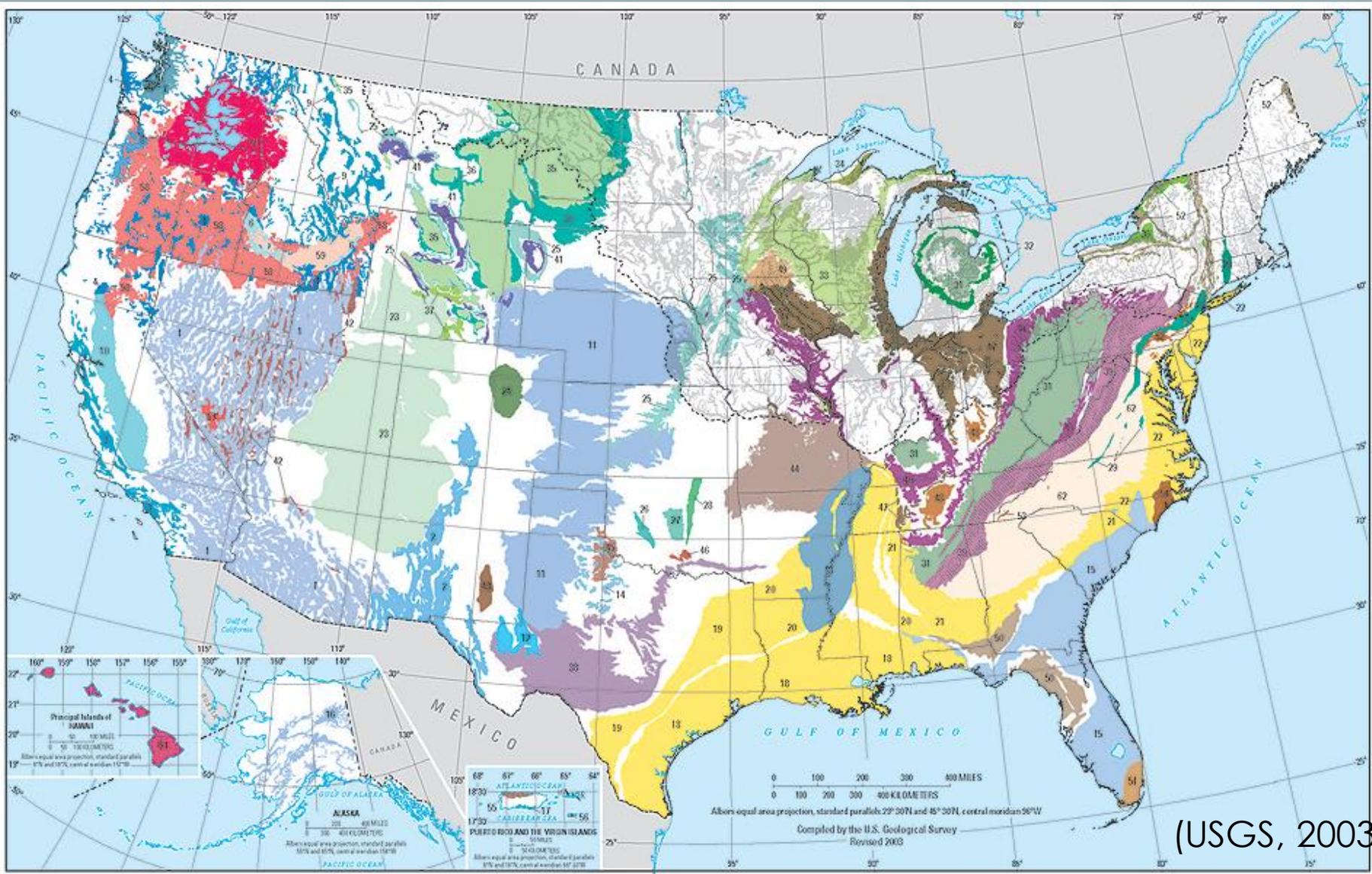




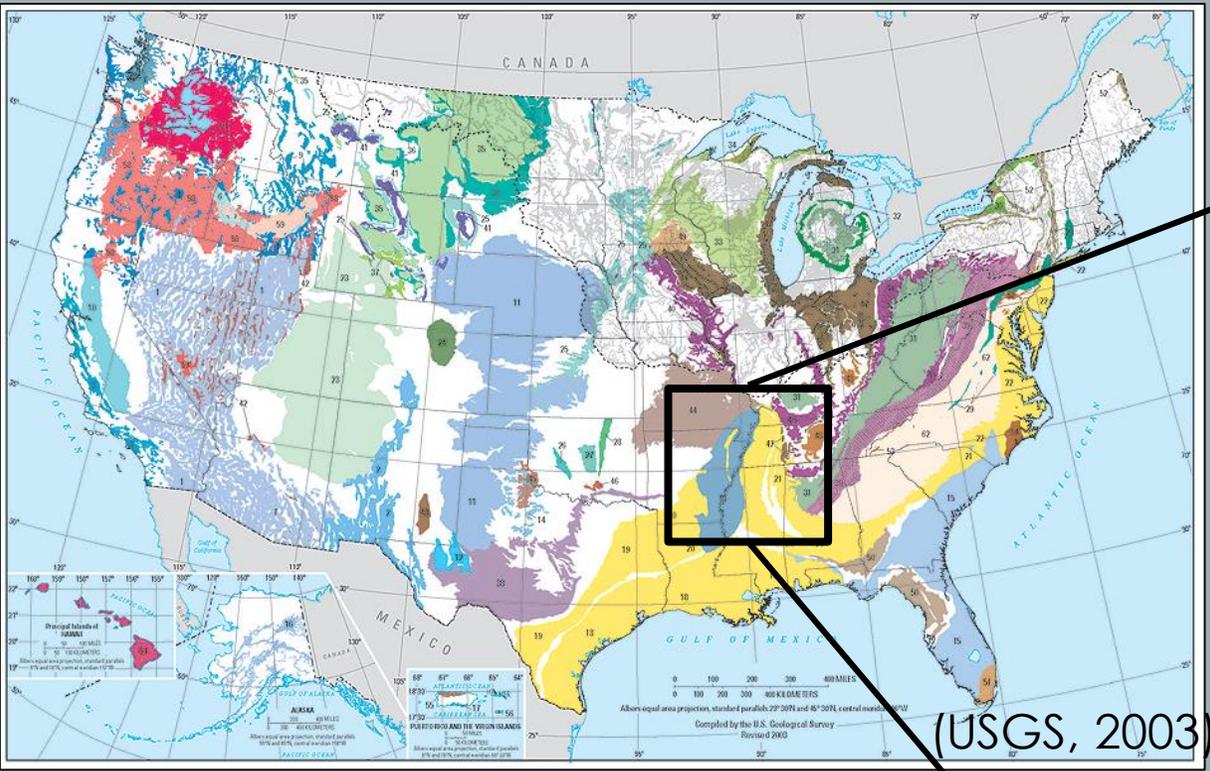
A LOOK BENEATH THE SURFACE:  
DEVELOPING A TRANSBOUNDARY  
GROUNDWATER GOVERNANCE FRAMEWORK  
AND AGREEMENT FOR THE MEMPHIS SAND  
AQUIFER

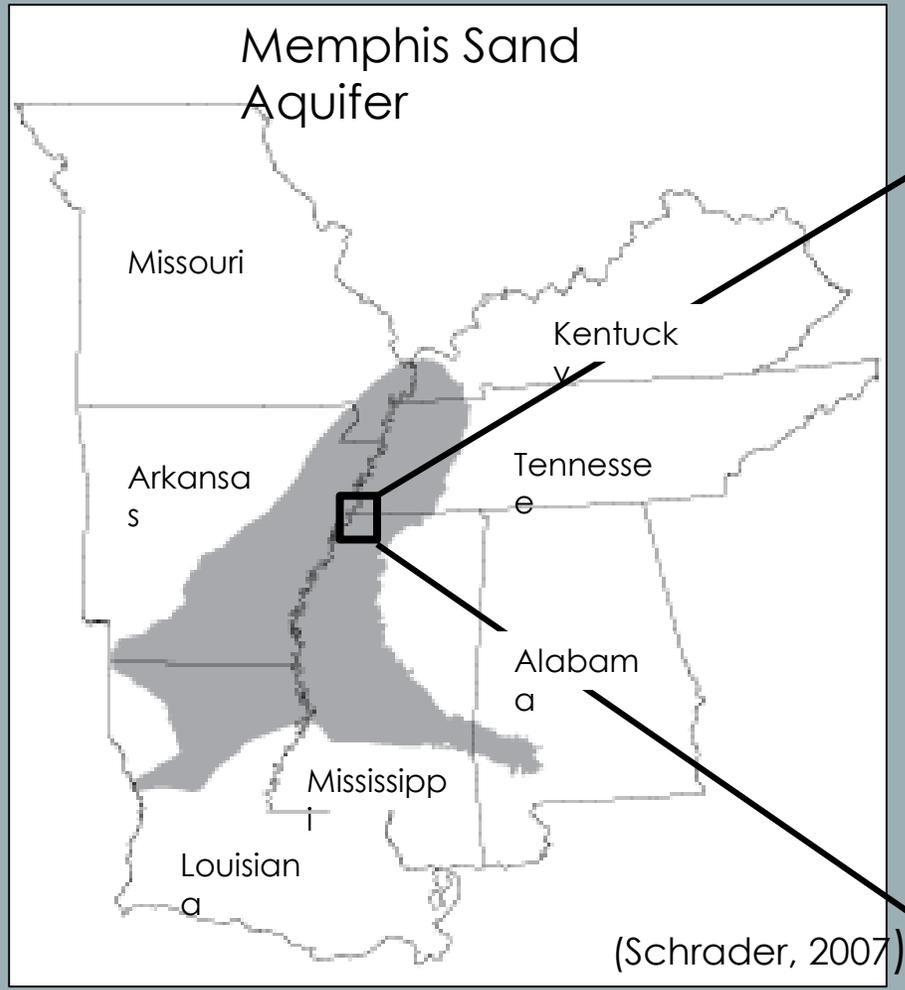


HOLLY MONDO  
MAY 3RD, 2019

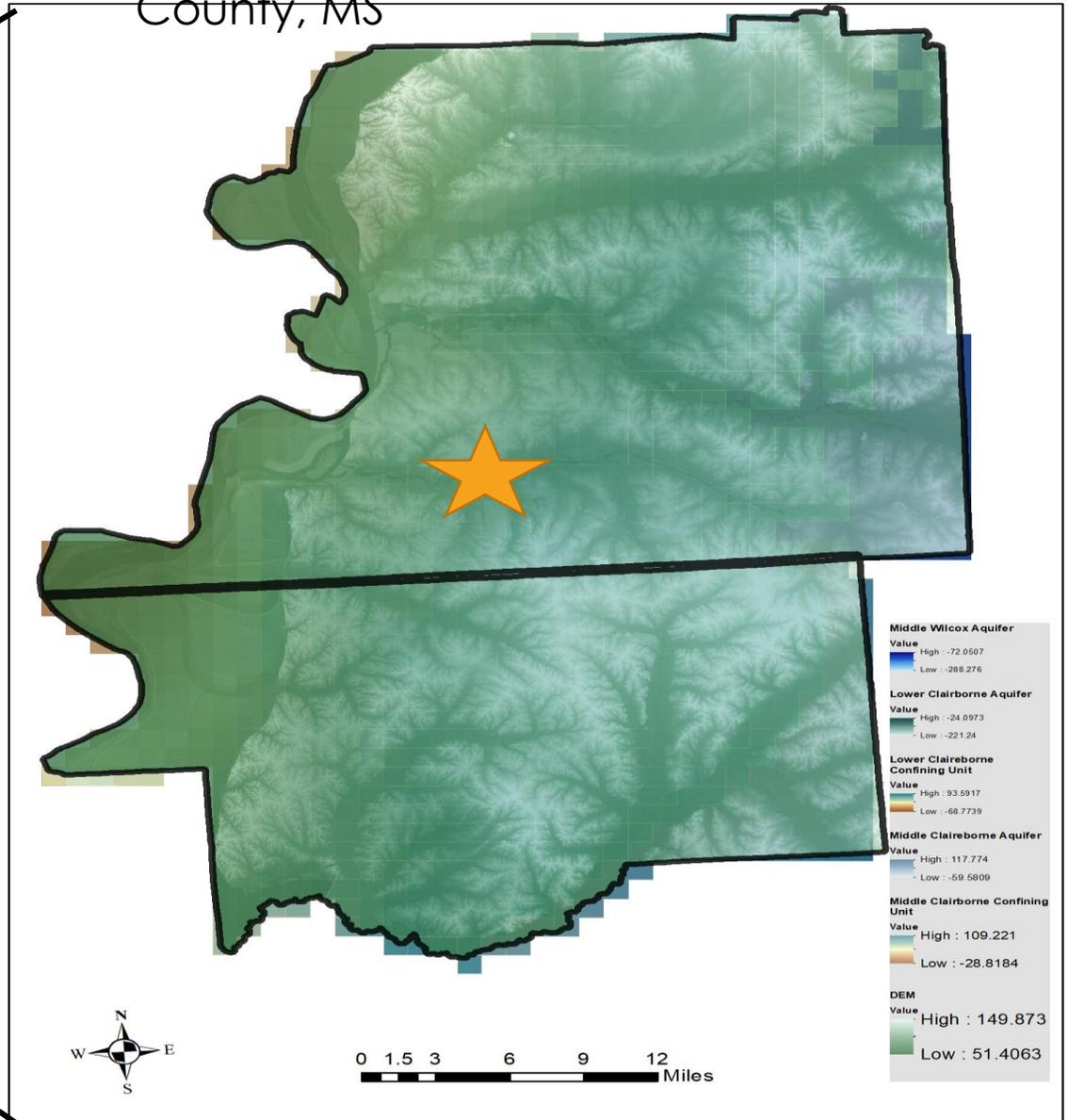


- Aquifer : Water Bottle
- Groundwater : Water
- Transboundary in nature
- Inability to see groundwater has inhibited understanding of resource
- Information on transboundary groundwater resources lacking
- Transboundary groundwater policies fragmented

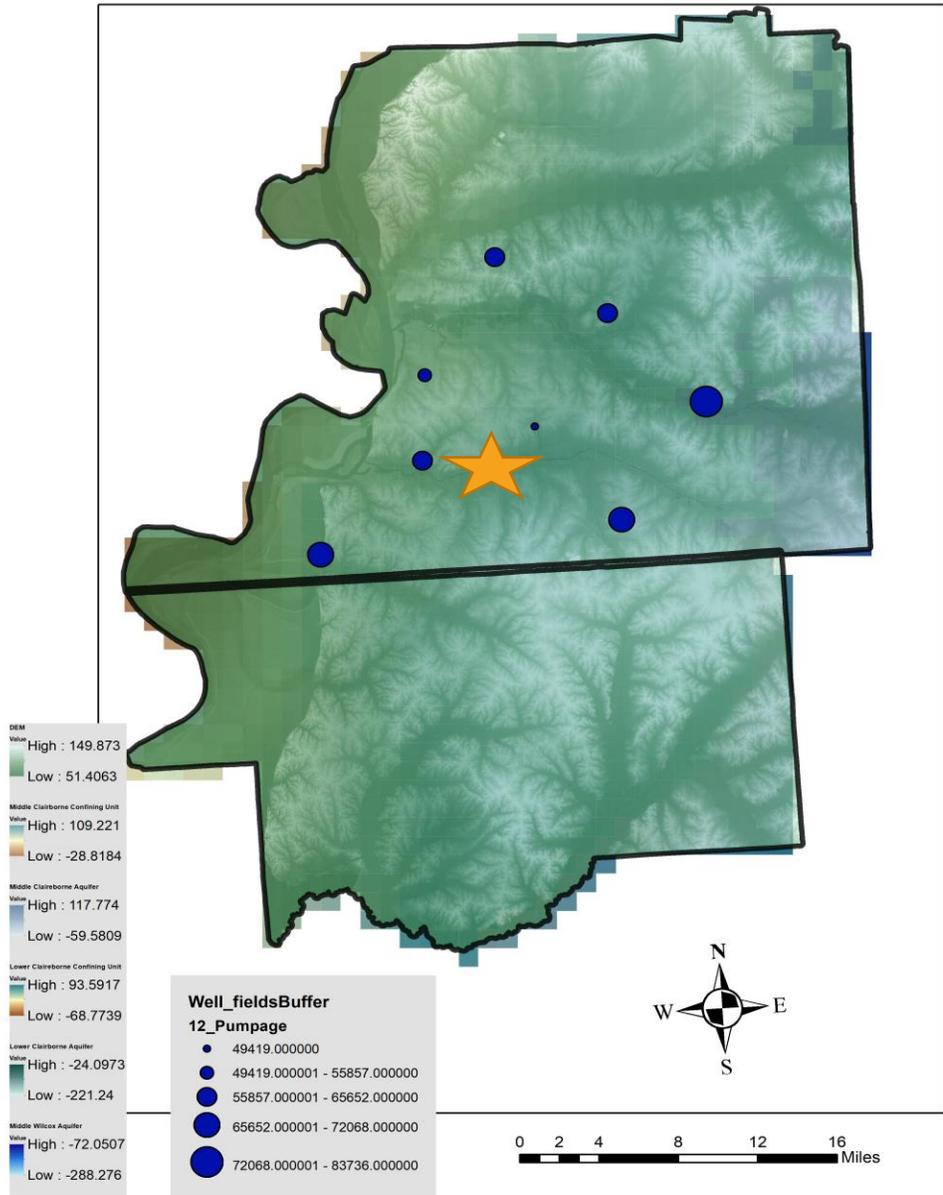




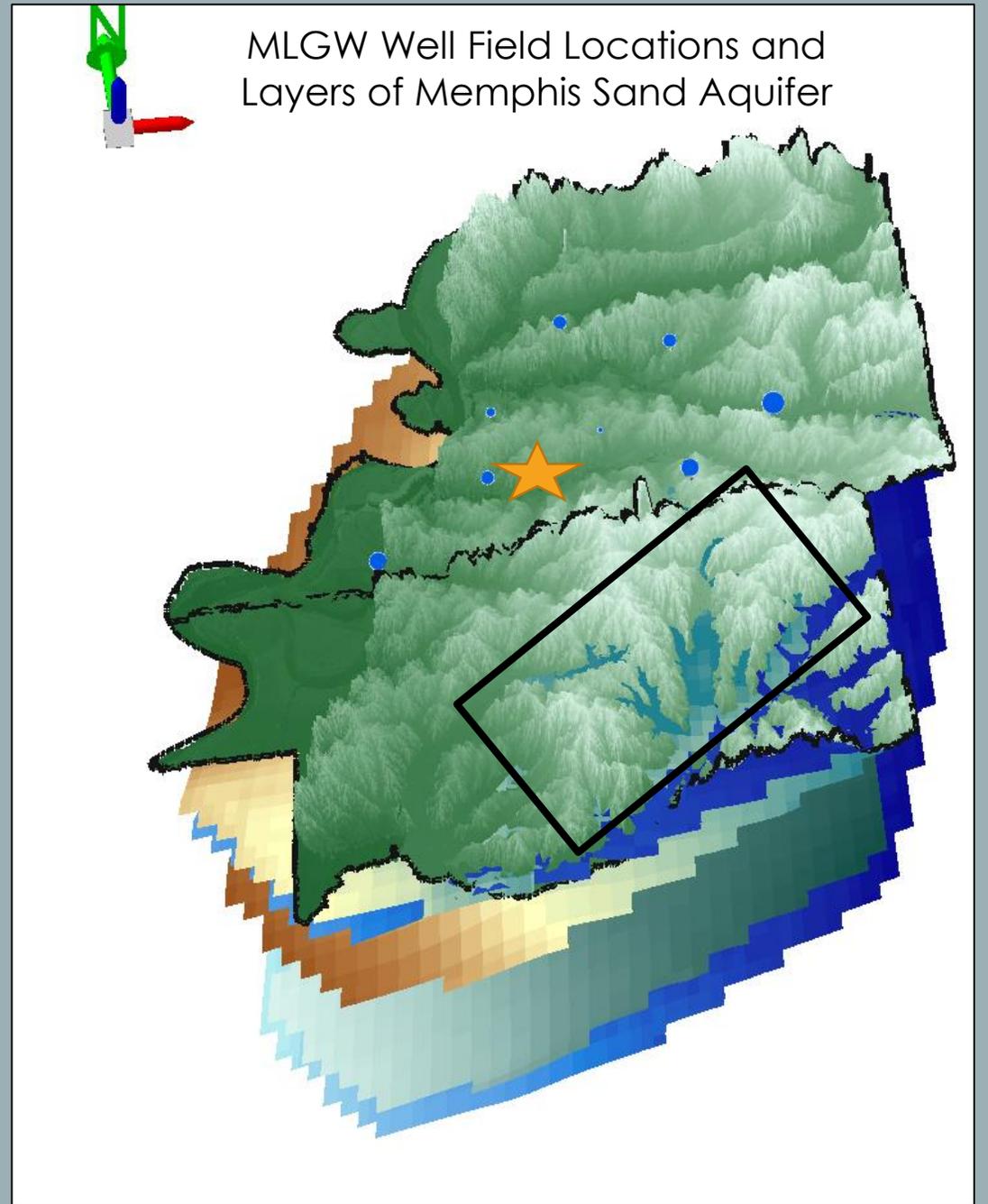
## Shelby County, TN & De Soto County, MS



# MLGW Well Field Locations

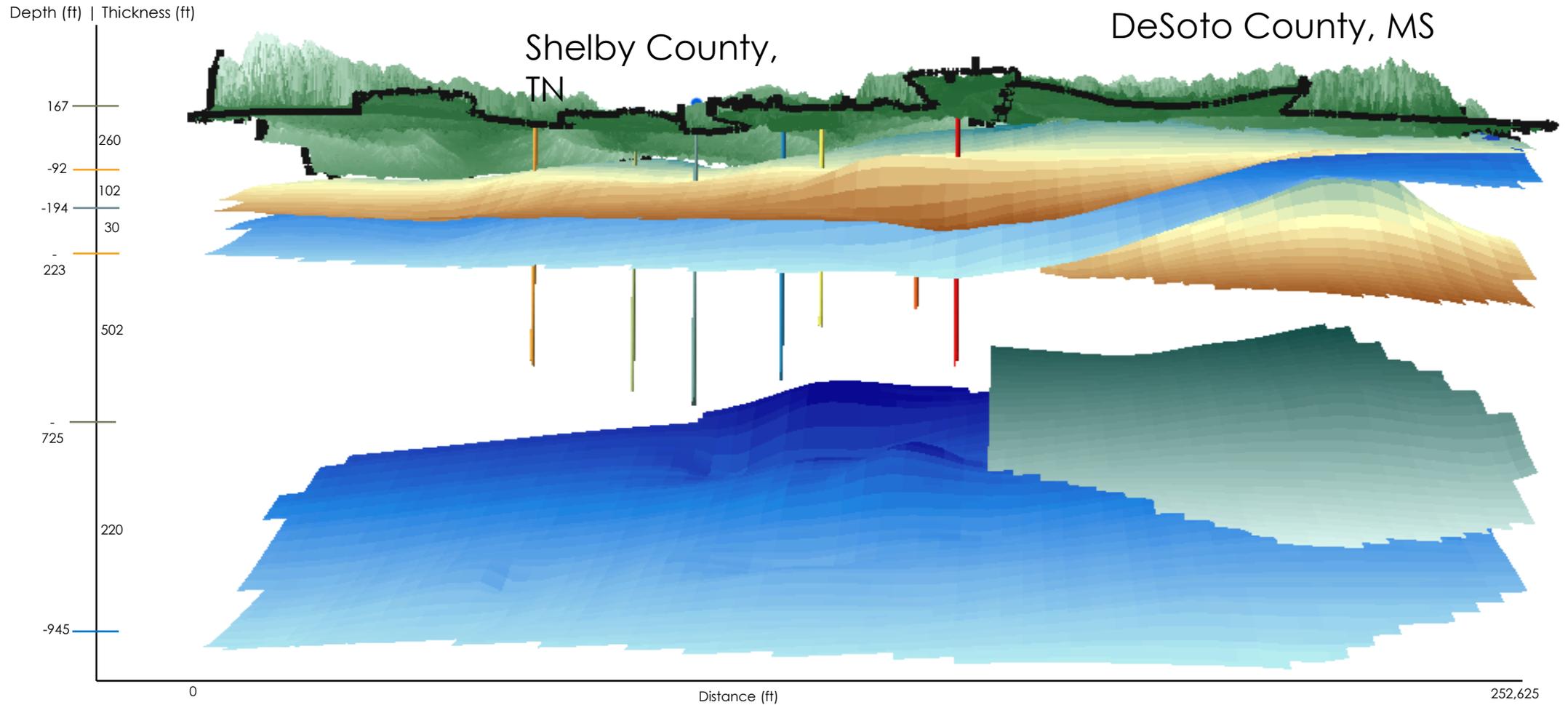


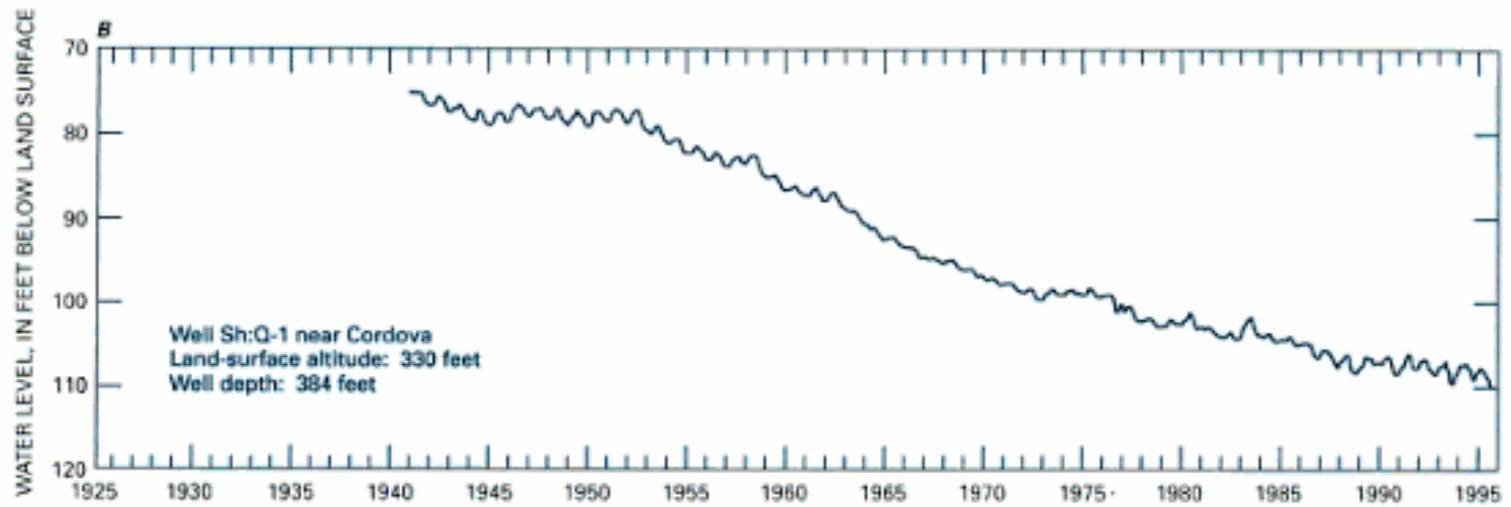
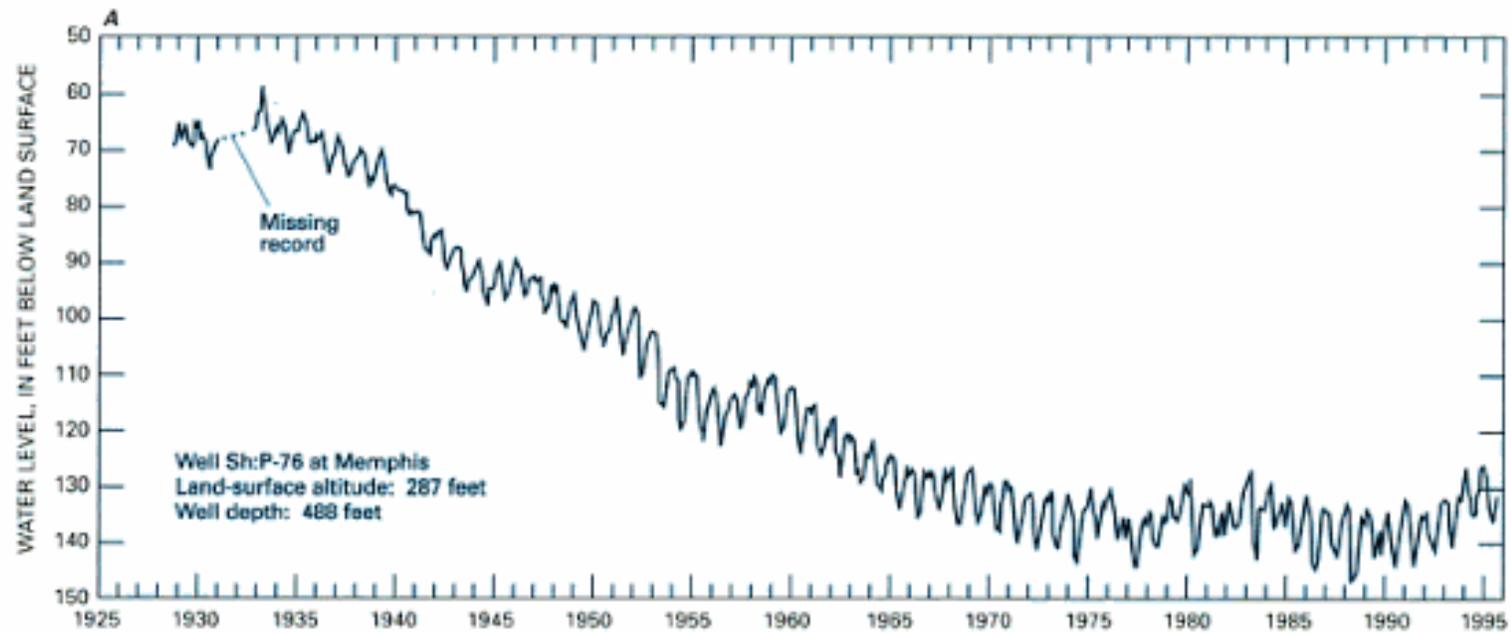
# MLGW Well Field Locations and Layers of Memphis Sand Aquifer



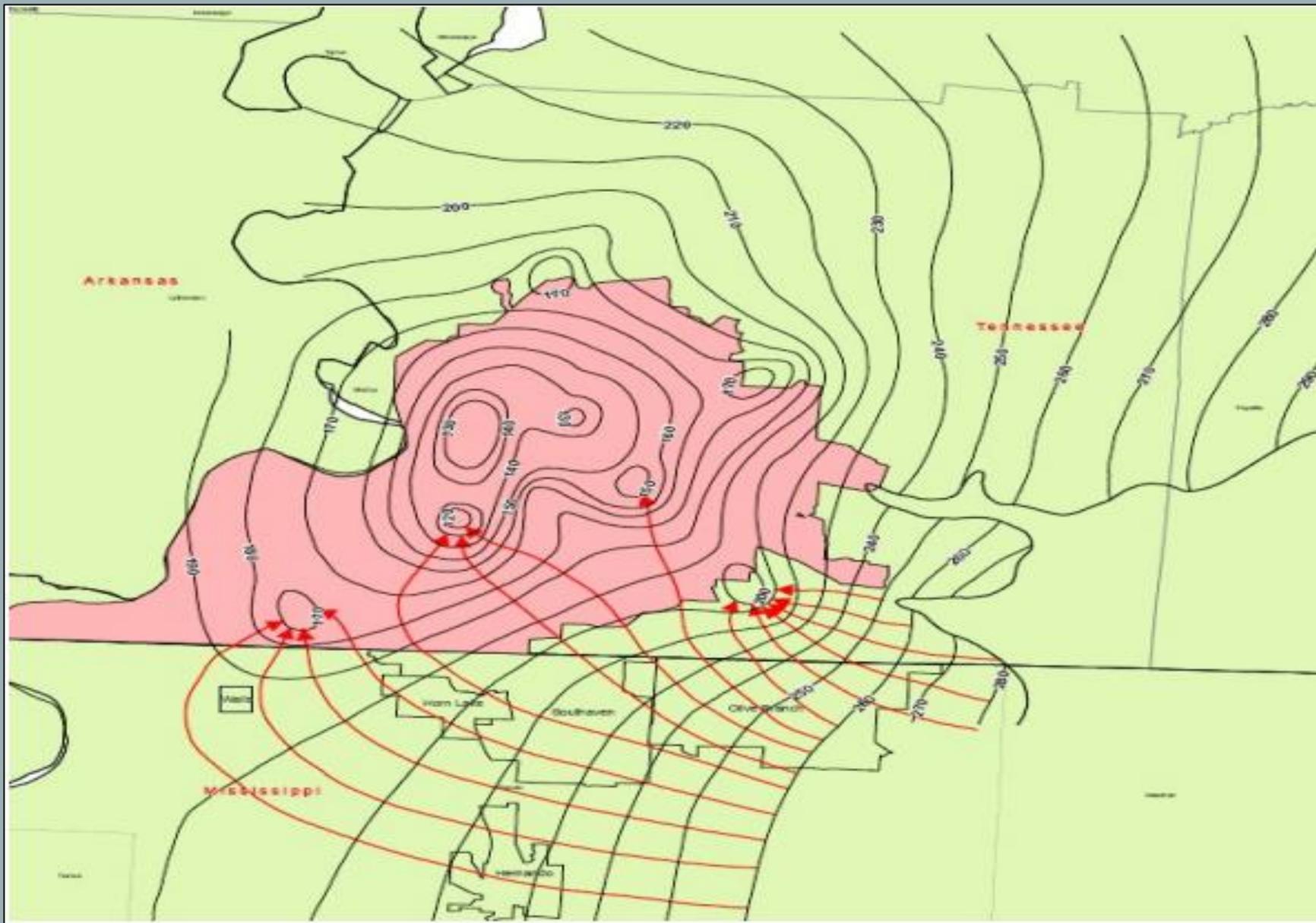


# Memphis Sand Aquifer and MLGW principal Well fields





(Taylor and Alley, 2005)



(Cameron, 2009)

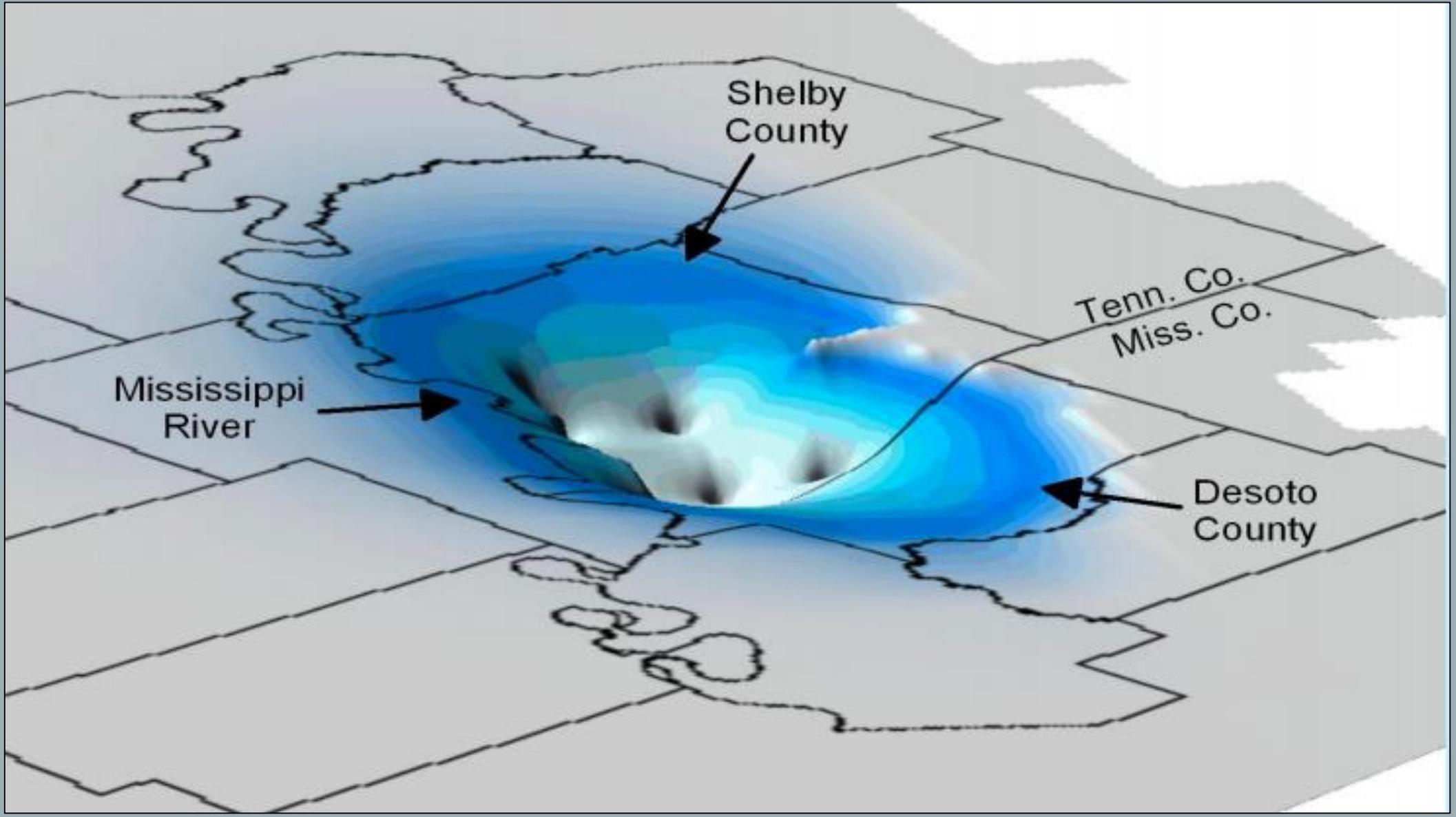
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## A TIMELINE OF MISSISSIPPI V TENNESSEE

1960: USGS confirms cone of depression

1990: MDEQ proposes joint study with  
MLGW

2000: TDEC studies MLGW's pumping rates

2005: MS files action against MLGW

2008: Case goes to trial

2009: MS appeals

2010: SCOTUS declines to hear case

2014: SCOTUS grants MS request to file new  
lawsuit

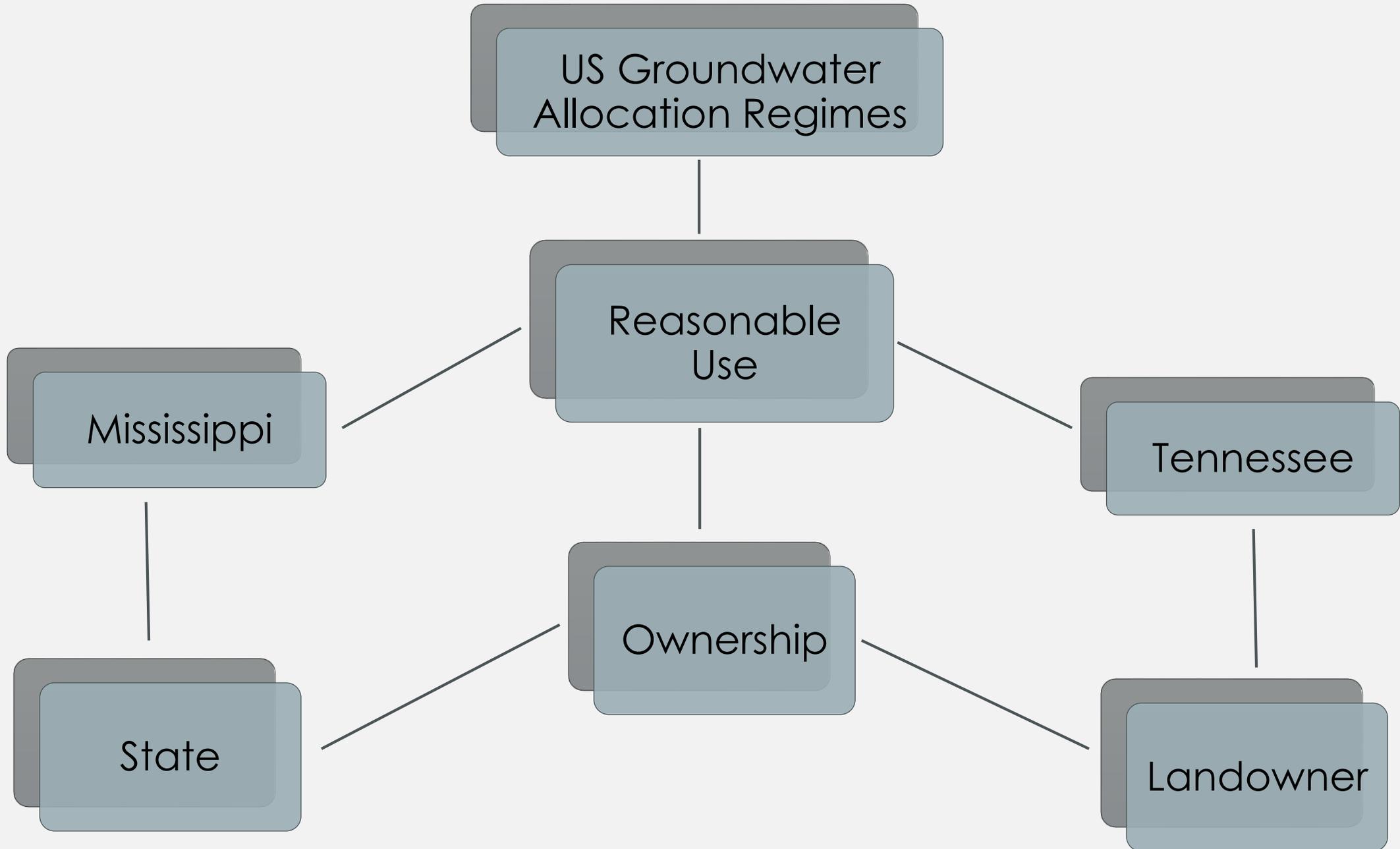
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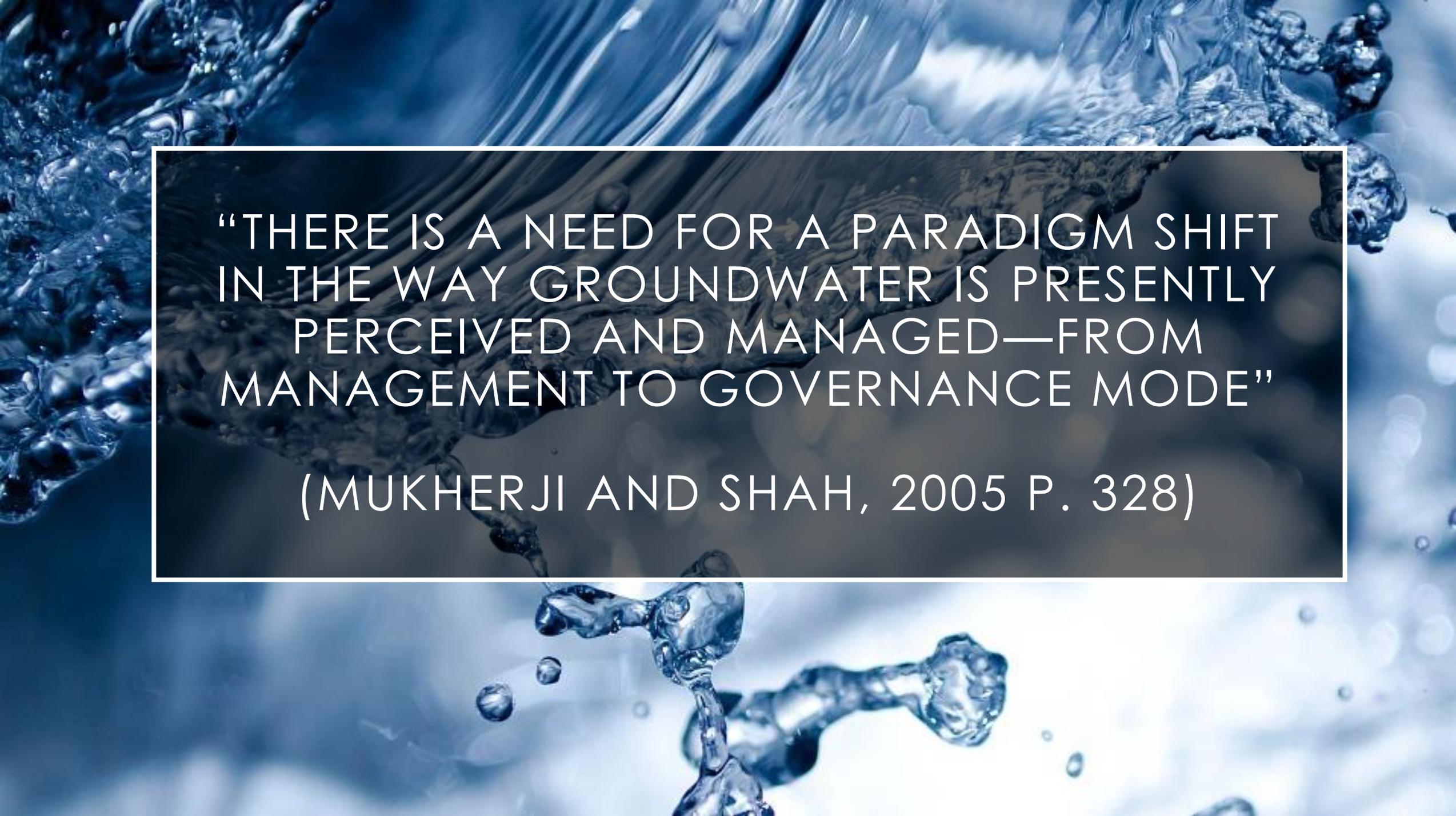
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“THERE IS A NEED FOR A PARADIGM SHIFT  
IN THE WAY GROUNDWATER IS PRESENTLY  
PERCEIVED AND MANAGED—FROM  
MANAGEMENT TO GOVERNANCE MODE”

(MUKHERJI AND SHAH, 2005 P. 328)

## **GOVERNANCE:**

“...The process of informed decision-making that enables trade-offs between competing users of a natural resource so as to balance protection and use in such a way as to mitigate conflicts, enhance security, ensure sustainability and hold government officials accountable for their action”

(Turton et al., 2007, p. 11)

# OBJECTIVE

To develop a governance framework that leads to an agreement on groundwater use

# RESEARCH QUESTIONS

I. What components do frameworks for transboundary aquifer governance include?

II. What instruments and tools create effective transboundary aquifer agreements?

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## **POLICY INSTRUMENT:**

“Structure and influence public policy and determine what resources can be used and by who” (Lascoumes and Le Gales, 2007, p. 4)

## **POLICY TOOL:**

Specify a network of actors that will play important roles and the nature of the roles they perform (Salamon, 2000).

# METHODS, STEP 1

FRAMEWORK:	PROPOSED BY:	CONSIDERATIONS:
Dimensions for "good" groundwater governance	Varady et al, 2013	<ol style="list-style-type: none"><li>1. Political-institutional</li><li>2. Socio-cultural</li><li>3. Economic</li><li>4. Ecological</li></ol>
Internationally Shared (Transboundary) Aquifer Resources Management (ISARM) Framework	UNESCO, FAO, UNECE, IAH, 2001	<ol style="list-style-type: none"><li><b>1. Scientific-hydrogeological scope</b></li><li>2. Legal aspects between or among concerned sovereign states</li><li>3. Socio-economic aspects</li><li>4. Institutional aspects</li><li>5. Environmental aspects</li></ol>

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# METHODS, STEP II

<b>SIGNATORIES</b>	<b>DATE</b>	<b>TYPE</b>
France & Switzerland	2007	Legally binding
Jordan & Saudi Arabia	2015	Legally binding
Libya, Algeria, & Tunisia	2002	Informal
Argentina, Brazil, & Paraguay, Uruguay	2010	Informal
Chad, Egypt, Libya, & Sudan	2013	Informal
Utah & Nevada	2009	Proposed
N/A	1989	Model
N/A	2008	Model

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Agreement and the C and

The High Resolution dated 13.5.2008 Hashemite Kingdom of Jordan management Riyadh on 30

The Government Water and represented Parties), by countries, and affirming a layer of protection (Disi), and standards have limited

The Parties

Article On

For the purpose of the following

Saudi: The and Electric

Jordan: The

The Al-Sa'ad the main fields of th

THE PROTECTION OF THE STATE COVENANT

Recognizing the need of aquifer in order to protect waters,

Covenant and agree as follows

FIRST CHAPTER – Main

Article 1 – The Commission

1. A Geneva Aquifer Commission hereby created with members designated in Geneva and by the
2. At least two members Commission shall matters.

<sup>1</sup>Free translation

G

The Republic of Argentina, the and the Oriental Republic of U

In the spirit of cooperation with the purpose of expanding and sustainable utilization of the resources, which is located in t

Taking into consideration the Assembly, related to the perm

Taking into account also the Assembly on the Law of Transl

Bearing in mind the principal responsibility of States regarding Declaration of the United Nations 1972;

Conscious of the responsibility present and future generation and Development, 1992;

Taking into account the conclusions Development, Santa Cruz de la Summit on Sustainable Develo

Considering the progress in water resources and physical in Treaty of the Plata River Basin,

Supported by the integration on the Environment of MERCOS

Motivated by the desire to scientific understanding on the management of its water resou

Taking into consideration the Protection and Sustainable De

I

ROBER

Increasing population worldwide are placing increasing pressure on these groundwater basins international or transboundary giving water from a neighboring severe and protracted conflict are only at a beginning institutions on the matter year period have develop

The draft provides to be managed by mutual unilateral leaking. The transboundary transfer fundamental goal is to resolution of disputes and pressures upon this price

The "black letter" discretion to the joint agreement initiative subject to the full range of problems in

Rapid population putting steadily increasing from North Africa to North become critically dependent Potentially explosive in places as diverse as India and the United States, a

<sup>4</sup> Published by The International 668-722, Summer, 1989.  
<sup>1</sup> City University of New York  
<sup>2</sup> University of New Mexico

محضر اتفاق

لتعاون بين جمهورية مصر العربية والجمهورية العربية الليبية الشعبية الاشتراكية العظمى الخاص بإنشاء الهيئة المشتركة لدراسة وتنمية خزان الحجر الرملي النوبي

إرساء لمصر ليبيا واتفاقية للتعاون المستمر بين جمهورية مصر العربية والجمهورية العربية الليبية الشعبية الاشتراكية العظمى وتقليدا لتعاون وات الصداقة بين جمهورية مصر العربية والأخ / قائد ثورة ال ١٩٦٩ من سبتمبر للعاصمة في لقاء طبرق بتاريخ ١٩٨٩/١٠/١٢ . والمحضر الذي تم التوقيع عليه من قبل السيد نائب رئيس مجلس الوزراء وزير الخارجية لجمهورية مصر العربية والأخ / رئيس اللجنة الشعبية لدراسة التعاون بالجمهورية العظمى.

وبالإشارة إلى معناه اجتماع اللجنة العليا المشتركة الليبية المصرية في دورتها الأولى المنعقدة في طرابلس في الفترة ١٩٩١/٧/٨-٦م، والذي أقر فيه إنشاء هيئة مشتركة لدراسة واستثمار مياه خزان الحجر الرملي النوبي لصالح الدول المشتركة في هذا الخزان. تم الاتفاق على ما يلي:

أولاً : تشكيل هيئة مشتركة لدراسة وتنمية خزان الحجر الرملي النوبي تسمى (الهيئة المشتركة لدراسة وتنمية خزان الحجر الرملي النوبي) يترأسها الجمهورية العربية الليبية الشعبية الاشتراكية العظمى الهيئة الشعبية العامة للاستصلاح الزراعي وتسيير الأراضي - الهيئة العامة للمياه، ويمثل فيها جمهورية مصر العربية - وزير الأشغال والموارد المائية - مركز البحوث المائية - معهد بحوث المياه الجوفية ويجوز أن تضم

دول أخرى لهذا الاتفاق وبذلك يسهل العودة به على أن تكون من بين دول حوض خزان الحجر الرملي النوبي، ويكون المقر الرئيسي للهيئة مدينة طرابلس - بالجمهورية العظمى ويقع مكتب فرعي لها في مدينة القاهرة بجمهورية مصر العربية وليس أن تتلقى مكاتب أخرى في الدول الأخرى.

ثانياً : أهدافه

دراسة وتقييم وإدارة الموارد المائية بخزان الحجر الرملي النوبي وحمايتها والمحافظة عليها وتكثيف استعمالها وتطويرها لخدمة التنمية الاقتصادية والاجتماعية الشاملة في الدول المشتركة في هذا الخزان.

# METHODS, STEP III

<b>INSTRUMENT</b>	<b>Regulatory</b>	<b>Economic and Fiscal</b>	<b>Communication and Information</b>	<b>Agreement and Incentive</b>	<b>De-Jure and De-facto</b>
<b>ASSOCIATED TOOLS</b>	Rules (prescriptive and prohibitive)	Pricing mechanism (terms of costs and payment)	Defintion of terms Data sharing mechanism Monitoring plan Public outreach Water Quality & Water Quantity Control	Previous agreement Planning regime Conflict resolution mechanism Establishment of Joint Committee Flexibility	Defined authority and responsibilities Established liability

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# RESULTS PART I

What components do frameworks for transboundary aquifer governance include?

- Hydrodiplomacy
- Assessments
- Dimensions of Groundwater Governance

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# RESULTS PART II

What instruments  
and tools create  
effective  
transboundary  
aquifer agreements?

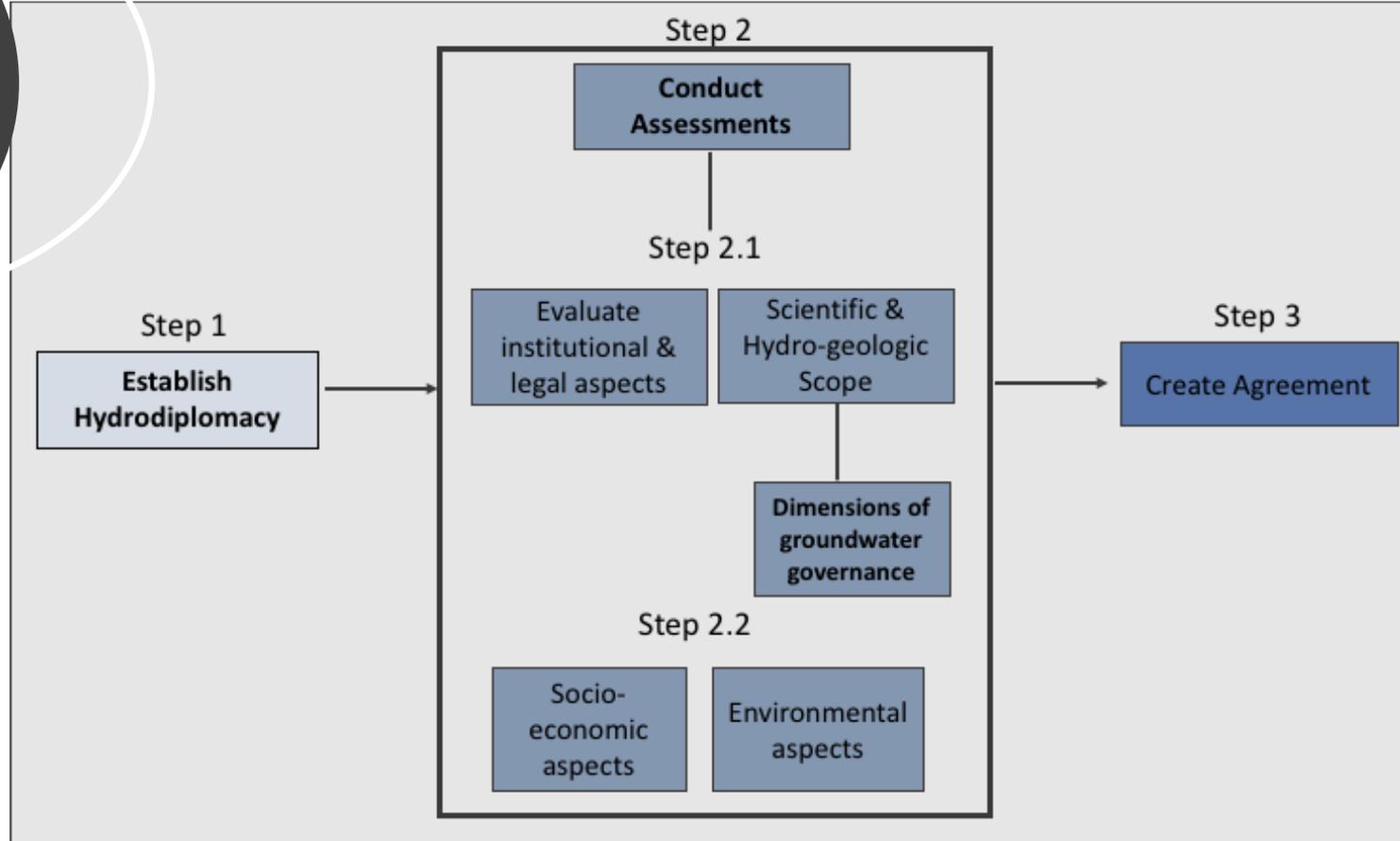
Instrument Type	Agreement Type				
	Agreement & Incentive	Communication & Information	De Jure & De Facto Standards	Economic & Fiscal	Regulatory
Model	+	+	+	+	+
Legally Binding	+	+	+	+	+
Informal	+	+	+	+	-
Proposed	+	+	+	-	+

# RESULTS PART II

What instruments and **tools** create effective transboundary aquifer agreements?

		Instrument Type		Agreement & Incentive Based								Communication & Information Based				De Jure & De Facto	Economic & Fiscal	Regulatory Based					
		Tool Type		Conflict resolution mechanism	Establishment of Joint Committee	Flexibility	Equitable and Reasonable Use	General Obligation to Cooperate	Obligation not to cause significant harm	Planning Regime	Previous Agreements	Data sharing	Definitions of terms	Monitoring	Public Outreach	Water Quality Control	Water Quantity Control	Authority & Responsibilities	Liability rules	Project funding	Project pricing mechanism	Prescriptive	Prohibitive
Agreement Type	Agreement Name																						
Model	UNILC Draft Articles	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	-	+	-	-	+		
	Bellagio Draft Treaty	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	-	-	-		
Legally-Binding	Al-Sag/Al-Disi Aquifer Agreement	+	+	+	+	+	+	+	-	+	+	+	-	+	+	+	-	-	-	+	+		
	Genevois Aquifer Agreement	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-		
Informal	Guarani Aquifer Agreement	+	+	+	+	+	+	+	+	+	+	-	+	+	+	-	-	-	-	-			
	NW Sahara Aquifer Agreement	-	+	-	+	+	+	+	-	+	-	+	-	+	+	+	-	+	+	-	-		
	Nubian Sandstone Aquifer Agreement	-	+	-	+	+	+	+	-	+	-	+	-	+	+	+	-	-	-	-	-		
Proposed	Snake Valley Aquifer Agreement	+	-	+	-	+	+	+	+	+	+	+	+	+	+	-	-	-	+	+			

# MEMPHIS SAND AQUIFER GOVERNANCE FRAMEWORK



# MEMPHIS SAND AQUIFER AGREEMENT

## Transboundary Aquifer Draft Agreement for the Memphis Sand Aquifer

### Preliminary Article

The present agreement was drafted with the goal of ensuring the future of the Memphis Sand Aquifer...

### Article 1

Definitions of terms used throughout document

- Aquifer, Aquifer State, etc....

### Article 2

Establishment of Memphis Sand Aquifer Joint Management Committee

- Composed of representatives of agencies/entities in charge of water resources in each aquifer state, including riparian states.

### Article 3

Inclusion of International Customary Law

- General obligation to cooperate
- Obligation not to cause significant harm
- Equitable and reasonable use
  - Utilize transboundary aquifers or aquifer systems in a manner that is consistent with the equitable and reasonable accrual of benefits therefrom to the aquifer States concerned
  - Maximize the long-term benefits derived from the use of water contained therein
  - To be determined by Joint Committee

### Article 4

Outline of authority and responsibilities

- Annual aquifer review to ensure control and protection of groundwater (i.e. planning regime)
- Establish use for aquifer states
- Oversee construction and maintenance of new waterworks and equipment
- Appoint technical consultants specialized in water matters
- Investments/ operational costs
- Communicate with Aquifer States

### Article 5

Planning regime

- Joint committee shall establish and implement plans for the proper management of their transboundary aquifers or aquifer systems.
- Identify transboundary groundwater conservation zones
- Monitoring program
  - Use agreed or harmonized standards and methodology for monitoring their transboundary aquifers or aquifer systems.
  - Identify key parameters that they will monitor based on an agreed conceptual model of the aquifers or aquifer systems.
- Water quantity/quality control mechanism
  - Identify the recharge and discharge zones of transboundary aquifers or aquifer systems that exist within their territory.
  - Establish pumpage rates and extraction volumes for each state
- Data sharing mechanism
  - On a regular basis, exchange readily available data and information on the condition of their transboundary aquifers or aquifer systems, in particular of a geological, hydrogeological, hydrological, meteorological and ecological nature and related to the hydrochemistry of the aquifers or aquifer systems, as well as related forecasts

### Article 6

Conflict resolution mechanism

- Enter into consultations and, if necessary, negotiations with a view to arriving at an equitable resolution of the situation.
- Utilize an independent fact-finding body to make an impartial assessment

### Article 7

Public outreach component

- All monitoring data collected should be shared and made available to the public.
- Increase aquifer literacy amidst public in each aquifer state

### Article 8

Flexibility

- Agreement may be amended by agreement of the Parties.
- Agreement shall be reviewed every X year(s).

### Article 9

Final provisions and Signatures

- A copy of agreement for each Party
- Date when agreement will take effect

# CONCLUSIONS PART I: RECOMMENDATIONS

- Aquifer vs Groundwater
  - Ownership
- Education
  - Funding
- Governance!
- Hydrodiplomacy
- Mississippi & Tennessee

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# CONCLUSIONS PART II: IMPLICATIONS

- SCOTUS Siding with TN
  - Makes sense on paper...not so much in reality
- SCOTUS siding with MS
  - Would continue the fallacy that water conforms to political boundaries
- Agreement
  - Would be the first of its kind

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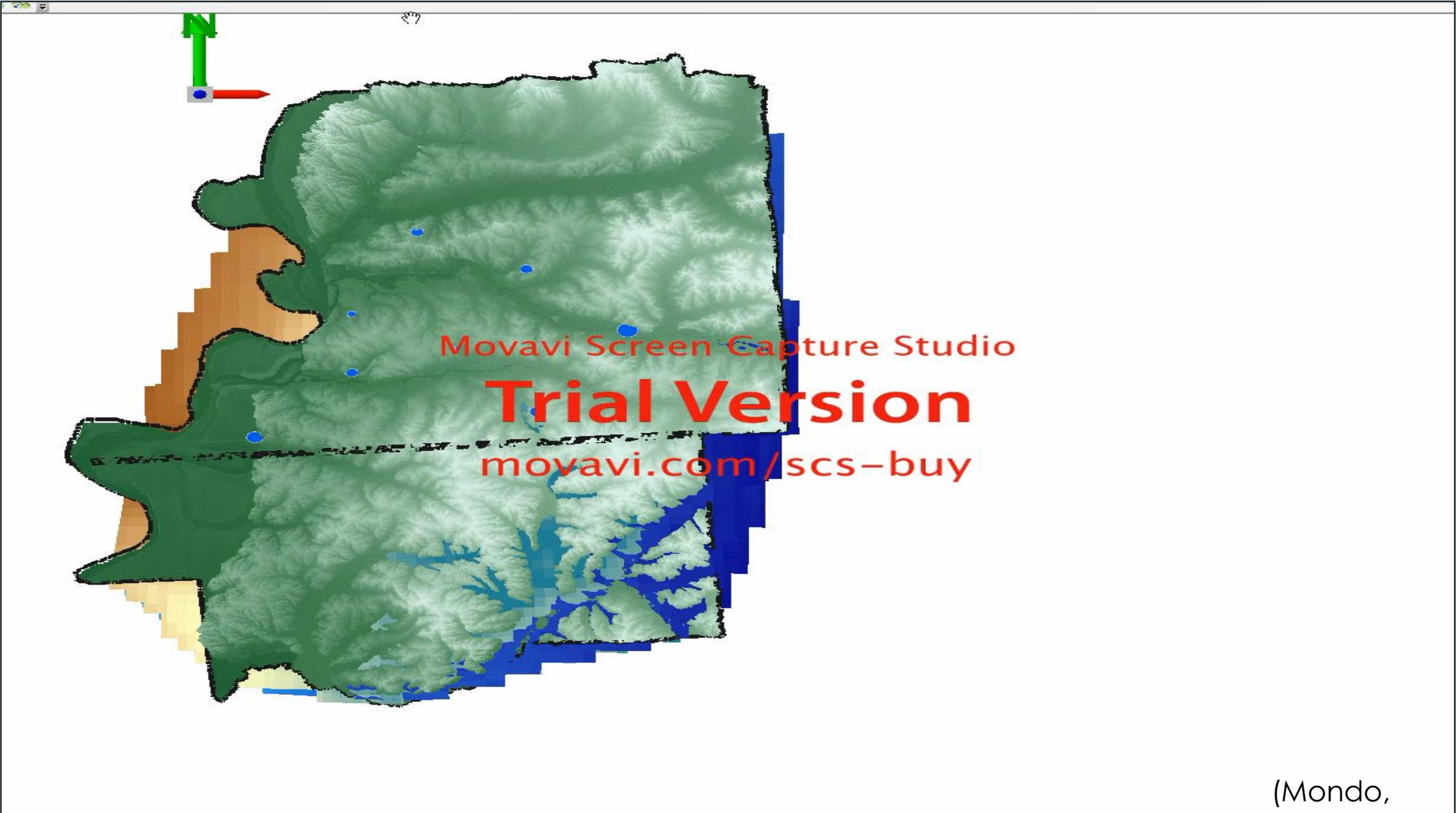
Conclusions

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A high-speed photograph of a water splash, showing intricate droplets and a central column of water. The background is a soft, out-of-focus blue. A white-bordered rectangular box is superimposed over the center of the splash.

QUESTIONS?



Movavi Screen Capture Studio

**Trial Version**

[movavi.com/scs-buy](http://movavi.com/scs-buy)

(Mondo,  
2018?)