranked top 25% by predicted average annual sediment output
- Values assigned on breaks in data distribution
- 1, 2 and 3 are critical acres





Limitations of the model

- Determining data input thresholds
  - Cutoff for soils and landuse
- No flow data in watershed
- Limited WQ data
  - Evaluate individual HUC 12s
- Static input data for simulation
- Gulley erosion
- Instream erosion

Next steps

- Refine current model
  - Add bacteria inputs
  - Adjust soil and Landuse data
- Get input from DC's
  - Determine likely participants in watershed
- Run scenarios for to evaluate BMP's
  - Performance
  - Economic evaluation
  - Potentially run simulations into the future