National Center for Alluvial Aquifer Research

NCAAR
NATIONAL CENTER FOR ALLUVIAL AQUIFER RESEARCH
USDA United States Department of Agriculture
MISSISSIPPI STATE UNIVERSITY

Drew M. Gholson
NCAAR Coordinator & Assistant Professor
Extension Irrigation Specialist
Delta Research and Extension Center

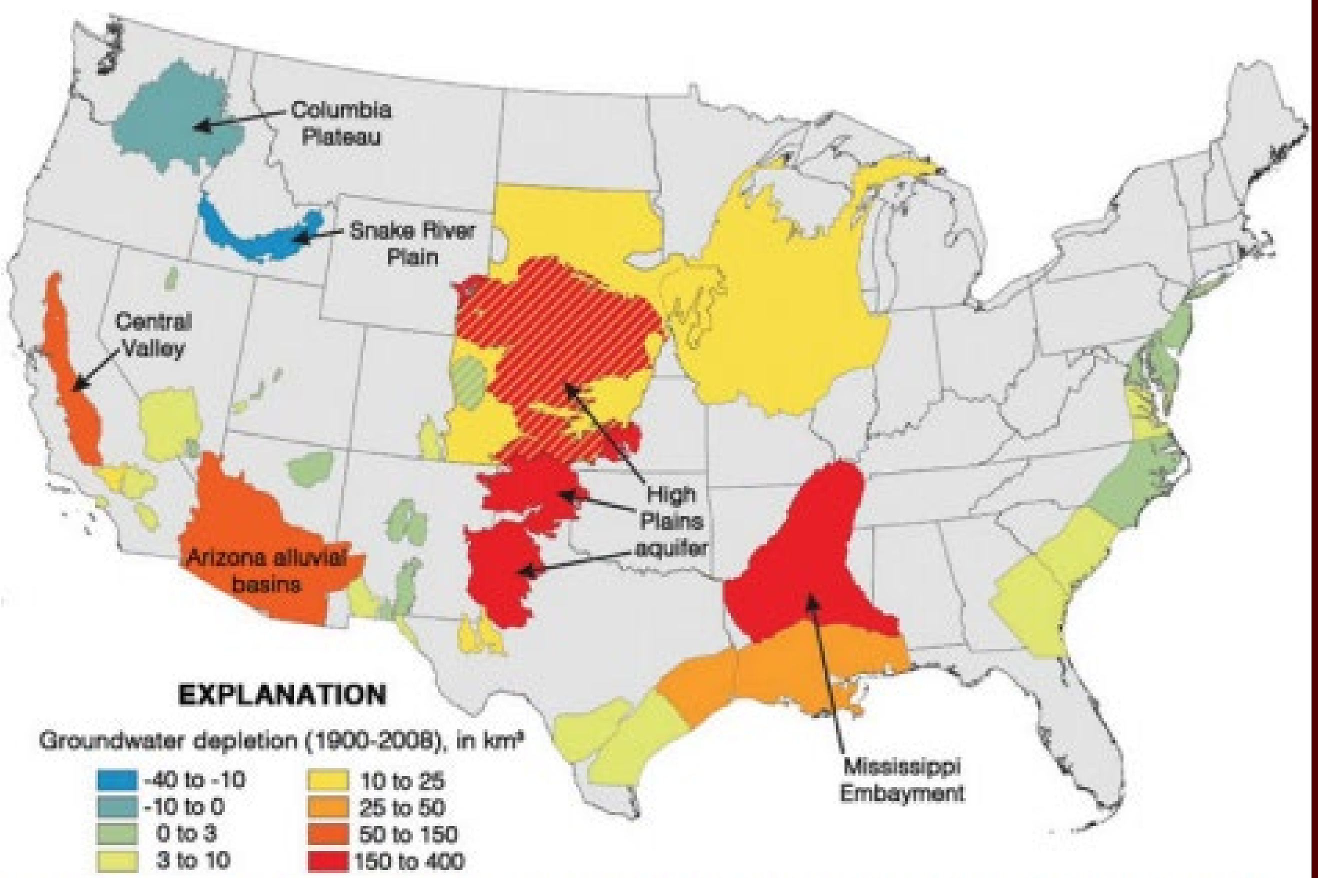
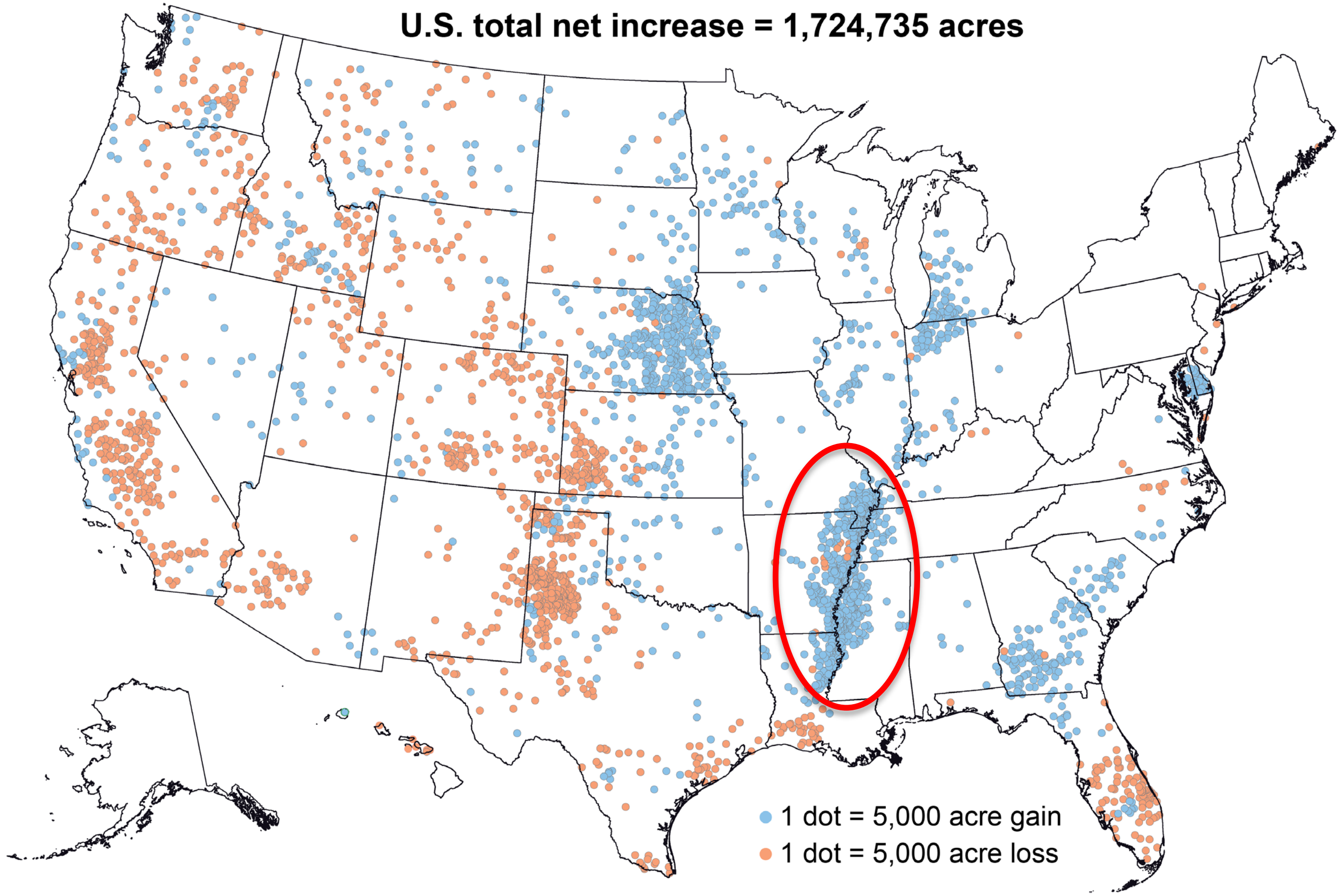


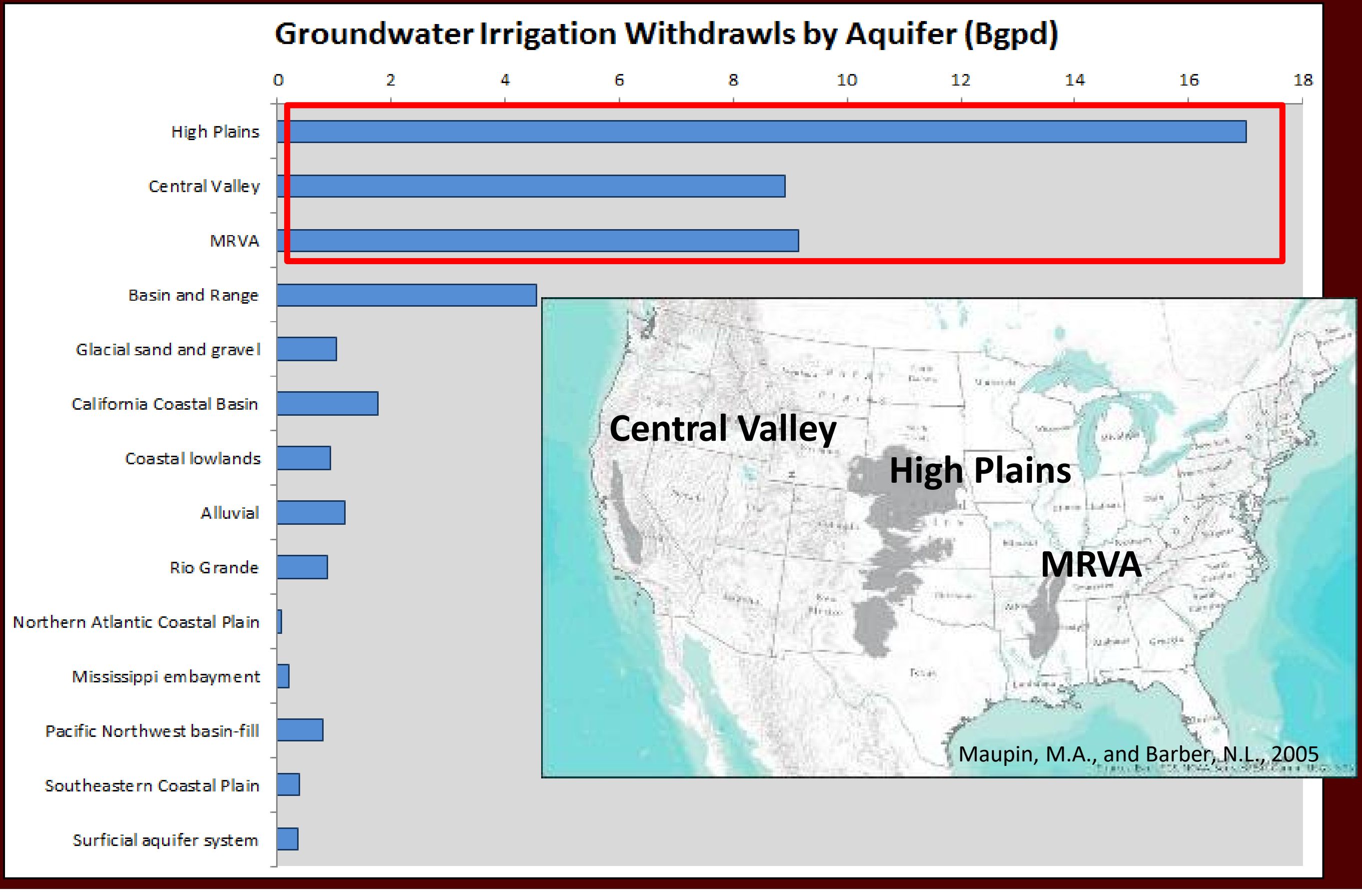
Figure 4. Cumulative long-term volumetric groundwater depletion in the United States during 1900–2008 in km³ (modified from Konikow [2013]). Hachured areas are where a shallow aquifer overlies a deeper aquifer.

Change in U.S. acres of irrigated agricultural land by county, 1997-2017

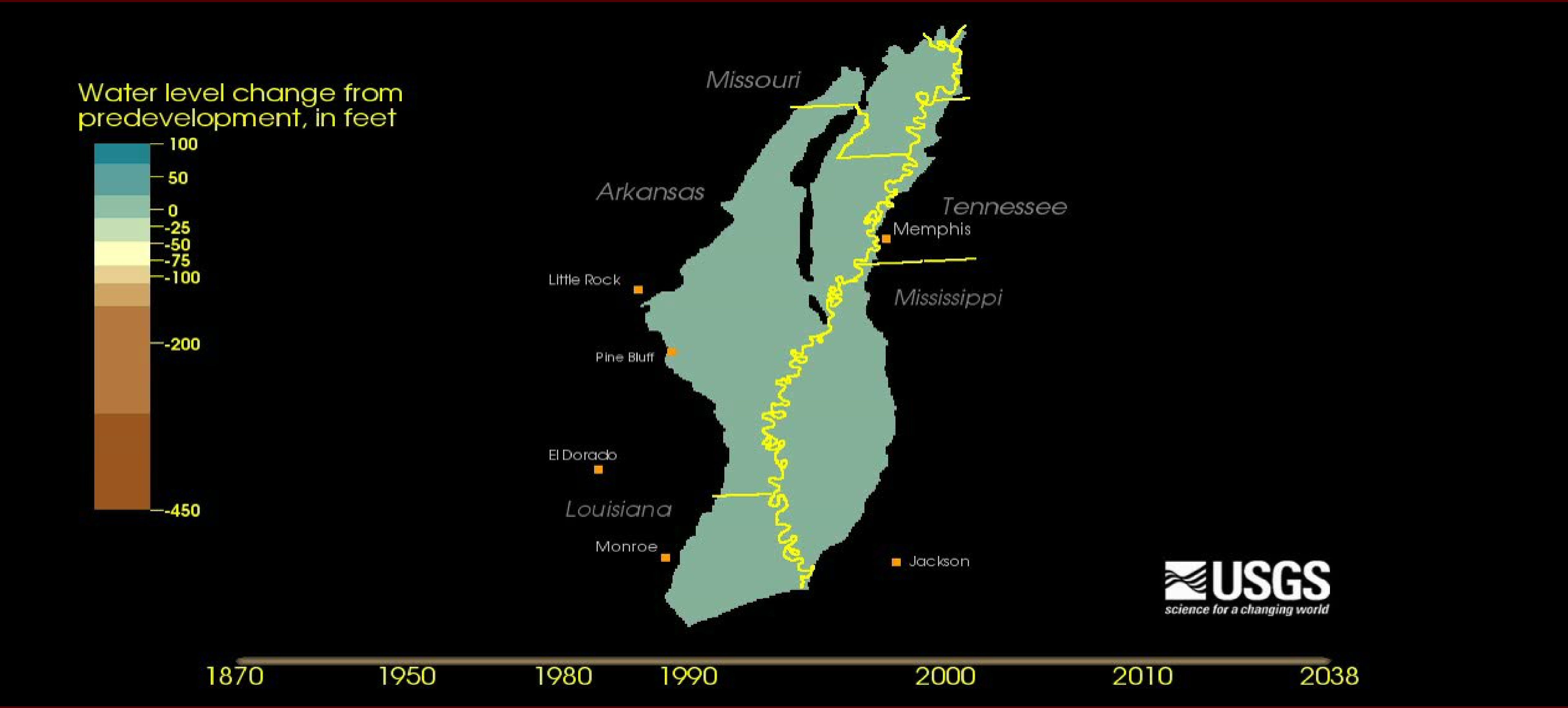


Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, 1997 and 2017 Census of Agriculture.

The Lower Mississippi River Basin is one of the most productive and intensively irrigated agricultural regions in the nation



Modeling MRVAA Decline



About the National Center for Alluvial Aquifer Research – NCAAR

Cooperative program between USDA's Agricultural Research Service (ARS) and Mississippi State University's Delta Research and Extension Center (DREC) to produce and communicate research aimed at:

- Conservation and sustainability of water resources for agriculture
- Development of management systems that increase profitability, conserve water and protect water quality

Multi-Disciplinary Team

- Soil Scientist
- Plant Physiologist
- Hydrologist
- Physical Scientist
- Hydrologist/Engineer
- Ag Technology Engineer
- Agricultural Engineer
- Research Leader

- Irrigation Engineer
- Natural Resource Economist
- Extension Irrigation Specialist
- Research Agronomist
- Hydrologist/hydrogeologist

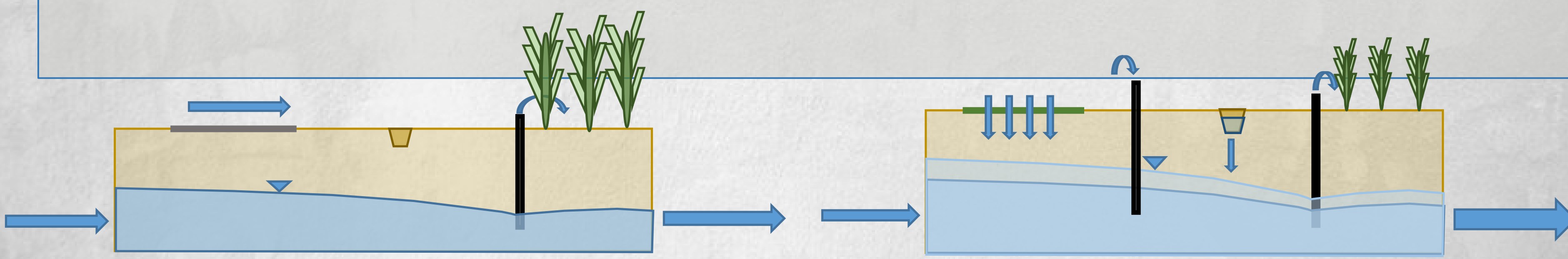
Mitigating Groundwater Depletion

Technological Approaches focus on bringing inflows and outflows into balance.

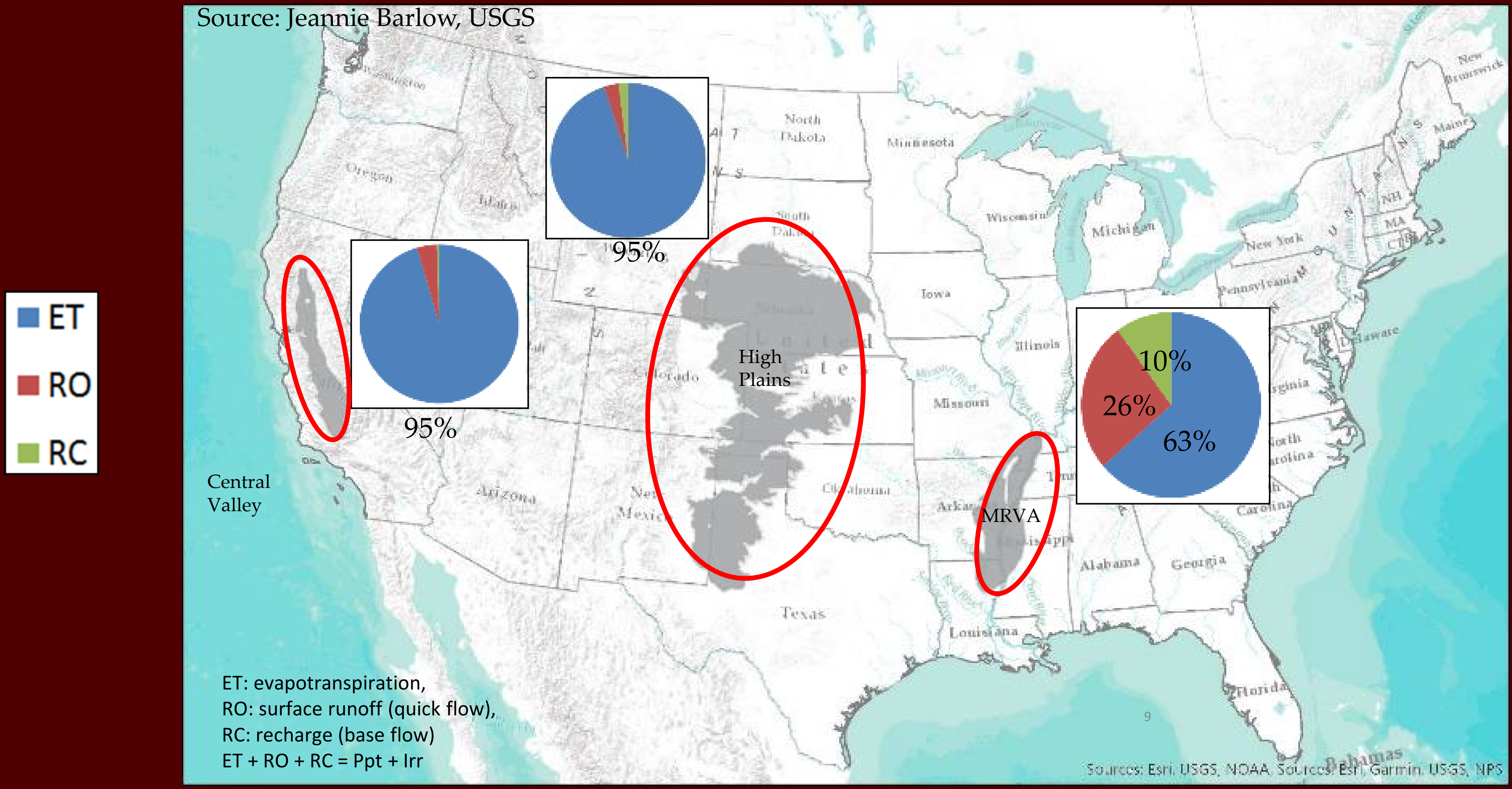
The can also include methods to decrease the amount of water pumped from an aquifer through the use of:

- Irrigation efficiency
- Instream weirs to increase surface-water availability
- Tailwater recovery and onsite farm storage

This can include attempts to increase the recharge to an aquifer, often referred to as Managed Aquifer Recharge (MAR), e.g. ASR, PR, and use of Green Space



Water Budgets of the 3 most used aquifers, all for irrigation



NCAAR CRIS Objectives

Objective 1: Determine the impact of alternate water supplies on aquifer recharge and groundwater levels in the LMRB.

NCAAR CRIS Objectives

Objective 2: Develop optimized irrigation scheduling tools and recommendations.

NCAAR CRIS Objectives

- **Objective 3:** Develop new and novel sensor systems.

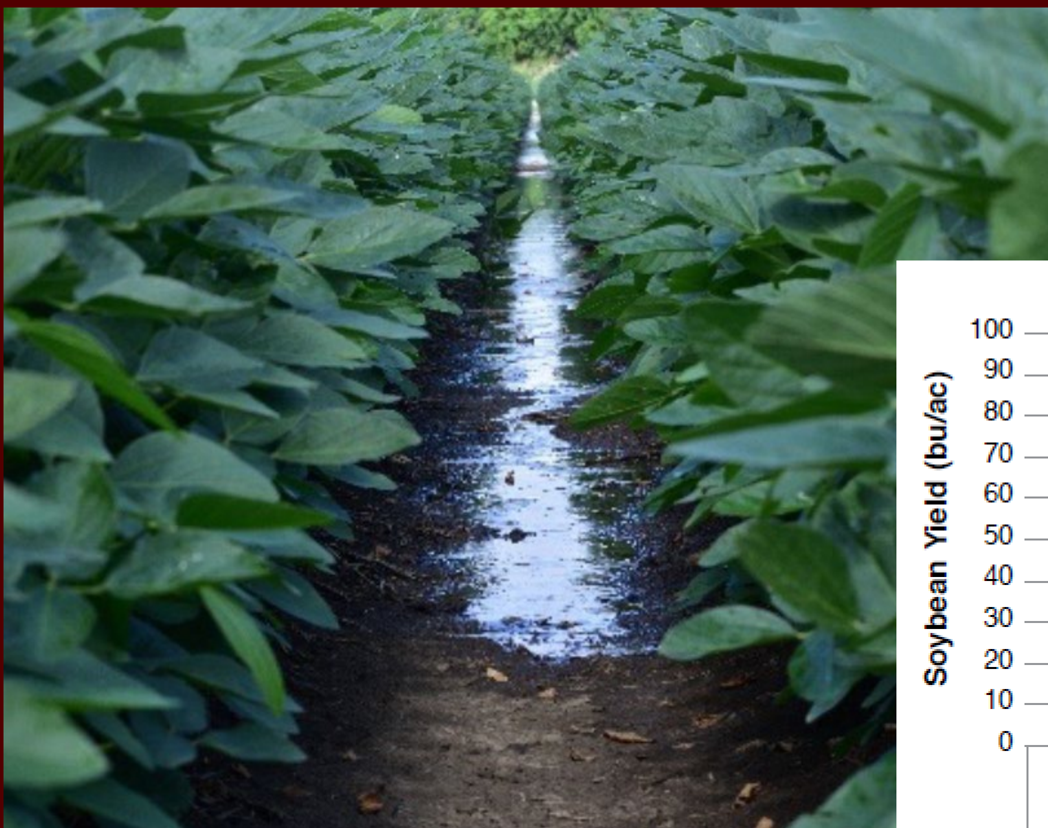
NCAAR CRIS Objectives

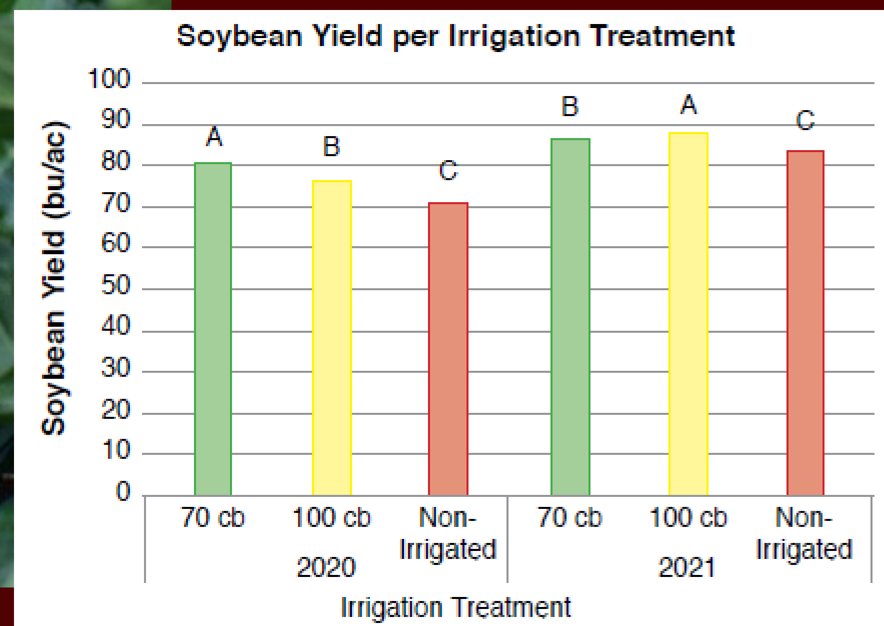
- **Objective 4:** Evaluate and improve current BMPs and the implementation of conservation practices including cover crops, tillage methods, edge-of-field buffers, surface water storage/use, and soil health.

NCAAR CRIS Objectives

- **Objective 5:** Engage LMRB stakeholders to characterize producer behavior, adoption, and attitudes.

Recommendations for Sensor Based Soybean Irrigation





MISSISSIPPI STATE UNIVERSITY™

National Center for Alluvial Aquifer Research
Delta Research and Extension Center

MISSISSIPPI STATE UNIVERSITY

National Center for Alluvial Aquifer Research
Delta Research and Extension Center

Field 6 at DREC

Vargas (2021)

Sensor-Based Irrigation Scheduling and Cover Crop Impacts on Corn Production

MISSISSIPPI STATE UNIVERSITY
National Center for Alluvial Aquifer Research
Delta Research and Extension Center

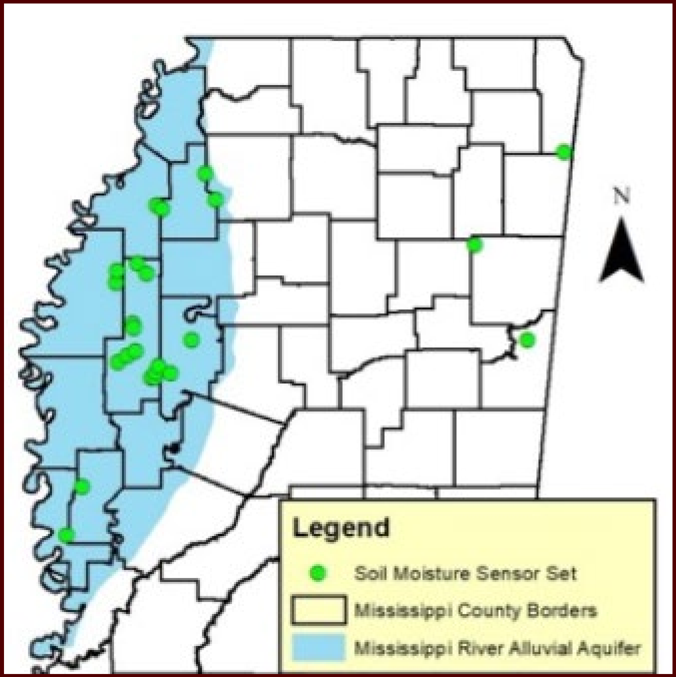
Establishing the Water Budget of a Tailwater Recovery System

MISSISSIPPI STATE UNIVERSITY

National Center for Alluvial Aquifer Research
Delta Research and Extension Center

Soil Management Effects on Furrow Infiltration

Advancing Adoption of Soil Moisture Sensors Through On-Farm Training and Demonstration



MISSISSIPPI STATE UNIVERSITY

National Center for Alluvial Aquifer Research
Delta Research and Extension Center

Advancing Adoption

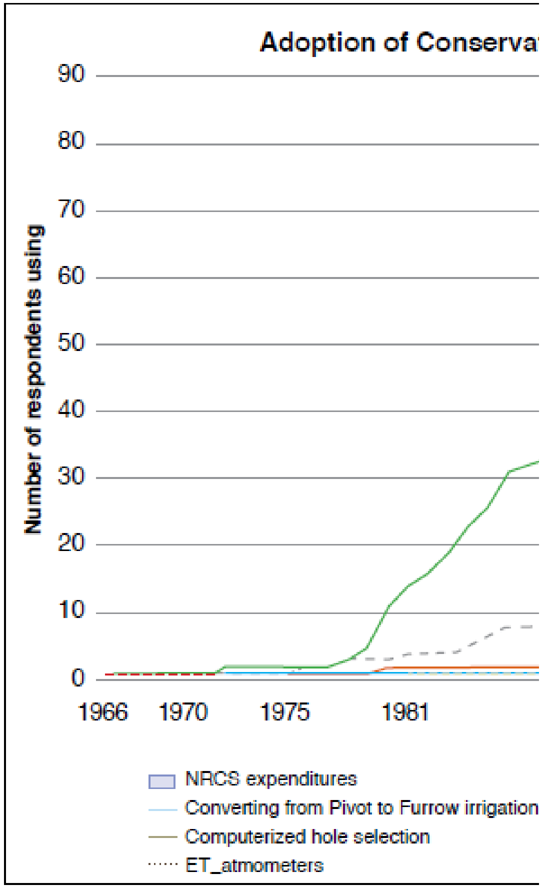


Figure 1. Farmer adoption curves for differe Mississippi contrasted with NRCS incentive

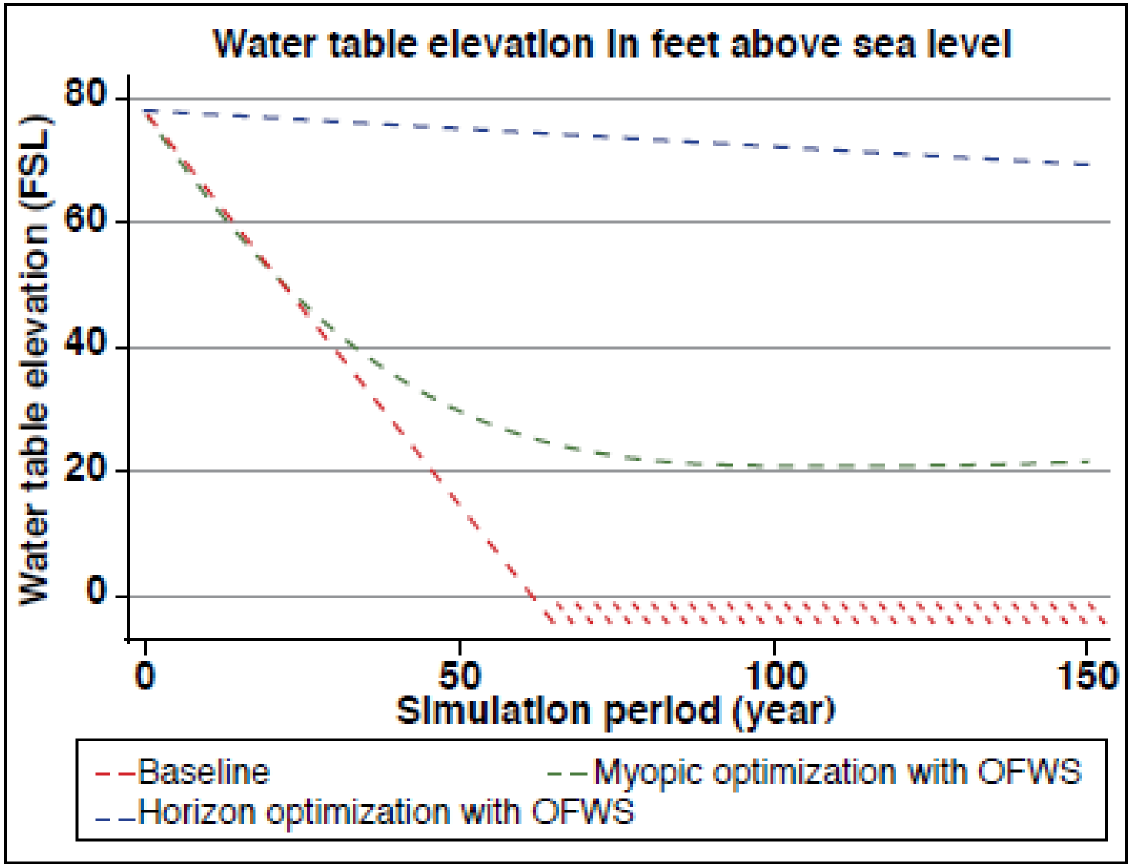
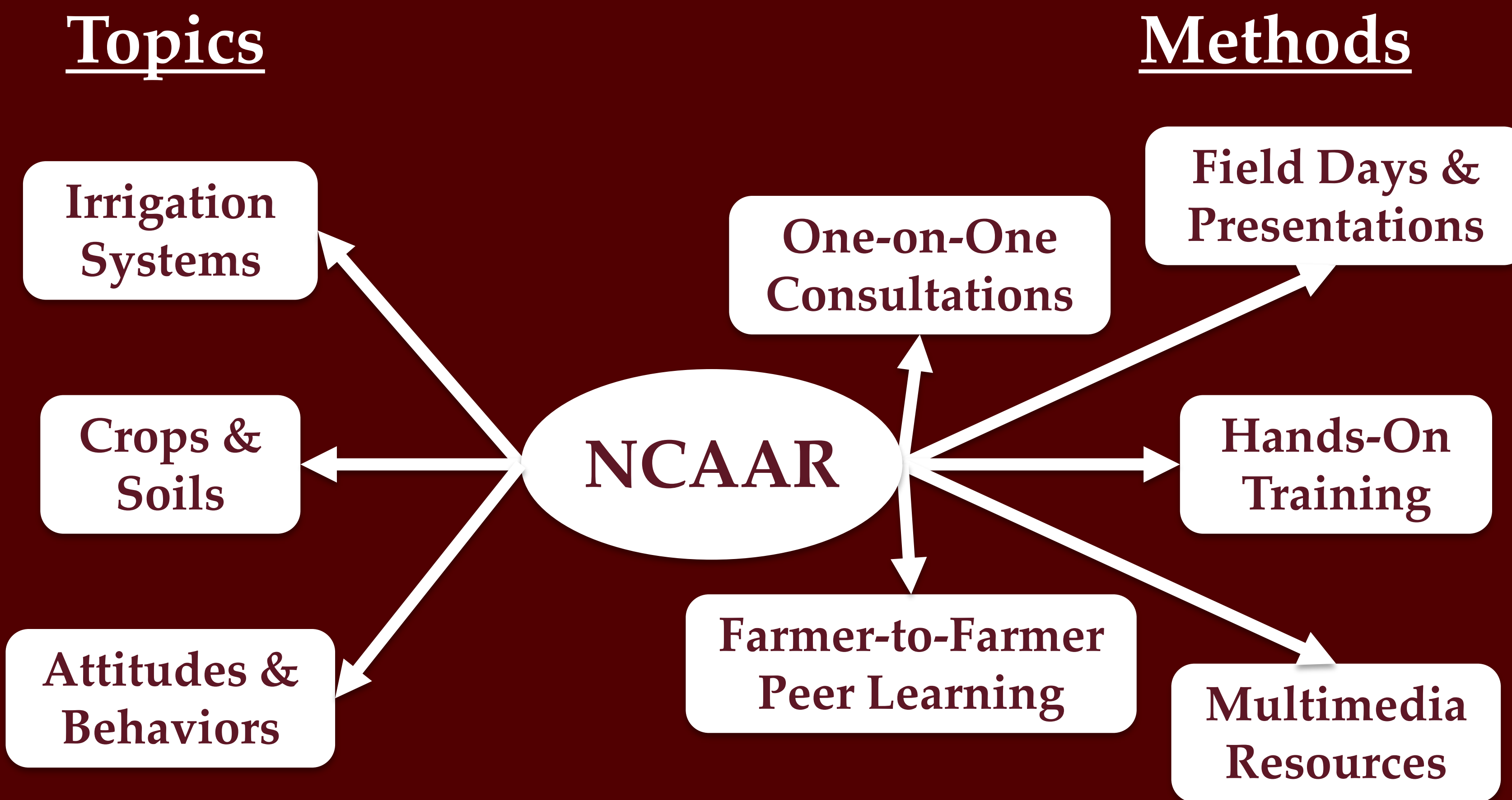


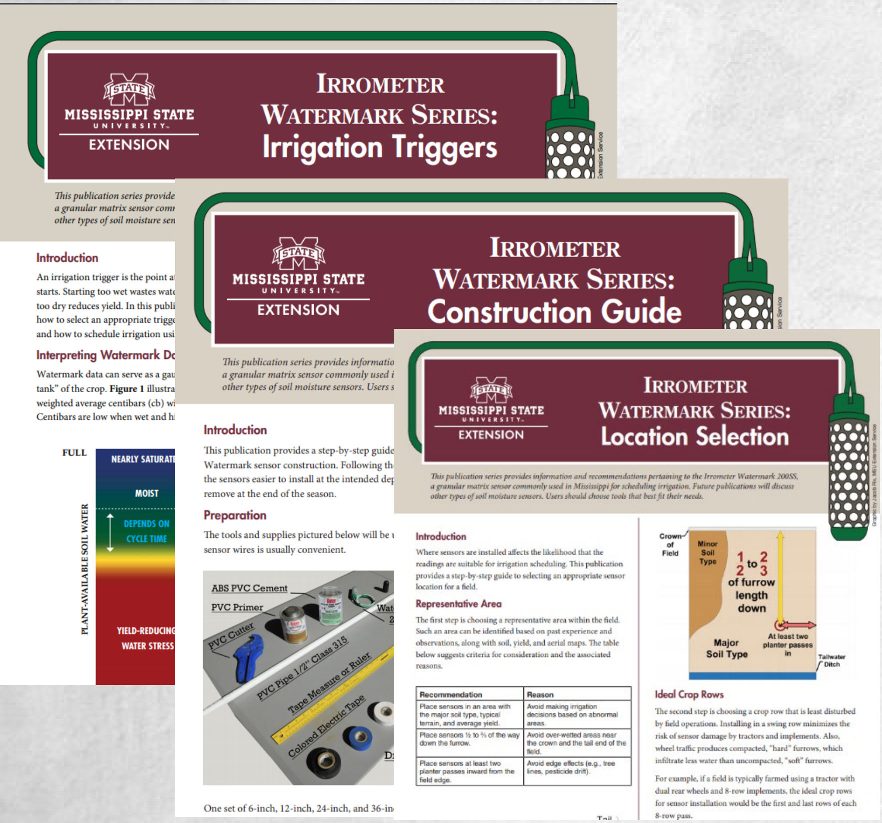
Figure 2. *Simulated evolution of alluvial aquifer water table elevation under alternative water use scenarios.*

Ongoing Educational Efforts




MISSISSIPPI STATE UNIVERSITY™
MS AGRICULTURAL AND
FORESTRY EXPERIMENT STATION
USDA
Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE
NCAAR
Home
About
People
Research
Extension/Outreach
NATIONAL CENTER FOR ALLUVIAL AQUIFER RESEARCH

Watermark Fundamentals & Application



1. Scientific Background
2. Measurement Devices
3. Sensor Construction
4. Sensor Location
5. Sensor Installation
6. Irrigation Triggers

https://www.ncaar.msstate.edu/outreach

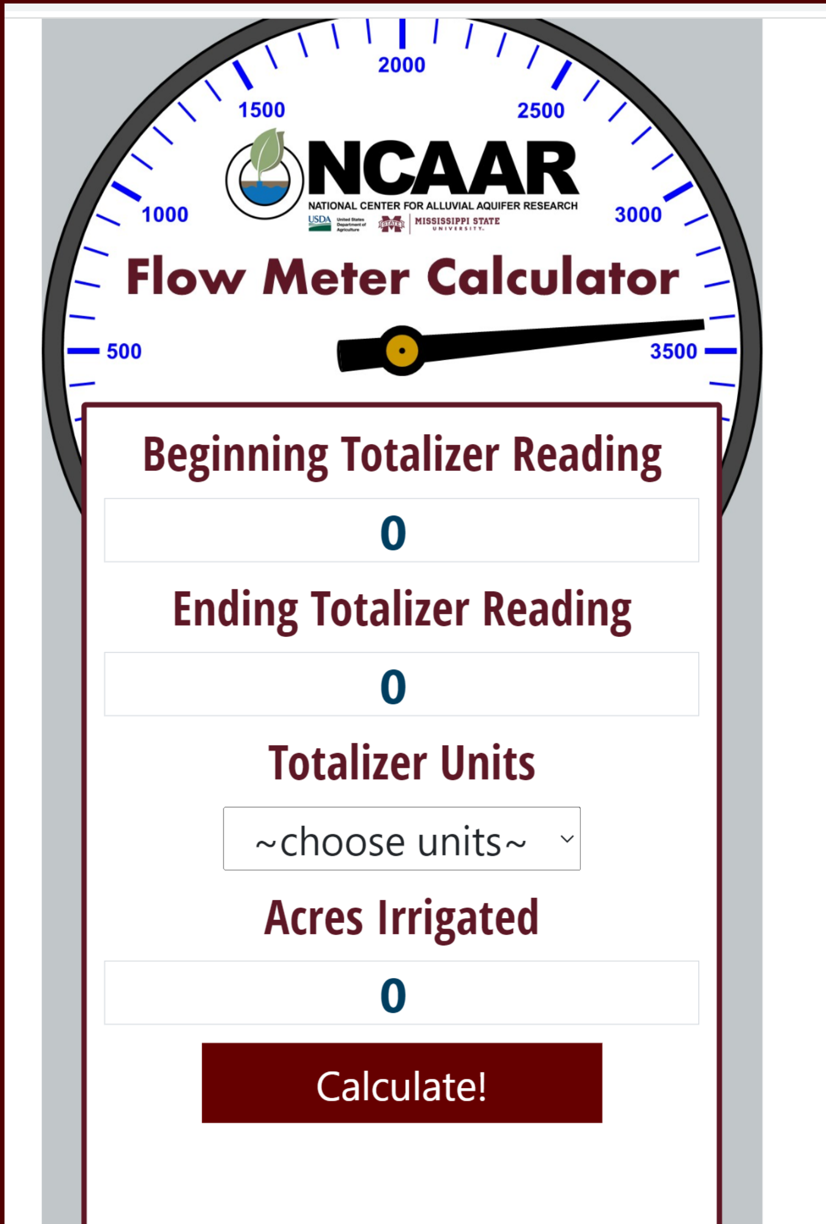
Calculate

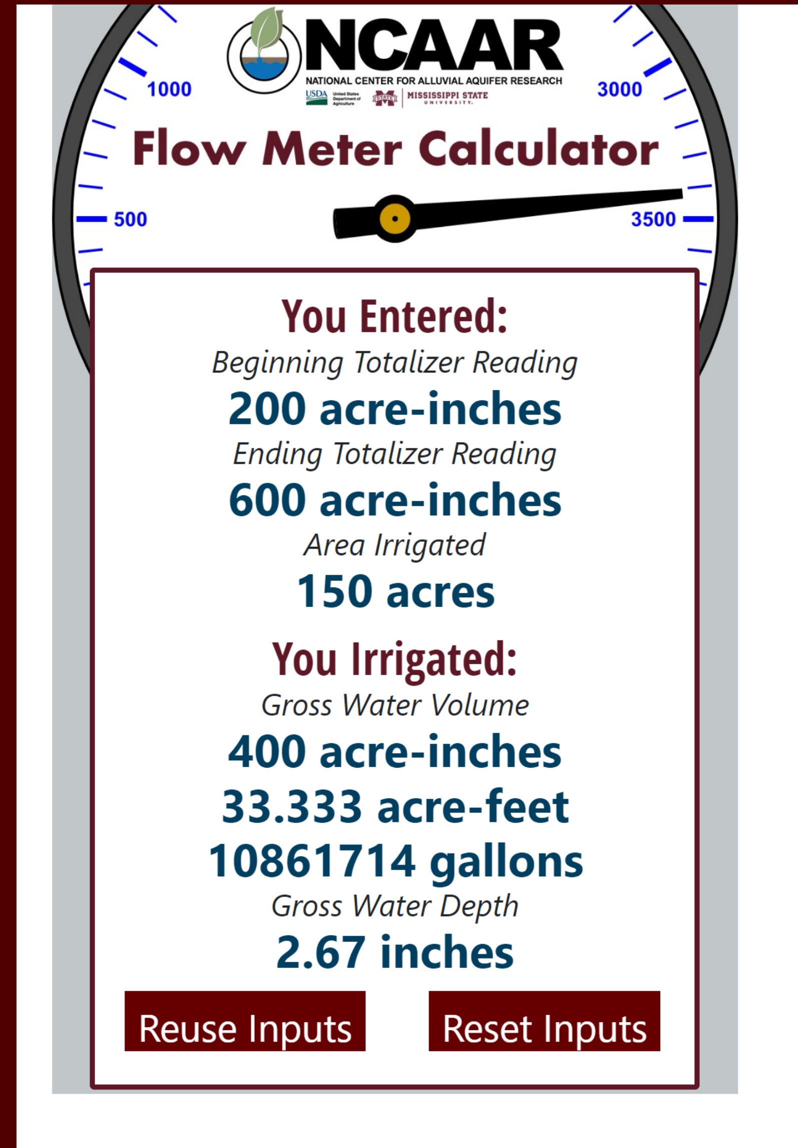
Results

Cost	$/Acre	Total
Pumping	$8.04	$1045.20
Labor	$0.38	$49.85
Capital	$1.20	$156.00
Total Irrigation Event	$9.62	$1251.05

Compare the cost of another irrigation with the expected benefits of additional irrigation; you can expect to profitably irrigate if the next irrigation event will result in the following yield gains:

Commodity	Yield
Corn	1.92 bu/acre
Cotton	9.62 lbs/acre
Soybean	1.07 bu/acre


NCAAR
NATIONAL CENTER FOR ALLUVIAL AQUIFER RESEARCH
Flow Meter Calculator
500
1000
1500
2000
2500
3000
3500
Beginning Totalizer Reading
0
Ending Totalizer Reading
0
Totalizer Units
~choose units~
Acres Irrigated
0
Calculate!


NCAAR
NATIONAL CENTER FOR ALLUVIAL AQUIFER RESEARCH
Flow Meter Calculator
500
1000
3000
3500
You Entered:
Beginning Totalizer Reading
200 acre-inches
Ending Totalizer Reading
600 acre-inches
Area Irrigated
150 acres
You Irrigated:
Gross Water Volume
400 acre-inches
33.333 acre-feet
10861714 gallons
Gross Water Depth
2.67 inches
Reuse Inputs
Reset Inputs

MISSISSIPPI STATE UNIVERSITY EXTENSION

What is Mississippi Master Irrigator?

A 24-credit hour formal education course designed to educate producers on water-related topics which include but are not limited to:

- **Agronomics**
- **Irrigation Scheduling**
- **Types of Irrigation Systems**
- **Economics**
- **Soil Health**
- **Policy and Management**

How will the course be offered?

The course will be offered as a hybrid system which will include online video modules and in-person sessions.

- Video modules and in-person sessions will be conducted by individuals/entities with specialized experience in each of the listed topics. This includes personnel such as:
  - **MSU Extension Specialists**
  - **YMD**
  - **USGS**
  - **EPA**
  - **Delta F.A.R.M**
  - **Farm Bureau**
  - **Delta Council**

Anticipated Course Timeline:	
Completion of videos	Nov. 2022
Completion of online video modules	Jan. 2023
Begin offering course	Mar. 2023
First in-person meeting	Nov. 2023
Second in-person meeting	Feb. 2023

National Center for Alluvial Aquifer Research
Delta Research and Extension Center

Thank You!

NCAAR
NATIONAL CENTER FOR ALLUVIAL AQUIFER RESEARCH
USDA United States Department of Agriculture
MISSISSIPPI STATE UNIVERSITY

Drew M. Gholson
Cell: 979-255-7018
Email: drew.gholson@msstate.edu