Project No.13-600

SWAT Modeling and Monitoring of Priority Watersheds- Phase III

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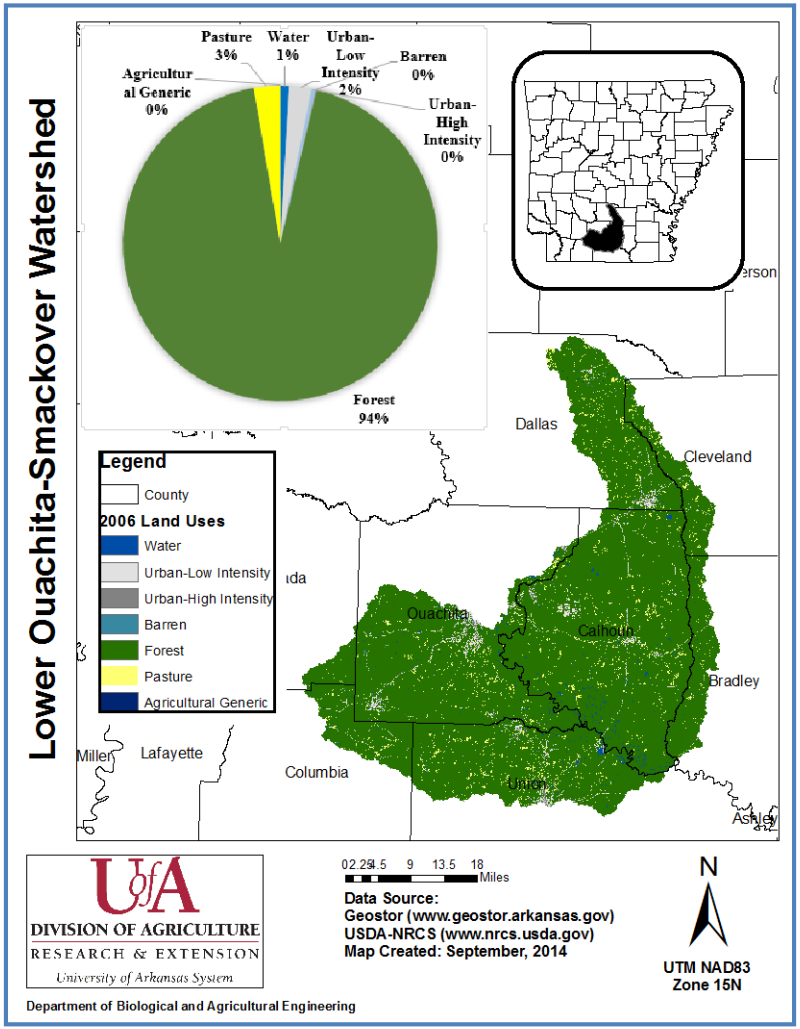
DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

ANRC NPS Annual 319 Program Review Meeting, September 18, 2014

Project Objective

Prioritize 12-digit HUCs using SWAT model output

Lower Ouachita Smackover Watershed



Area: 1797 sq. mi.

Land-use: Forest (94%)
Pasture (3%)
Urban (2%)
Water (1%)

Elevation: 202 ft. (mean)

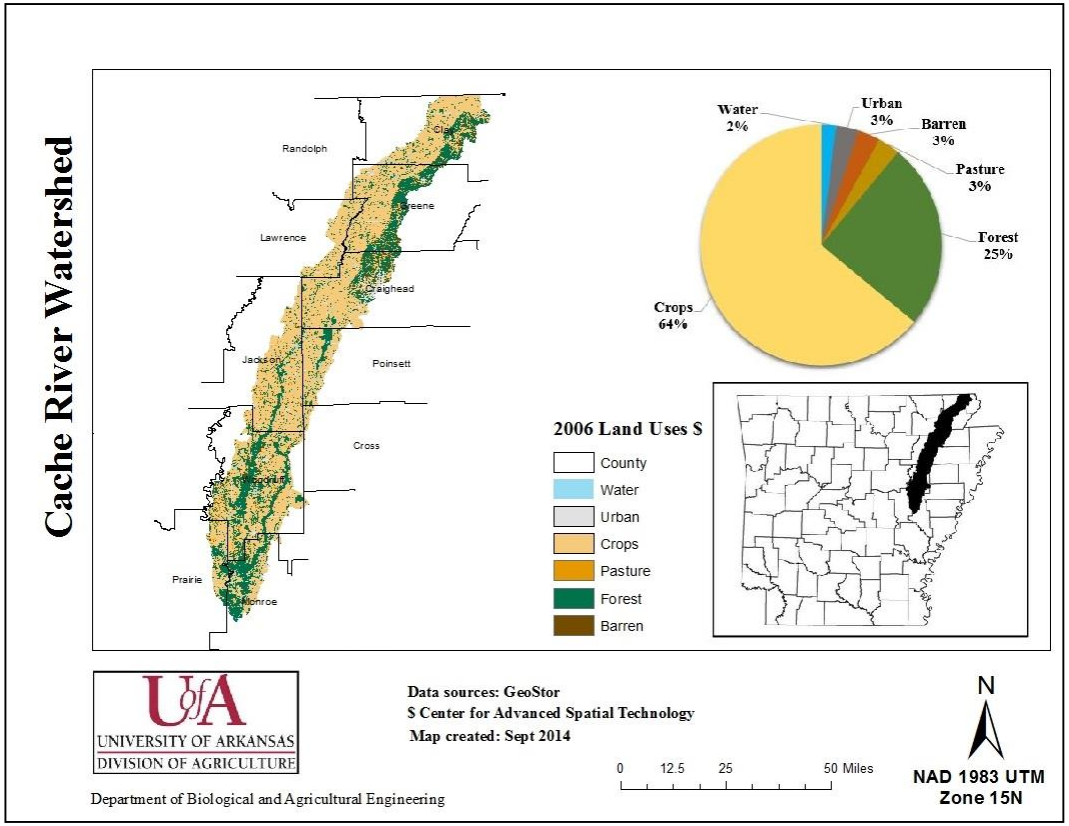
Slope: 37% area under 3-8% slope

Soil: 83% area under group C/D

Precipitation: 52 inch (mean)

WATERSHED PROFILE

Cache River Watershed



Area: 1956 sq. mi.

Land-use: Water (2%)
Pasture (3%)
Urban (3%)
Barren (3%)
Forest (25%)
Crops (64%)

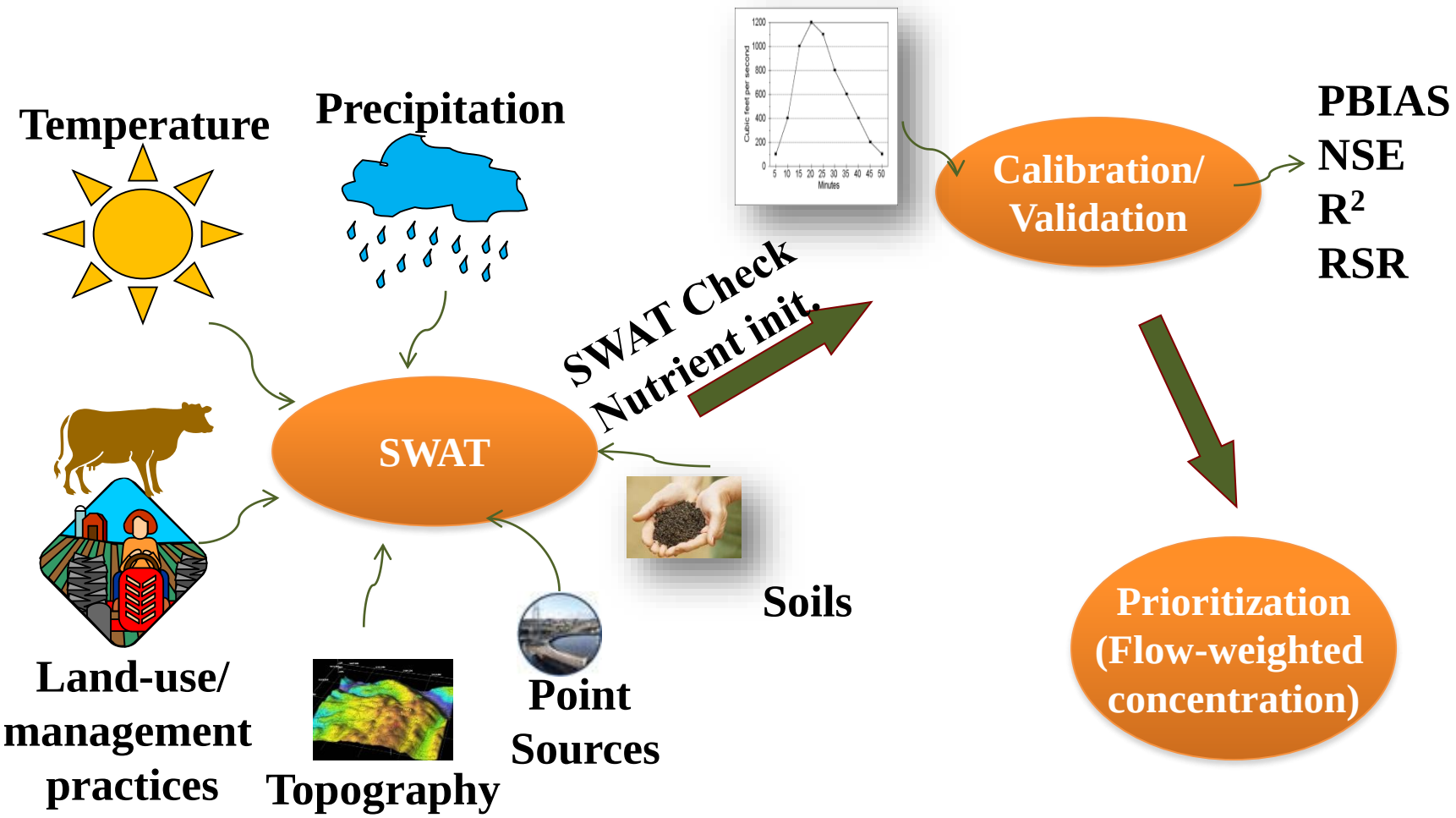
Elevation: 351 ft. (mean)

Slope: 48% area under 0-1 % slope

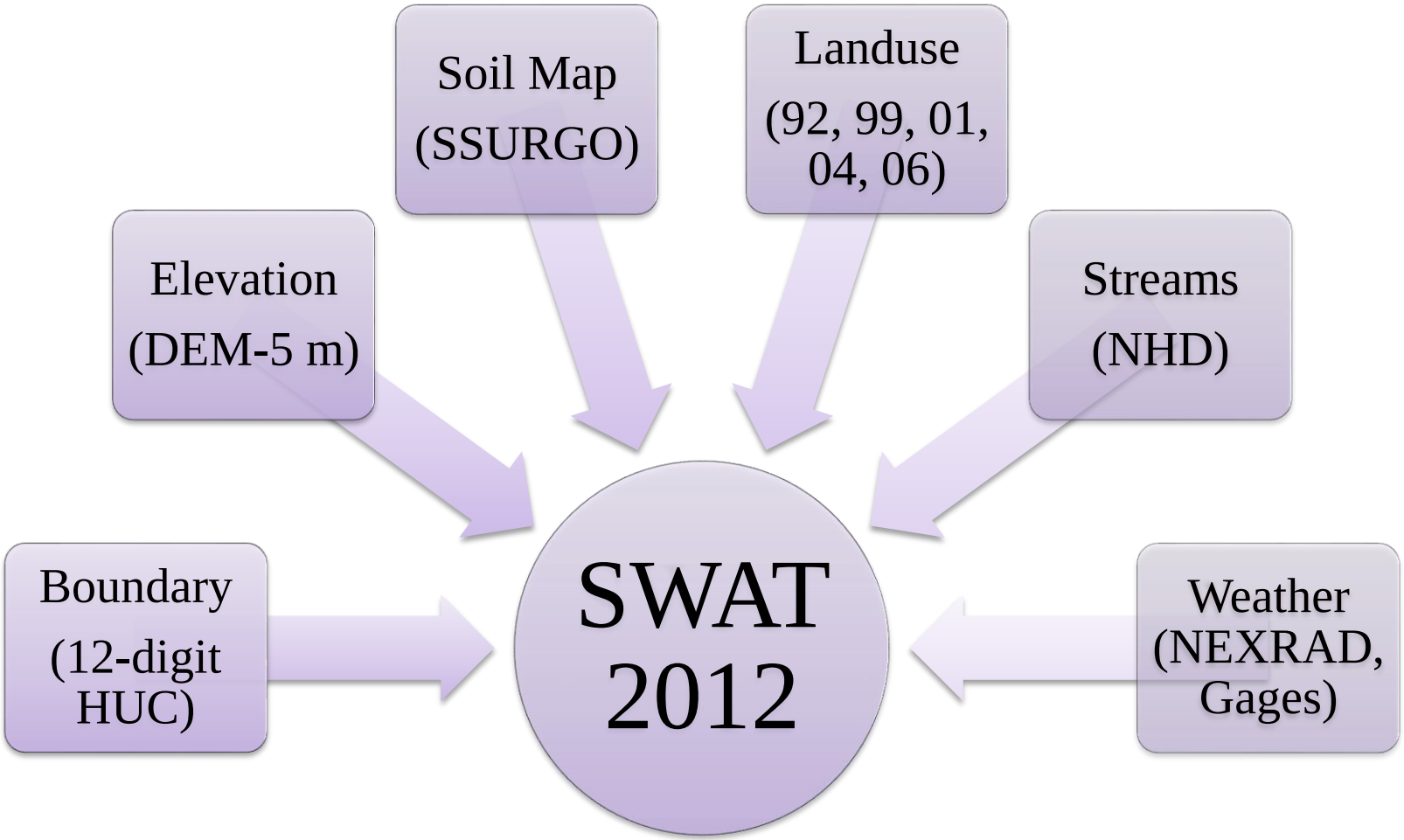
Soil: 36% area under group C/D

Precipitation: 35 inches (mean)

Overall Project Approach



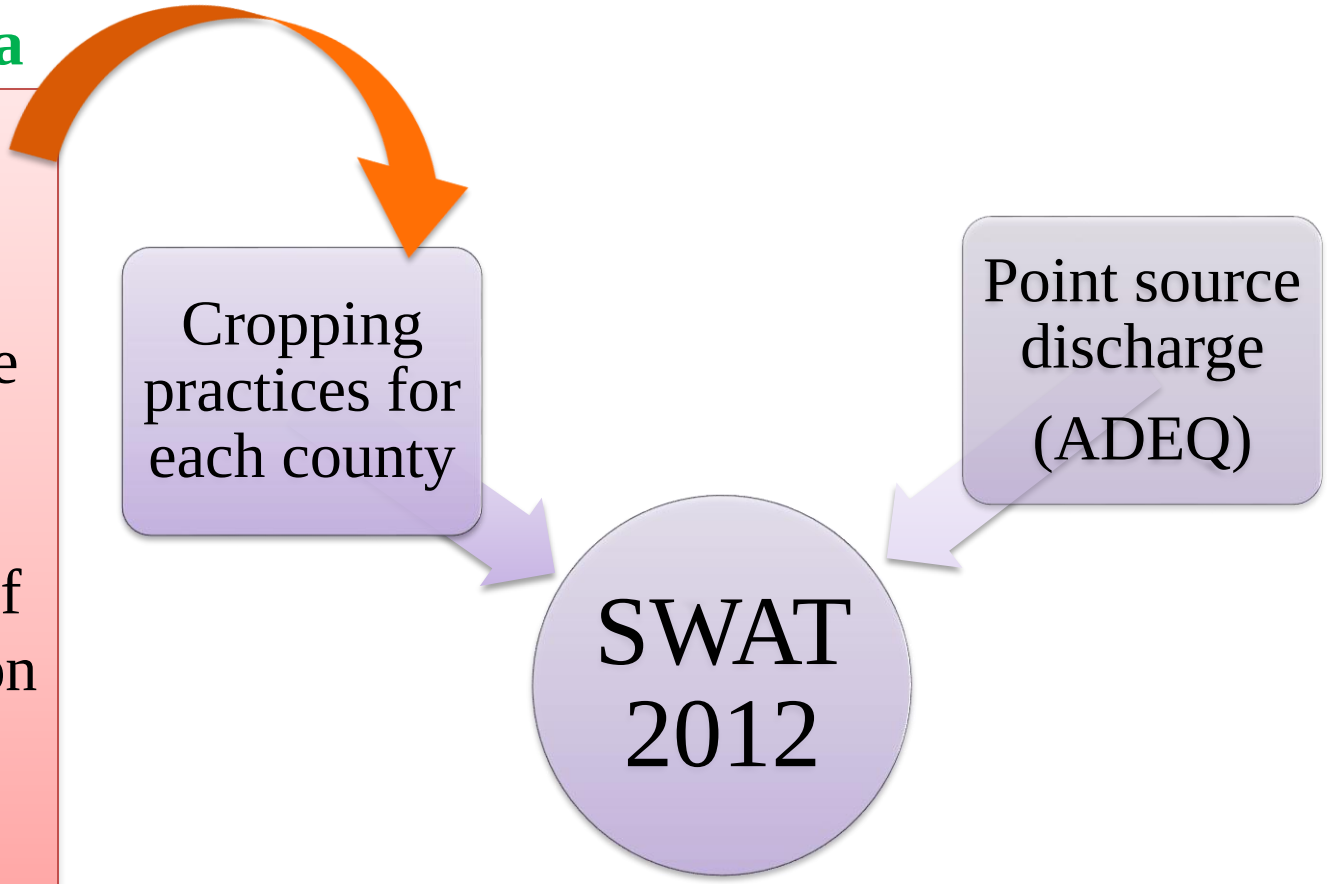
SWAT Model Setup: Spatial Data



SWAT Model Setup: Tabular Data

Management Data

- Crop rotation
- Timing & frequency of tillage
- Planting date
- Harvesting date
- Timing and rate of fertilizer application
- Irrigation
- Pesticides



SWAT Check

- Input Data Errors
- Initial Model Development Problems
- Improper Parameter Adjust During Calibration
- Process not Properly Represented
- Known SWAT Model application Errors

Water Quality Monitoring in the Lower Ouachita-Smackover Watershed

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OBJECTIVE

(1) Better understand how water quality changes across headwater sub-water sheds draining different land use mixes

(2) Estimate nitrogen (N), phosphorus (P), and sediment loads at select sites where active USGS stage and discharge monitoring stations exist.

OVERALL GOAL

The knowledge attained from this project will help validate the SWAT modeling output, and improve the level of confidence that we have in the sub-watershed prioritizations based on the SWAT output.

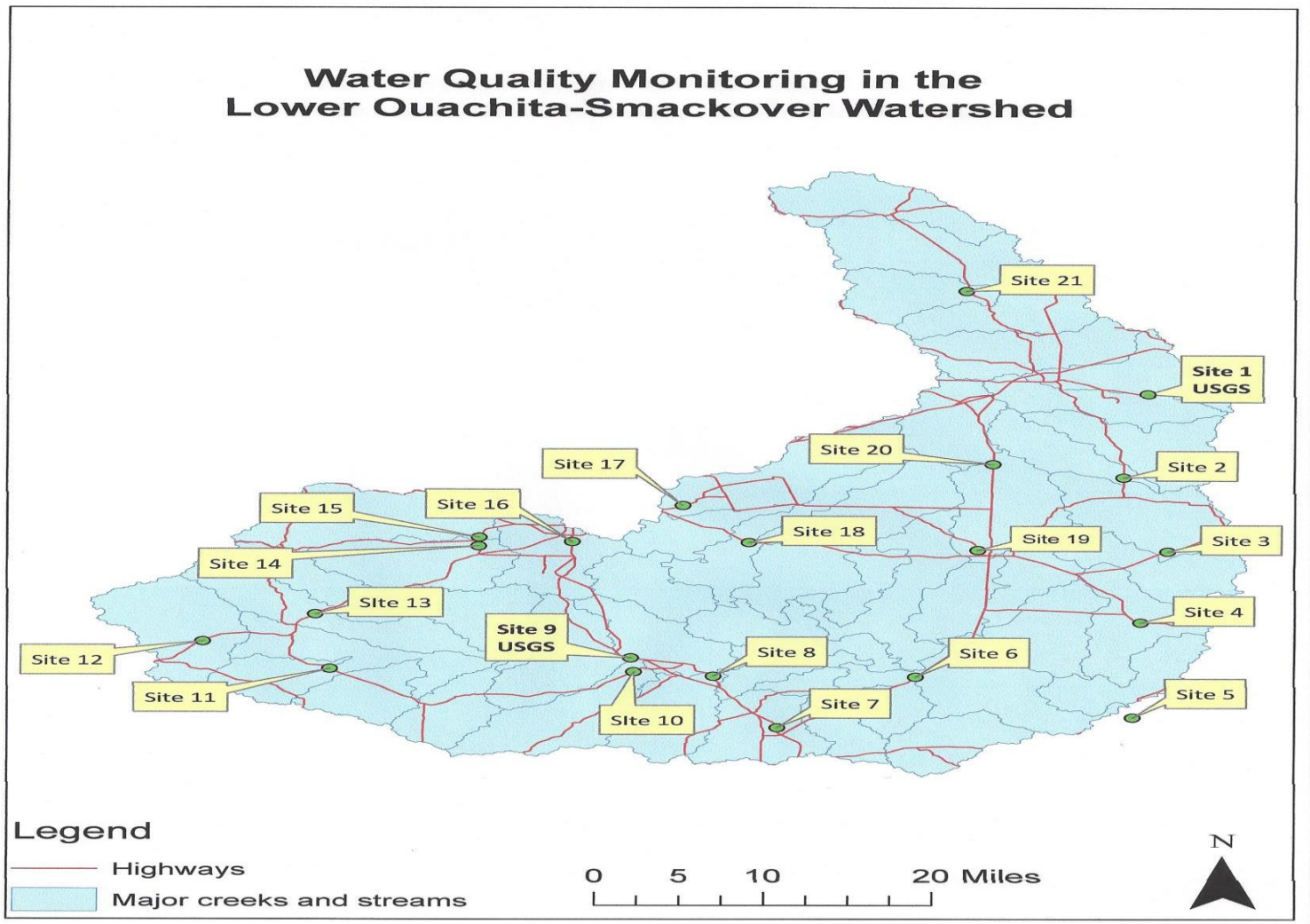
USE AWRC PROTOCOL

- Collect over 250 water samples from 21 sites in Lower Ouachita-Smackover Watershed starting November 2013 through October 2014.

- The routine, monthly sampling will be used to understand how physicochemical properties change in relation to the mix of catchment land use.

- Collect storm samples from 2 USGS sites.
  - -Moro Creek, Fordyce, AR
  - -Smackover Creek, Smackover, AR

SAMPLING SITES



Sites

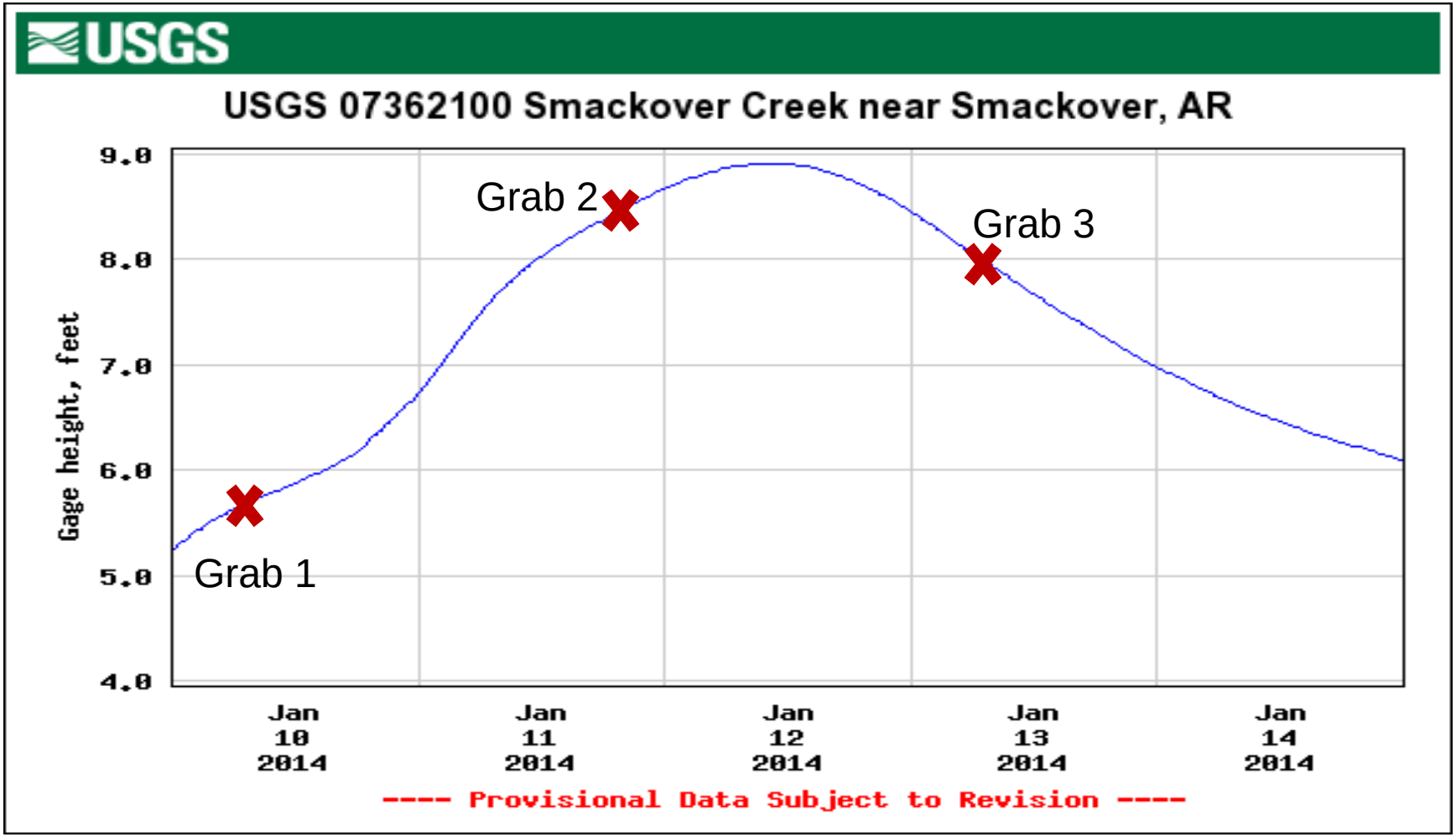
1. Moro Creek
2. Caynes Creek
3. Moro Creek
4. Moro Creek
5. Ouachita River
6. Ouachita River
7. Haynes Creek
8. Holmes Creek
9. Smackover Creek
10. Camp Creek
11. Sloan Creek
12. Smackover Creek
13. Gum Creek
14. South Bayou
15. North Bayou
16. Two Bayou
17. Hussey Creek
18. Locust Bayou
19. Champagnolle Creek
20. Champagnolle Creek
21. Bryant Creek

What we're doing

- Online USGS discharge data at Moro Creek and Smackover Creek used to determine when to grab storm samples.
    1) one of the rising limb
    2) one near peak
    3) one on the falling limb

Usage of Alpha Meter

STORM SAMPLING



STORM SAMPLING-EFFORTS

Month	Moro Creek	Smackover Creek	# of samples a month	**Distance covered (miles)
Nov. 2013	3	1	4	1,593
Dec. 2013	3	2	5	1,717
Jan. 2014	5	3	8	2,347
Feb. 2014	4	7	11	2,540
Mar. 2014	7	8	15	2,800
Apr. 2014	16	14	30	5,052
May. 2014	6	8	14	3,809
Jun. 2014	15	12	27	5,015
Jul. 2014	6	10	16	3,941
Aug. 2014	6	10	16	3,975
Sept. 2014				
Total	**71**	**75**	**146**	**32,789**

****Distance includes trips to Fayetteville, AR for sample analysis.**

WHAT ARE WE DOING IN THE LAB

TASKS

- Process water samples, filtering a portion and saving raw water.
- Testing for the following:
  - Conductivity
  - Nitrate-nitrogen (NO_3-N),
  - Total nitrogen (TN)
  - Soluble reactive phosphorus (SPR)
  - Total phosphorus (TP)
  - Total suspended solids (TSS)
  - Turbidity (NTU)
- Include appropriate lab quality assurance & control, like spikes, duplicates, and blanks
- Water samples were delivered to the lab within 48 hours.

Water Samples from the 21 Sites and Storm Sampling

Moro Creek Storm Sampling

- **Precipitation (inches)**

  -Nov. 2013=**4.82** -Dec. 2013=7.45

  -Jan. 2014= 1.69 -Feb. 2014=3.95

  -Mar.2014=4.37 -Apr. 2014=6.02

  -May.2014=**5.28** -Jun. 2014= **2.98**

  -Jul.2014 =3.21 -Aug.2014=5.83

  Total=45.6 in

- **Nutrient**

  -NO3 rises increases as discharges rises.

  -PO4 remains constant.

- **Sediment**

  -TSS and Turbidity increases as discharges increases.

  - There is more TSS than Turbidity with heavy precipitation.

- On average, it takes 48-72 hours from rising limb to falling limb to be collected.
- Average peaks were 4-8 hours.

Smackover Creek Storm Sampling

- **Precipitation (inches)**
  -Nov. 2013=**5.01** -Dec. 2013=6.56
  -Jan. 2014= 1.16 -Feb. 2014=3.42
  -Mar.2014=3.99 -Apr. 2014=5.64
  -May.2014=**7.63** -Jun. 2014= **3.06**
  -Jul.2014 =2.86 -Aug.2014=2.36
  Total=41.7 in

- **Nutrient**
  -NO3 rises as discharges rises, but tends to decrease the longer discharge flow.
  -PO4 increases as discharges rises.
- **Sediment**
  -TSS and Turbidity increases as discharges increases and they typically remain in sync with one another.

- On average, it takes 72 hours from rising limb to falling limb to be collected.
- Average peaks were 10 hours.

ACKNOWLEDGEMENTS

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