Grand Theft Groundwater!

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WaterWired blog: [www.waterwired.org](http://www.waterwired.org)
Twitter: [@WaterWired](http://twitter.com/@WaterWired)
My T-Shirt got water?

Job opening: Water-Carrier
Requirements: must be able to balance 45 pounds on your head while trekking rocky dirt roads for miles.
Hours: up to 8 hours a day
Wages: $0

Only women & girls need apply!

(T-shirt: courtesy of Ray Newmyer)
What Will I Discuss?

- Why the **YUGE** Interest?
- Location and Background
- Memphis Sand: Some Hydrogeology
- The Issue
- Groundwater Flow: Nice Pictures & Black Holes
- The Plot Thickens...and the Courts
- Observations & International Relevance
- Where There’s a Dream, There’s a Nightmare (But No Longer!)
- Speculation
- Aquifer Maps: USA, Canada, Mexico
- Additional Information and References
So Why Is a Hydrogeologist from Oregon [and born in New York City!] Intrigued by This Case?

- Contacted by Tom Charlier of the Memphis Commercial Appeal and Mississippi Public Radio reporter in 2007
- Area experts reluctant to talk
- Seems like a story made for the Western USA – water quantity at issue
- Hydro-Irony: Two states in one of the USA’s wettest regions adjacent to one of the world’s largest rivers arguing over groundwater!
Memphis Background

• City-owned utility, Memphis Light, Gas, and Water (MLGW) provides water to about 1.1M people. Started pumping groundwater c. 1924.

• High quality groundwater is primarily from Memphis Sand (also known as Sparta Sand or Middle Claiborne aquifer) & Fort Pillow Sand aquifers.

• Daily pumpage: 0.6 – 0.75 MCM per day

• Cameron (2009) claims Memphis is world’s largest city relying solely on GW (Oh no, San Antonio!)
Memphis Sand

- Underlies 25 000 km² of AR, TN, MS, KY; up to 275 meters thick
- Very coarse sand with interbedded lenses of clay and silt - good water storage & transmissive properties; high quality GW
- Replenished via precipitation (average annual ~ 1400 mm) on outcrop belt in western TN & MS. Up to 20% of precipitation is recharged!
- Contains **380 BCM (380 km³)** of water (MLGW website), about 33% of global annual GW pumping or 80% of Lake Erie’s volume. Is it all **recoverable? No!**
NW-SE Hydrostratigraphic Cross Section beneath Memphis, Tennessee (TN) and Adjacent States of Arkansas (AR) and Mississippi (MS)
(note vertical exaggeration – strata dip more like 1%)

[Courtesy of the Department of Geosciences, Mississippi State University, Starkville, MS; modified from Brahana et al. (1987)]
The Issue

• MLGW pumping from 10 well fields; 175 wells have caused pumping effects to expand into Mississippi

• Mississippi claims that MLGW is ‘stealing’ its groundwater: currently ~90,000 cubic meters/day and 1.35 BCM (total), 1965 - 2005

• At one time: MS listed Memphis as biggest user of its groundwater!
MLGW Well Fields
(Cameron 2009)
Pumping Well Cone of Depression
(Cameron 2009)
Memphis Sand Aquifer Flow Net showing Groundwater Movement (red arrows) from Mississippi to MLGW Well Fields

Note: Natural Flow is Generally East to West

[Cameron 2009]
Three-Dimensional Representation of the Cones of Depression Created by MLGW’s Memphis Sand Aquifer Pumping

[Cameron 2009]
# Summary – State Groundwater Allocation Laws

(courtesy Ken Rainwater, Texas Tech University)

<table>
<thead>
<tr>
<th>Groundwater Allocation</th>
<th>No. of States</th>
<th>Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute Ownership</td>
<td>7</td>
<td>Connecticut, Indiana, Louisiana, Maine, Massachusetts, Rhode Island, Texas</td>
</tr>
<tr>
<td>Reasonable Use</td>
<td>16</td>
<td>Arizona, <strong>Mississippi</strong>, New York, North Carolina</td>
</tr>
<tr>
<td>Reasonable Use</td>
<td></td>
<td>Alabama, Florida, Illinois, Kentucky, Maryland, Missouri, Nebraska, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia</td>
</tr>
<tr>
<td>Correlative Rights</td>
<td>5</td>
<td>Delaware, Hawaii, Iowa, Minnesota, Vermont</td>
</tr>
<tr>
<td>Beneficial Purpose Doctrine (Restatement of Torts § 858)</td>
<td>3</td>
<td>Michigan, Ohio, Wisconsin</td>
</tr>
<tr>
<td>Reasonable Use / Correlative Rights</td>
<td>4</td>
<td>New Hampshire, Oklahoma</td>
</tr>
<tr>
<td>Absolute Ownership / Reasonable Use</td>
<td>1</td>
<td>Georgia</td>
</tr>
</tbody>
</table>
The Plot Thickens…

- MS GW flowed into TN before MLGW’s pumping, refuting argument that TN is ‘stealing’ MS groundwater. In fact, pumping in DeSoto County, MS, may have ‘stolen’ 40,000 cubic meters/day of TN’s water. See more at: http://bit.ly/IqPKpu

- Study published in the *Journal of the American Water Resources Association (JAWRA)* by Waldron & Larsen (2014). See: http://is.gd/CQbBfb
• MS filed lawsuit against Memphis and MLGW in 2005. It did so after withdrawing from discussions with TN & AR on Memphis Sand aquifer water allocation and management. Sought > $1B in damages.

• MS lost two successive Federal court levels. It appealed to U.S. Supreme Court (SCOTUS), which declined to hear the case without prejudice. MS could refile if evidence warranted it.

• Courts ruled that TN must be included as defendant because it allocates water.
Observations - 2

• Does the ‘public trust’ doctrine apply to groundwater? Mississippi invoked it - protecting groundwater for its citizens (Cameron 2009; Baxtresser 2010). MS claimed it was allocated groundwater in 1817 when it became a state.

• Institutional asymmetry is interesting: state v. city in a dispute over water resources. Are new approaches for resolution of such disputes needed?

• Should we establish regional interstate agencies to manage transboundary groundwater?
Observations - 3

• Water had not been allocated, so how could MS claim its water was being ‘stolen’?

• How could MS claim $$ damages?

• Groundwater is an ‘article of commerce’. Is this relevant?

• Hard to tell if GW is being ‘diverted’; can’t see diversion like you can with surface water.
Tom Charlier of the Memphis Commercial-Appeal reports Mississippi now wants $615M in damages.

Mississippi claims Memphis has ‘forcibly’ taken its water since 1985.

Basis for claims?

More information at http://is.gd/CXXx8e

SCOTUS has accepted case (advised not to)
Early 2016 - more

• For state vs. state “original jurisdiction” cases: SCOTUS must operate like a trial court rather than its normal appellate court role.

• SCOTUS appointed a Special Master to conduct the fact finding and narrow the case - the Honorable Eugene E. Siler, Jr., of Kentucky, who will make recommendation to SCOTUS.

• Case will likely be heard in 2018 or 2019.
My Nightmare – NOT!

If Supreme Court ties 4 - 4, status quo prevails

(But we finally got a ninth justice!)
My Dream: How About A Compact?

- Propose compact (or other agreement) among MS, AR & TN. Use Bellagio Draft Treaty (international) [http://bit.ly/2aXPymE] or model compacts as guides.
- Construct management model.
- Equitable allocation of water, protection of water quality, recharge areas, etc.
- Compact - needs Congressional approval.
- First ‘groundwater-only’ compact in USA. Only 4 written GW agreements on Earth!
- Template for future – potential GW conflicts? Chance to set a precedent! International interest, too!
How About An Agreement?

- Nevada and Utah were on the verge of signing an agreement to jointly manage the Snake Valley aquifer [http://bit.ly/2qZf6zw]. Utah Gov. Gary Herbert decided not to sign it.

- Other management and allocation options are being developed by groundwater governance/management experts.
Speculation?

Gabriel Eckstein of Texas A & M speculated on what might have happened had the case been heard before the U.S. Supreme Court:

“Will the same occur for the law of transboundary groundwaters? There is scant precedence in US law on which the Court might base its decision other than cases on transboundary surface waters. While the analogy between the two water resources is certainly applicable and appropriate, this is new and unsettled ground for the Court to plow.”

Eckstein also speculated on international implications – many look to SCOTUS for leadership.

Western Canada aquifers?
More Speculation

Eckstein estimated that in the past 1200 years there have been 3600 written surface water agreements and 4 groundwater agreements: France-Switzerland; Jordan-Saudi Arabia; and two in North Africa. See: http://bit.ly/2sfsfxV

My feeling is that if Mississippi prevails, it could be disastrous. States where groundwater flows into other states may decide to sue those states or otherwise restrict the flow of groundwater outside its boundaries.

Note that one other case that might go to SCOTUS involves ownership of an aquifer’s pore spaces. Could be important in cases involving groundwater storage. STAY TUNED!
USA Principal Aquifers

USGS: https://on.doi.gov/2rWXtx3
Canada – USA
Transboundary Aquifers

1 – Abbostford-Sumas, British Columbia/Washington State
2 – Okanagan-Osoyoos, British Columbia/Washington State
3 – Grand Forks, British Columbia/Washington State
4 – Poplar (Eastend to Ravenscrag), Saskatchewan/Montana
5 – Estevan, Saskatchewan/North Dakota
6 – Northern Great Plains, Manitoba/Saskatchewan/N.D./S.D./Montana
7 – Chateauguay, Quebec/New York state
8 – Richelieu/Lake Champlain, Quebec/Vermont/NY
9 – Milk River, Alberta/Montana
10 – Judith River, Saskatchewan/Alberta/Montana
Mexico – USA
Transboundary Aquifers
The Last Word?

“This is the first-ever case of one state claiming to outright own groundwater. This is all about money and the Supreme Court should have left this alone.” - Noah Hall, Wayne State University School of Law

Additional Information

- M. Campana’s more detailed PPT and comments by Prof. Gabriel Eckstein of the Texas A&M School of Law: http://bit.ly/2bjr08c
- Article by Boyce Upholt in *The Atlantic* (online December 2015): *An Interstate Battle for Groundwater* http://theatln.tc/1XPgLcl
- Link to webinar with MEC and water lawyer Noah Hall: http://bit.ly/2kwUmY9
- Memphis lawmakers plan bill to protect aquifer. http://memne.ws/2kh8TUB
References - 1


References - 2


Mississippi and Memphis Representatives Discuss Water Allocation Without Their Lawyers
(courtesy: www.duckboy.com)
Email: aquadoc@awra.org

Thank You!