



ORSANCO

Water Resources Initiative Update

Steve Braun & Sam Dinkins
Technical Committee
February 12-13, 2015

Water Resources Initiative Background

- Three year effort to explore possible Commission role in water resource management
 - Outside of traditional Compact authorities
- Funded through grants from multiple foundations
- Initiative began in 2012
- Funding ends June 2015

Water Resources Initiative Reports

Report #1: Water Resources Characterization

- Water Use Inventory
- Shale Gas Development
- Inter-basin Transfers

Report #2: Laws & Regulations Inventory

- Water Resource Laws & Regulations Inventory

Report #3: ORSANCO's Future Role in Water Resources

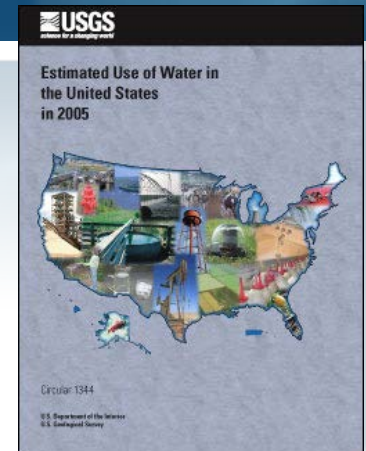
- Recommendation from WRC to Commissioners on recommended future role of ORSANCO in water resources management

Water Use in the Ohio River Basin

Data Availability

Water Withdrawals

- **USGS publicly available data**
 - 2005
 - County-level
 - State Agencies
 - 2010 water data publicly available in 2014
 - *GLBC
 - *TVA



Consumption

- **Consumption Coefficients – meta-analysis**
 - Shaffer & Runkle - 2007 - Consumptive Water-Use Coefficients for the Great Lakes Basin and Climatically Similar Areas
- **US Energy Information Administration (EIA)**
 - Thermoelectric facilities

Ohio River basin Freshwater-use

2005

Estimated (Bgal/day)

Withdrawals:	43.82	134,000 Acre-ft
Consumption:	1.92 (4.4%)	5,900 Acre-ft

Definitions

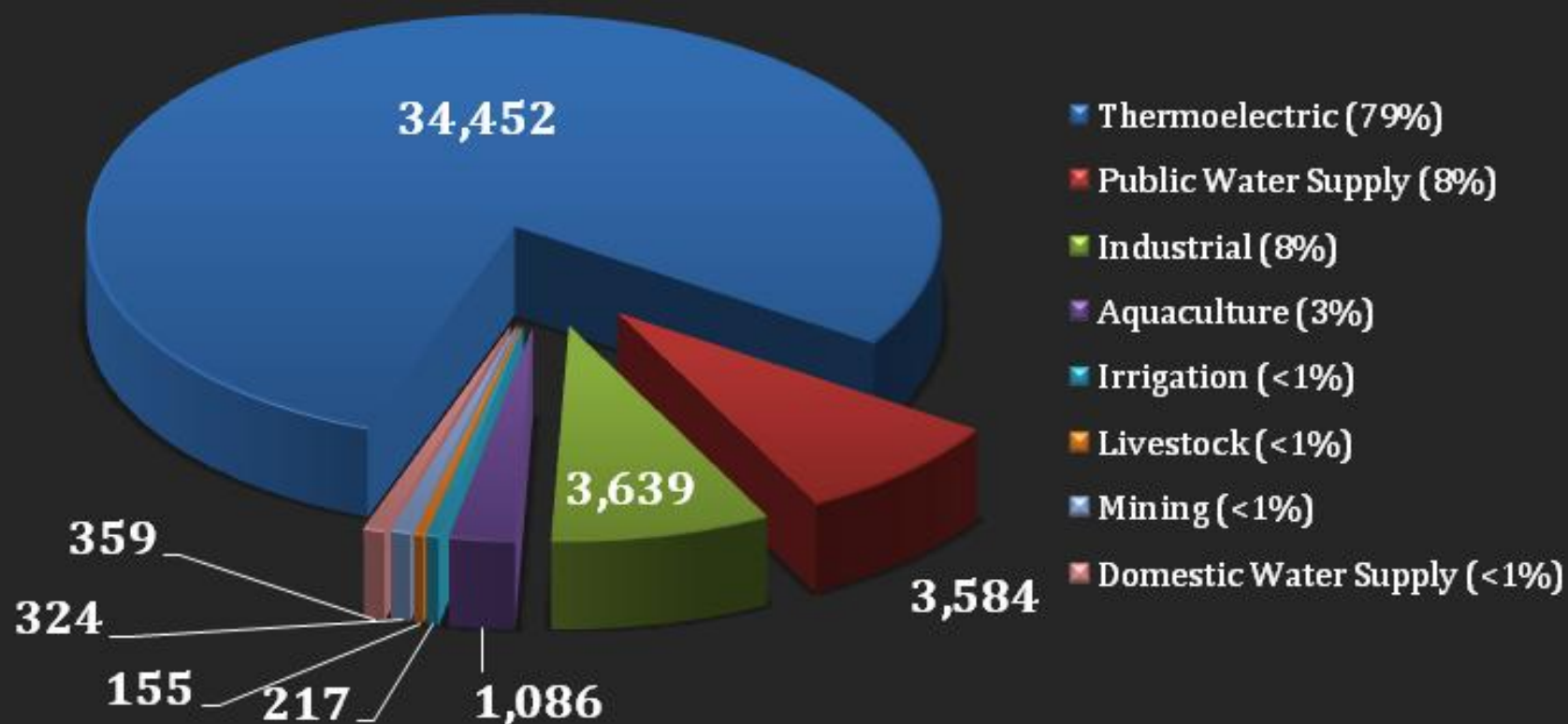
- **Water-use**
 - *water withdrawn from a source*
- **Consumption**
 - *water withdrawn and subsequently rendered unavailable for other withdraws.*
 - evaporated, transpired
 - consumed by humans or livestock
 - assimilated into crops or products.

Acre-Foot = Volume of water that will cover an area of one acre to a depth of one foot

Categorical Withdrawals

43,817 Mgal/day

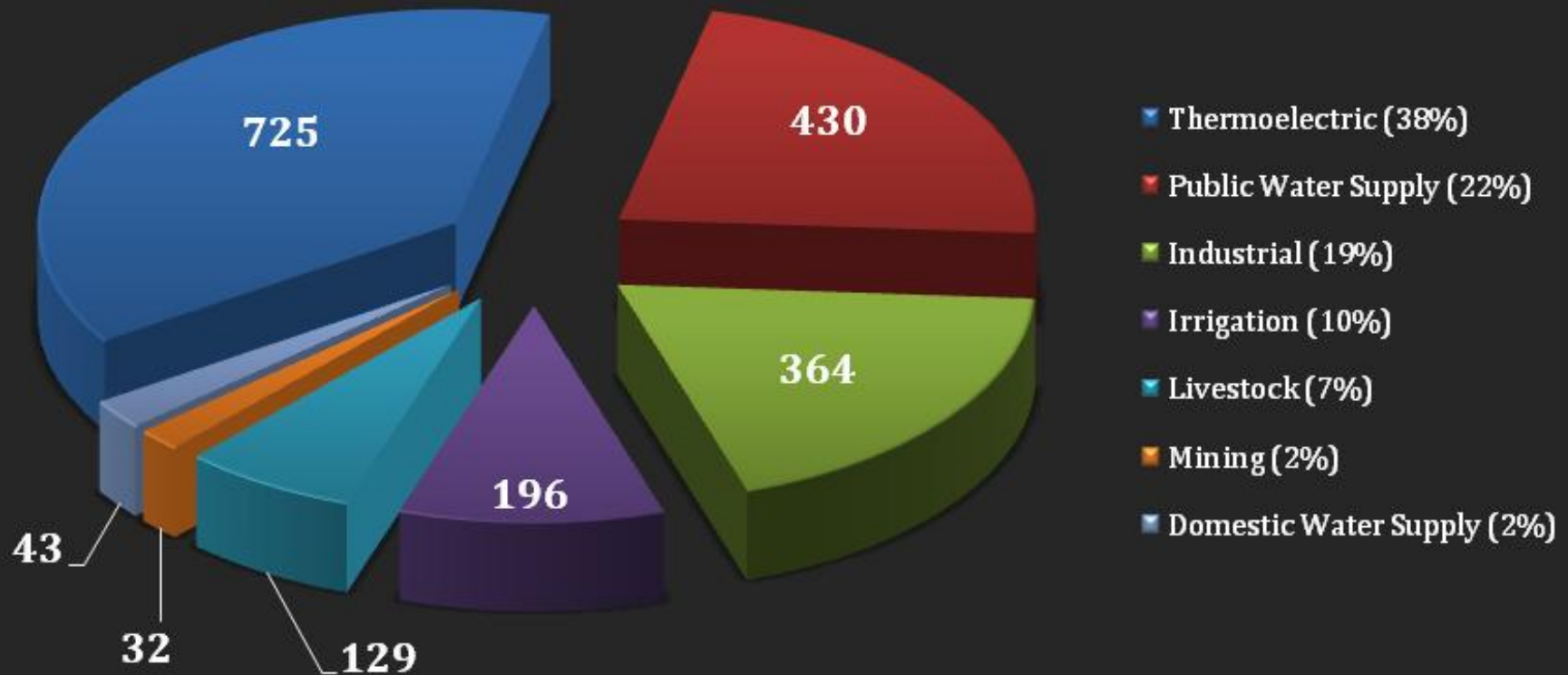
2005 Freshwater Use in Ohio River basin (Mgal/ day)



Consumptive-uses

1,919 Mgal/day

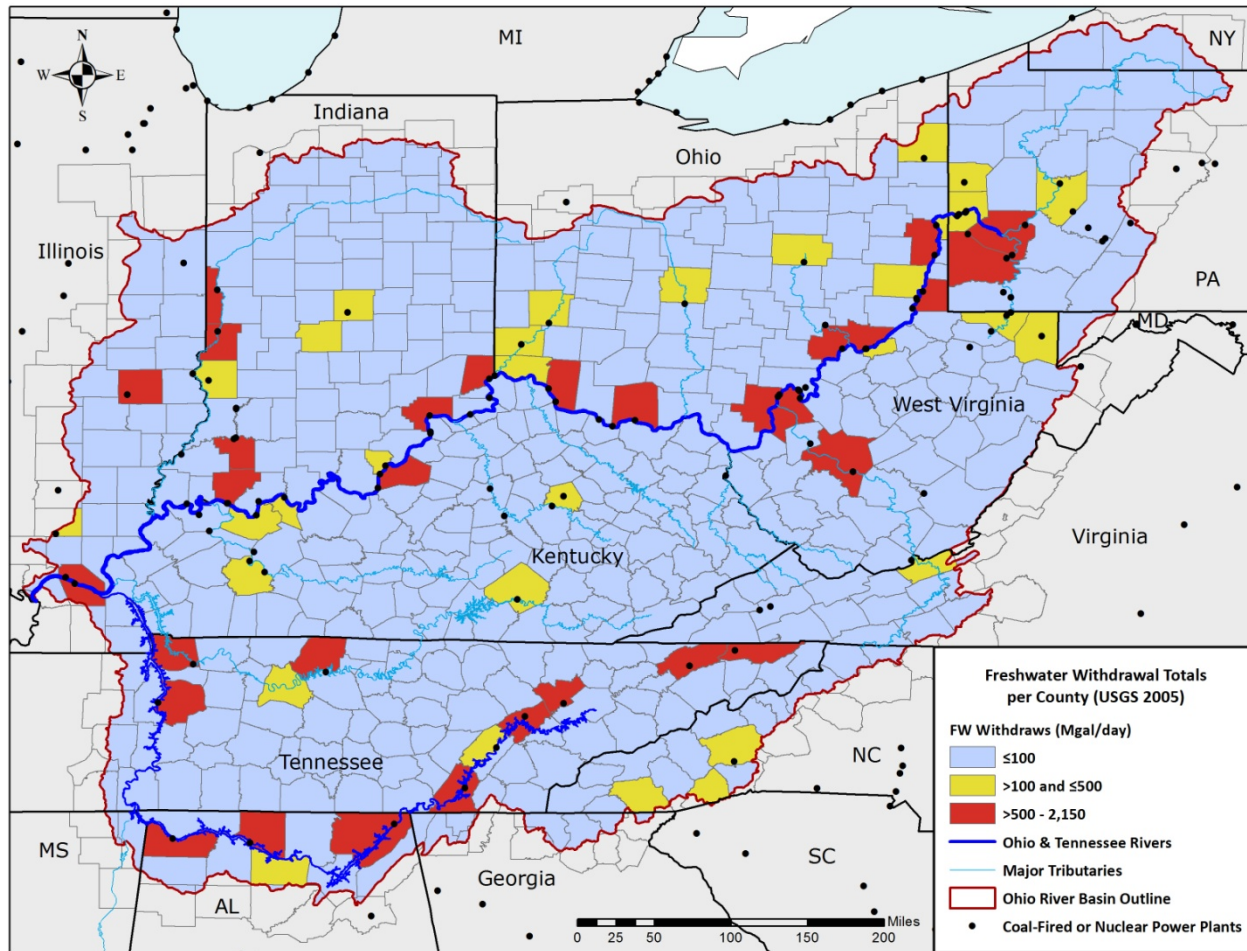
2005 FW Consumption in Ohio River basin (Mgal/day)



2005 Total Freshwater-use in the Ohio River basin

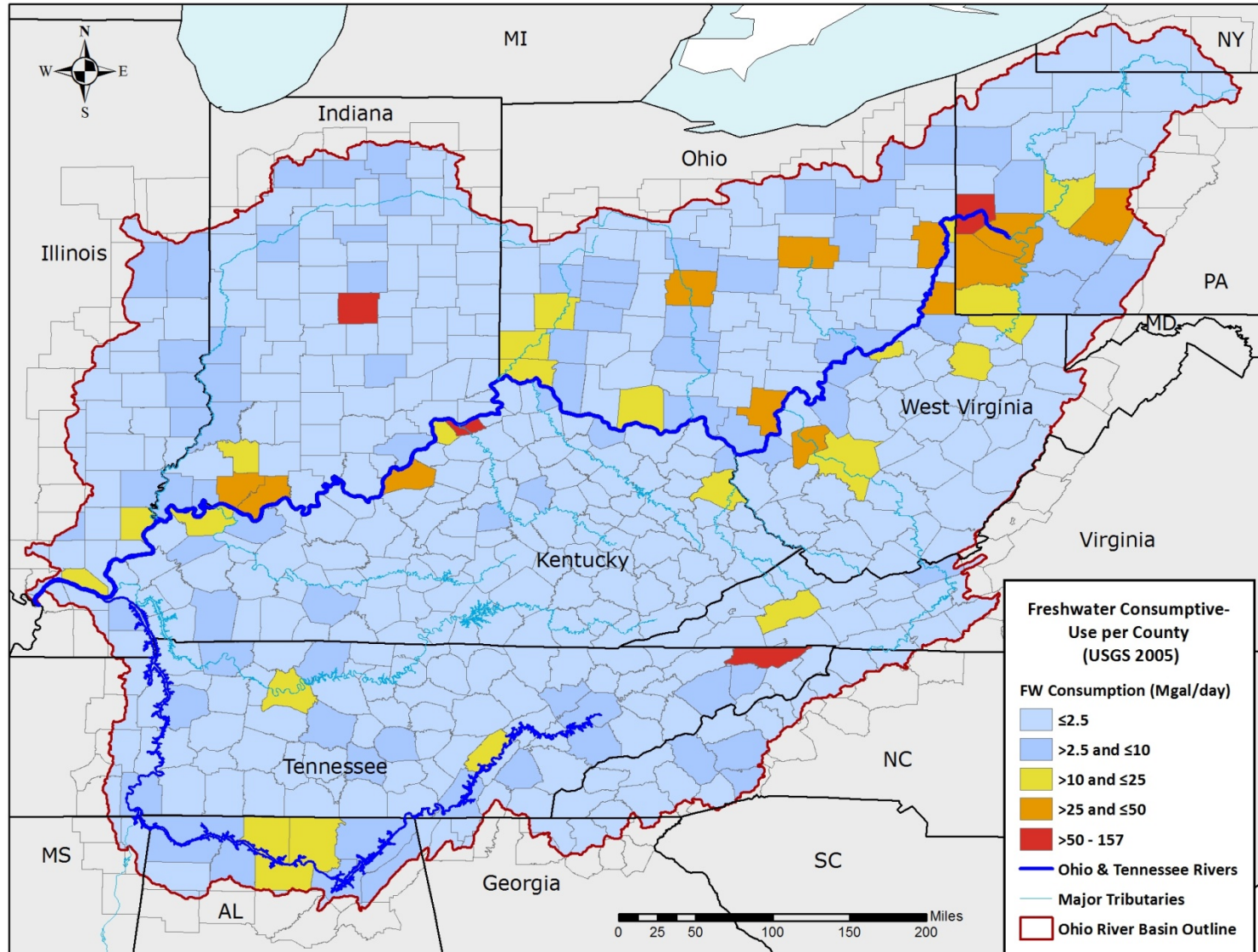
Trends in water withdrawals:

- 1) Juxtapose to a large water body
- 2) Thermoelectric facility
- 3) Contain a metropolitan area



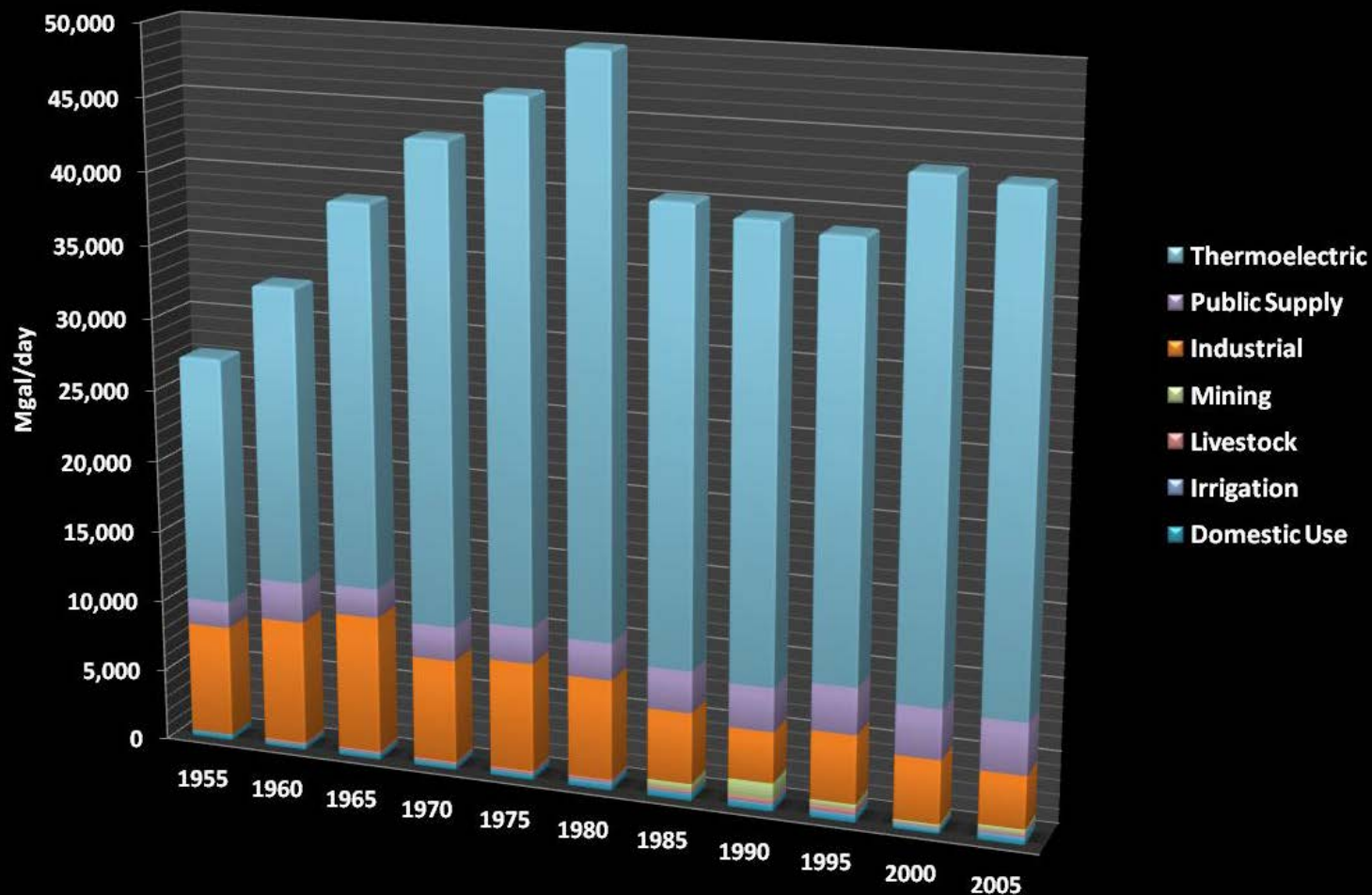
Consumption

(1,919 Mgal/day)



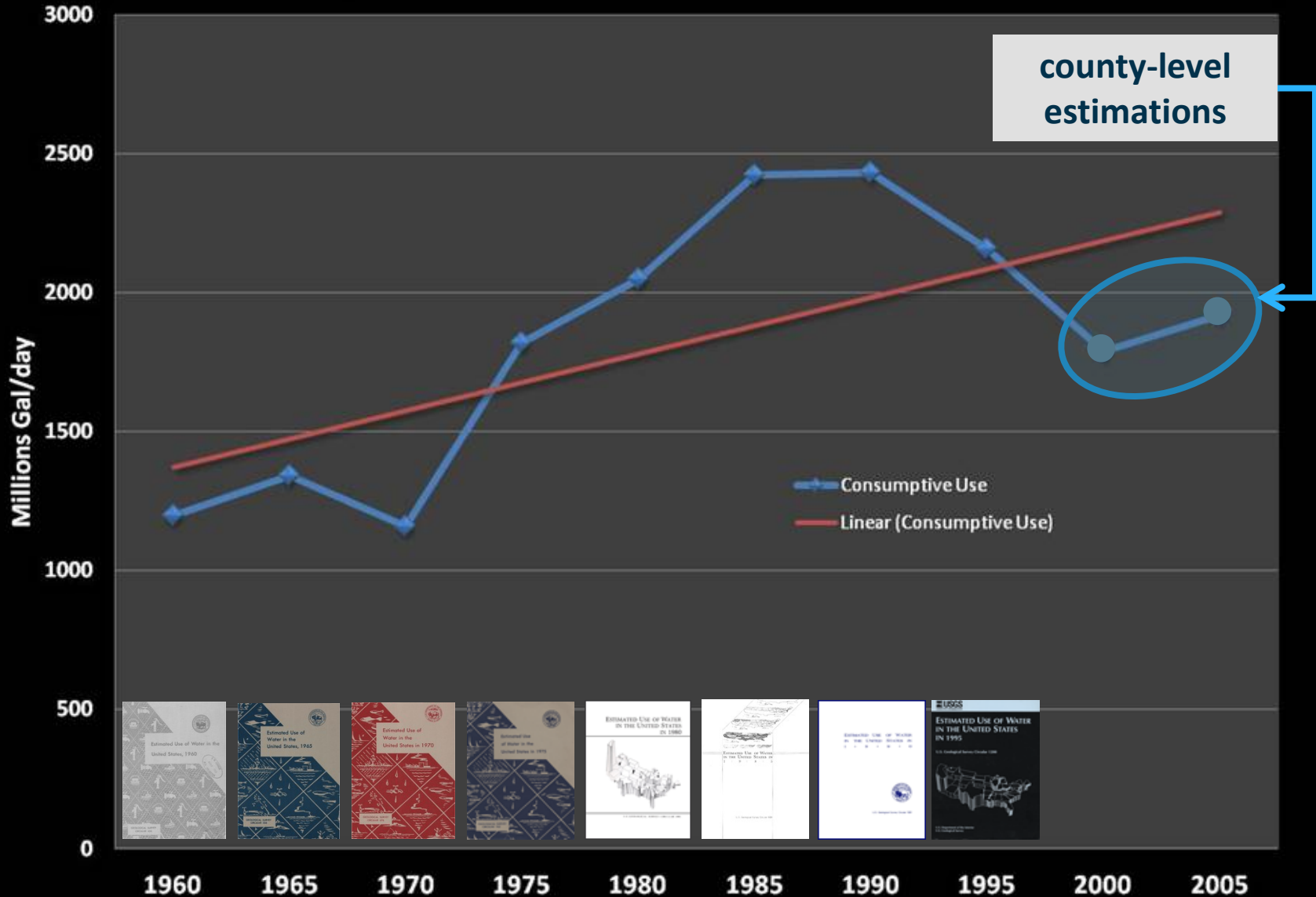
Quintennial water withdrawals in ORB (1955-2005)

Water Use by Category in the Ohio River Basin
(per quintennial USGS water-use estimations)



Quintennial Consumption

Consumptive Use Trends in the Ohio River Basin since 1960



Shale Gas in the Ohio River Basin



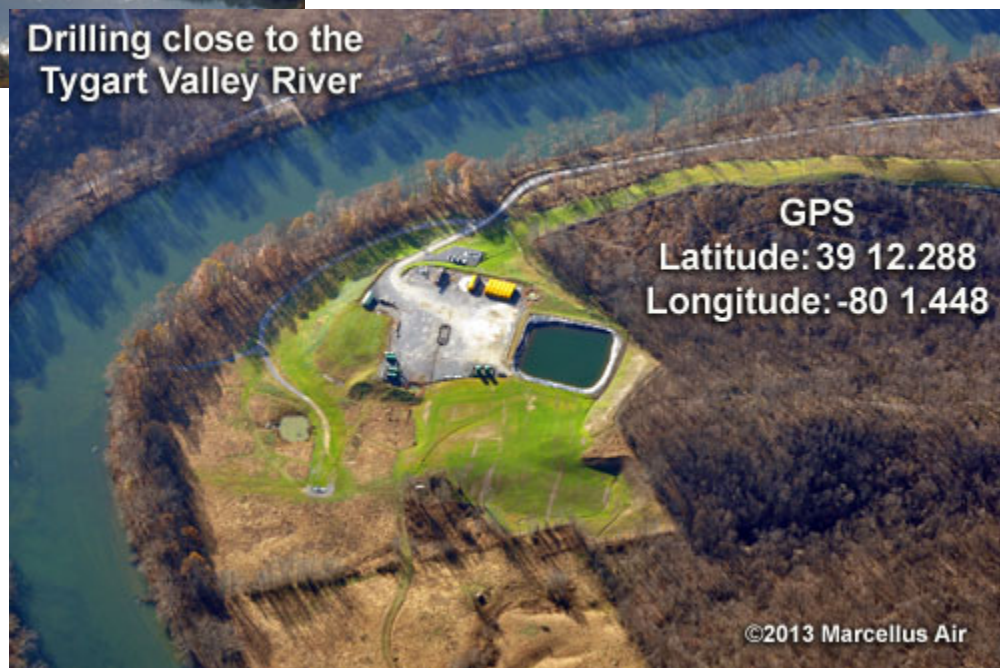
Surface water withdrawal site, Ohio River in background, March 2013





Shale drilling pad next to
Beaver River Reservoir

Drilling close to the
Tygart Valley River



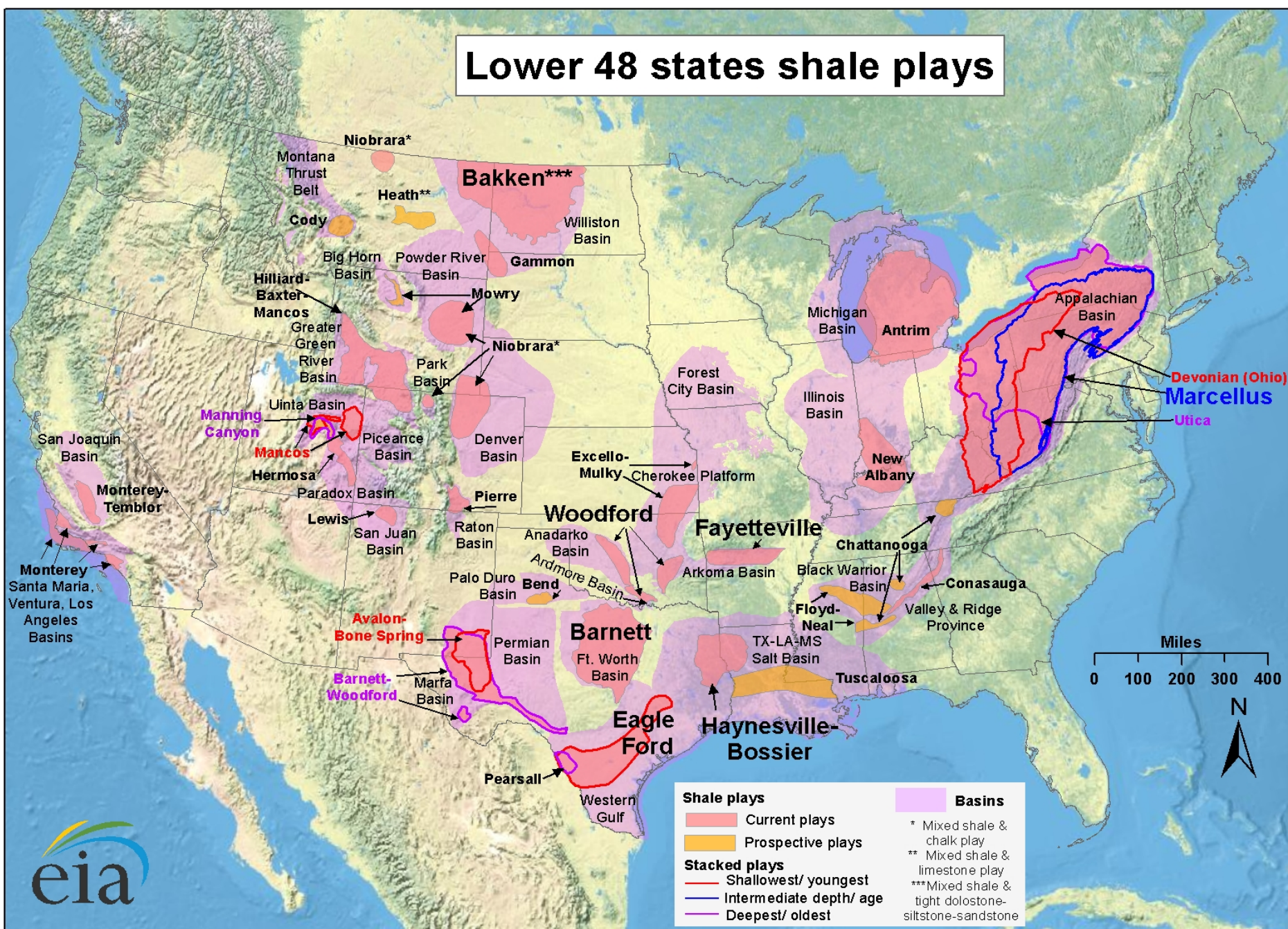
Background Info

- Marcellus Shale
 - on average 2,000 - 8,000 feet deep
 - Ranges from 40 - 800 feet thick
- Utica Shale
 - on average 4,000 – 10,000 feet deep
 - Ranges from 70 - 1,000 feet thick
- Horizontal wells can extend up to 6,000 feet laterally
- Water Usage
 - EPA - “up to 13 million gallons to fracture a well”
 - USGS – average well uses 4.5 million gallons
 - For comparison – Barnett Shale wells avg 2.8 million gal.
 - Waste water (10-70% returns to surface) must be injected, recycled, or treated for surface discharge

Background Info (continued)

- Injected fluid is composed of
 - Dozens to hundreds of chemicals can be added including hydrochloric acid, alcohol, ethylene glycol, sodium chloride and many more
 - <http://fracfocus.org/chemical-use/what-chemicals-are-used>
- Estimated Ultimate Recovery (EUR) [2012 estimates]
 - Average Marcellus shale well produces 1.56 Bcf of gas
 - Average Utica shale well produces 1.13 Bcf of gas
- 65% of a Marcellus Shale wells EUR is produced in the first 4 years
- Wells can be fracked multiple times, RRC estimates every 5 years
- RRC predicts wells lifespan will be 20-30 years
- Water is injected at a rate of ~30-40 gallons per minute

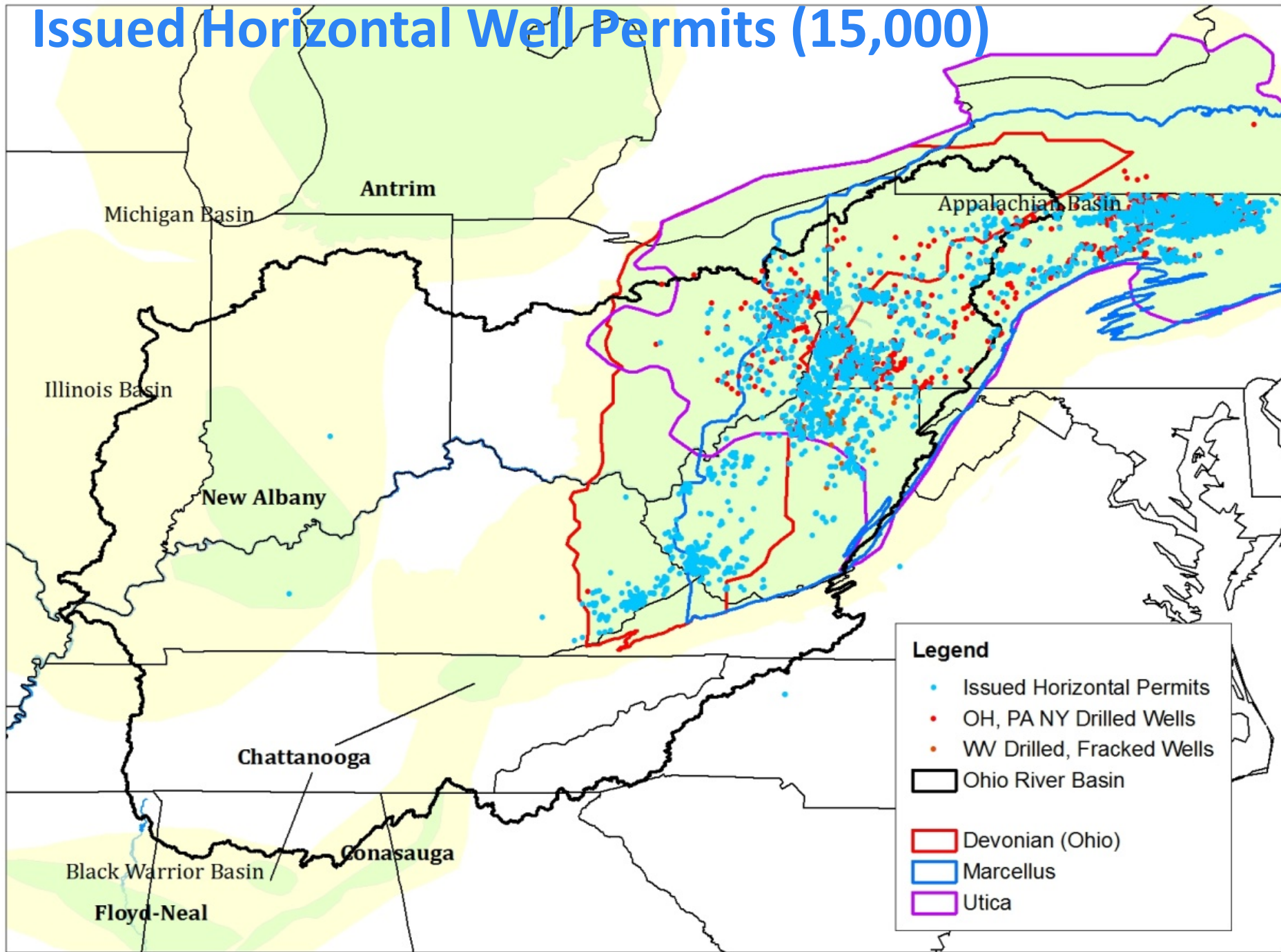
Lower 48 states shale plays



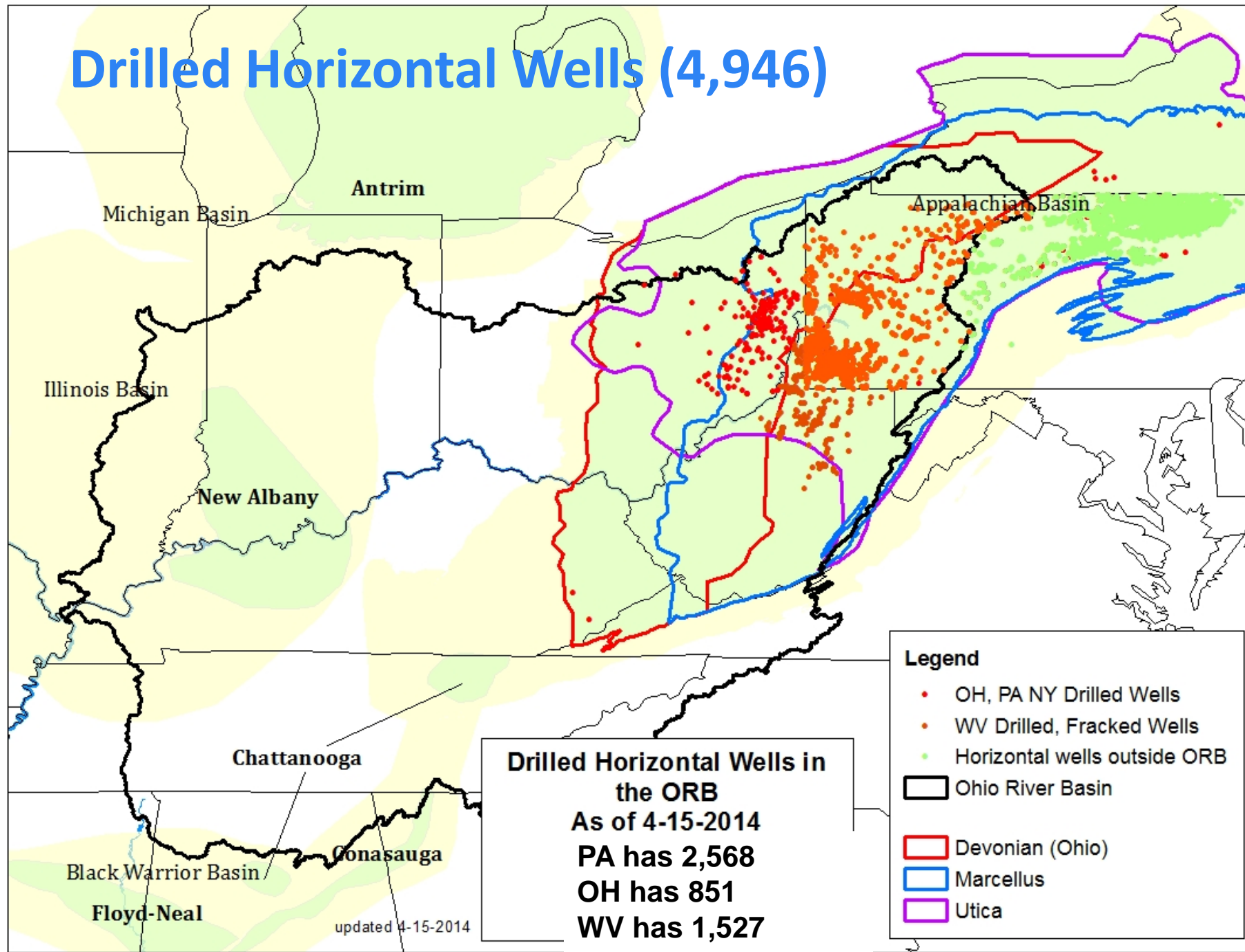
Shale Gas Plays



Issued Horizontal Well Permits (15,000)



Drilled Horizontal Wells (4,946)



Additional Horizontal Well Potential

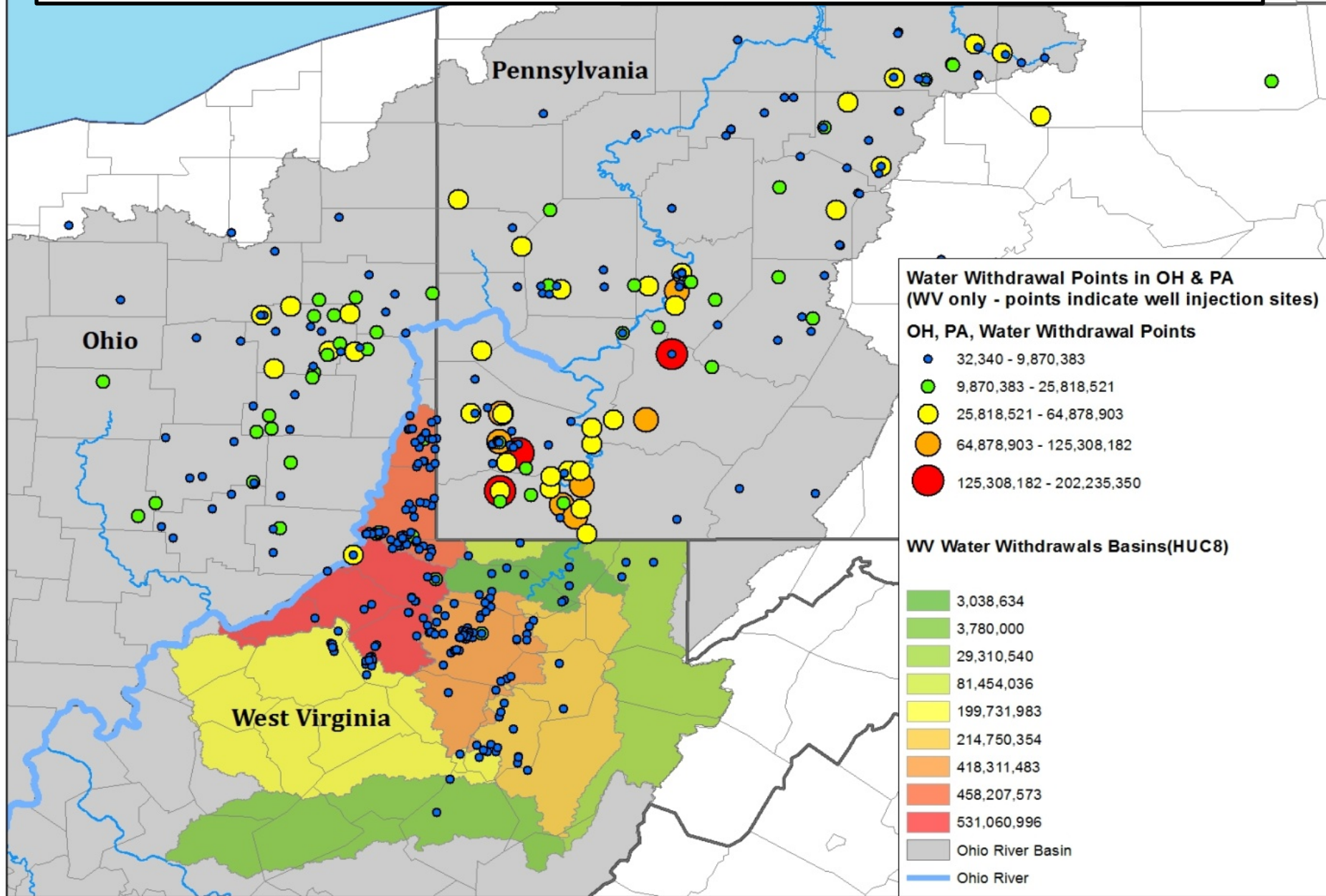
Shale Play	Area (sq. miles)	Avg. Well Spacing	% Area Potential	Number of Potential Wells	Additional Wells
Marcellus	104,067	5	18	90,216	~82,000
Utica	16,590	4	21	13,936	~13,000

Extraction of all recoverable gas would require:

Marcellus: 11x more wells

Utica: 15x more wells

Ohio River Basin Fracking Water Use (2007-2012)



Water Use for Hydraulic Fracturing

- Unreliable data until 2011
- Potentially a 3-year lag period
 - 2 years to drill
 - 1 year to report
- ORB Consumptive Use = 1.92 billion gallons/day
- Fracking adds a minimum of 1.73 billion gallons/year (incomplete data - 2012)

State	Total Gal/state	# of Drilled Wells	Gallons/well
Ohio	745,685,000	278	2,682,320
Pennsylvania	3,180,097,774	1,836	1,732,079
West Virginia	1,939,645,599	438	4,428,415

Conclusion

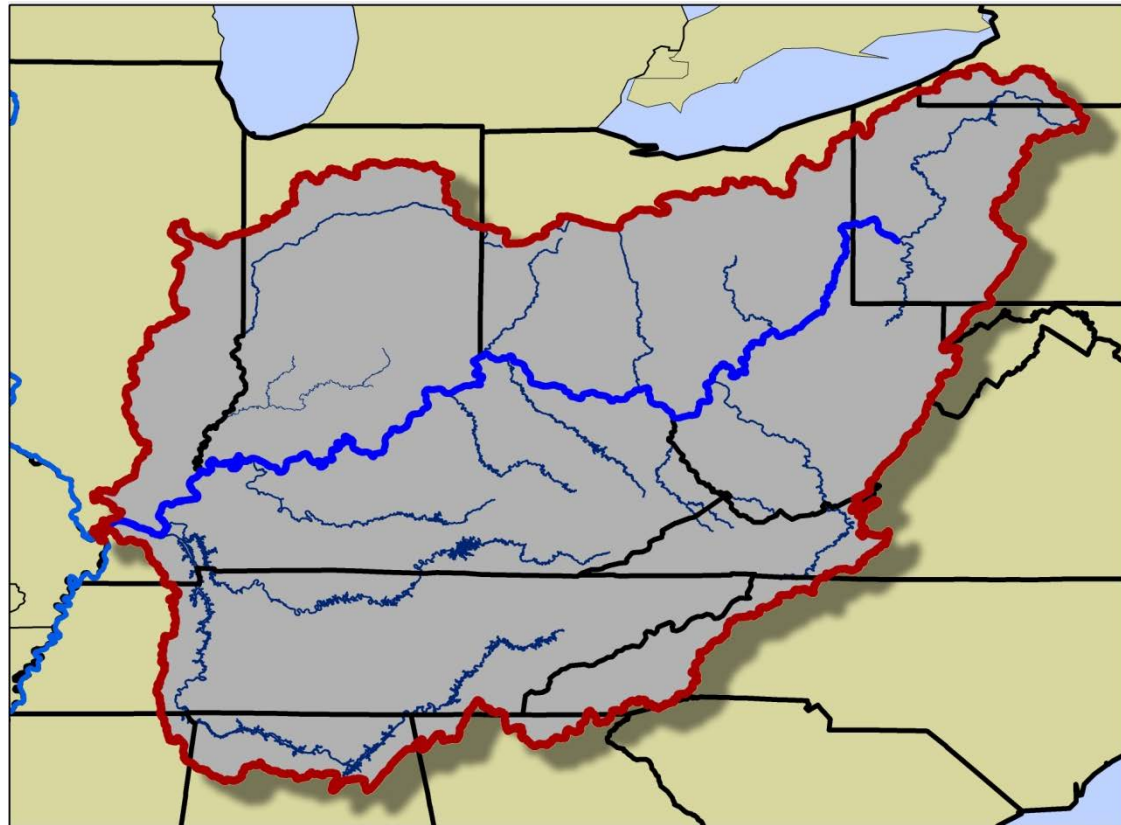
- Significant growth potential for shale gas extraction in the Ohio River Basin
- Potential exists for over 100,000 additional horizontal wells
- Ohio River is a preferred water source over headwater streams due to abundant supply
- Withdrawals for fracking account for <1% of total freshwater consumption in the basin



Inter-basin Transfers in the Ohio River Basin

Inter-basin Transfers

- *Surface waters that are transferred or diverted from a defined watershed basin to another*
- *2, 4, 6, 8-digit HUC*



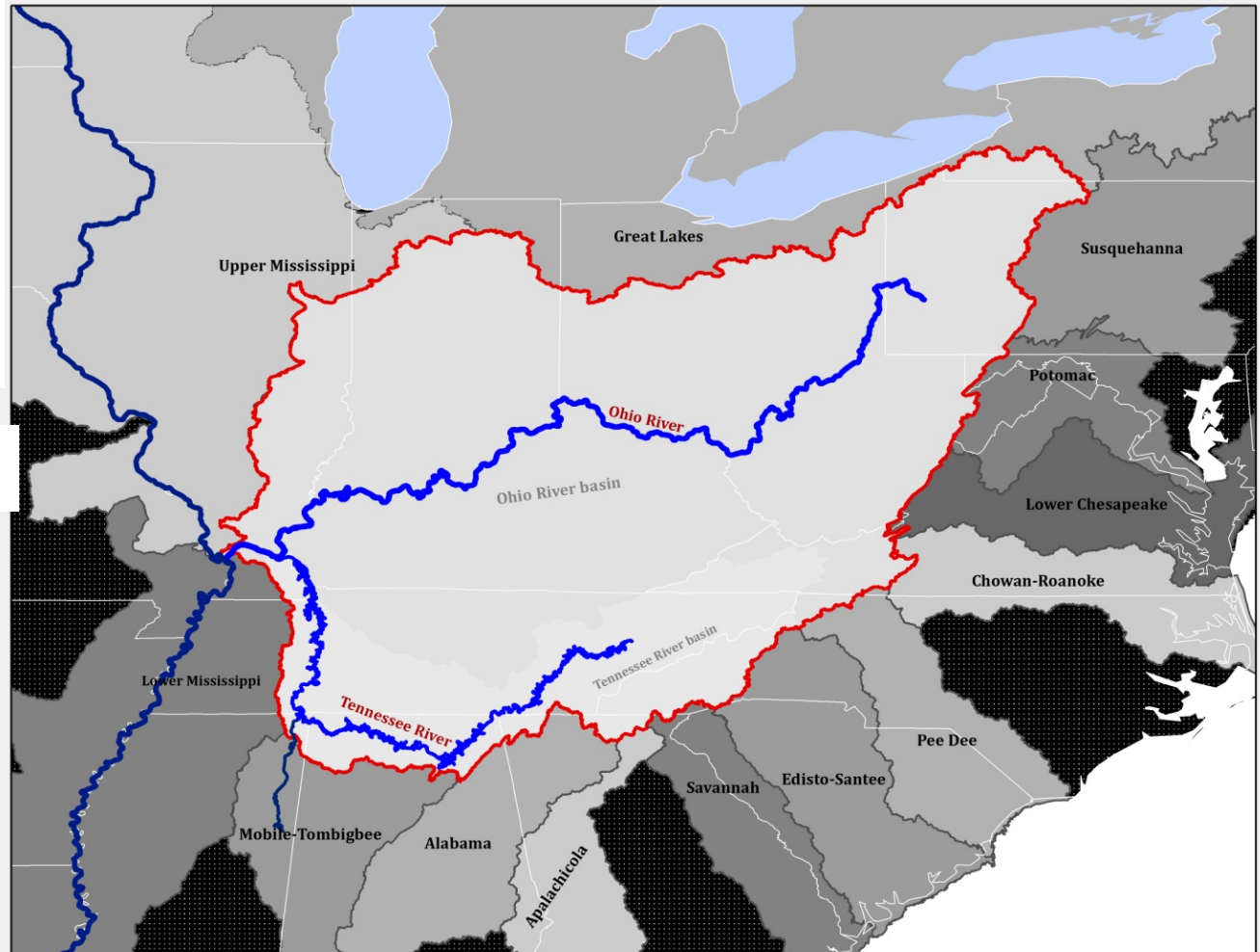
Inter-basin Transfers

3,782 peripheral miles of the ORB

13 major river basins

- Great Lakes
- SRBC
- ICPRB
- ACF-ACT
- Savannah (SRBP)
- UMRBA

- TVA

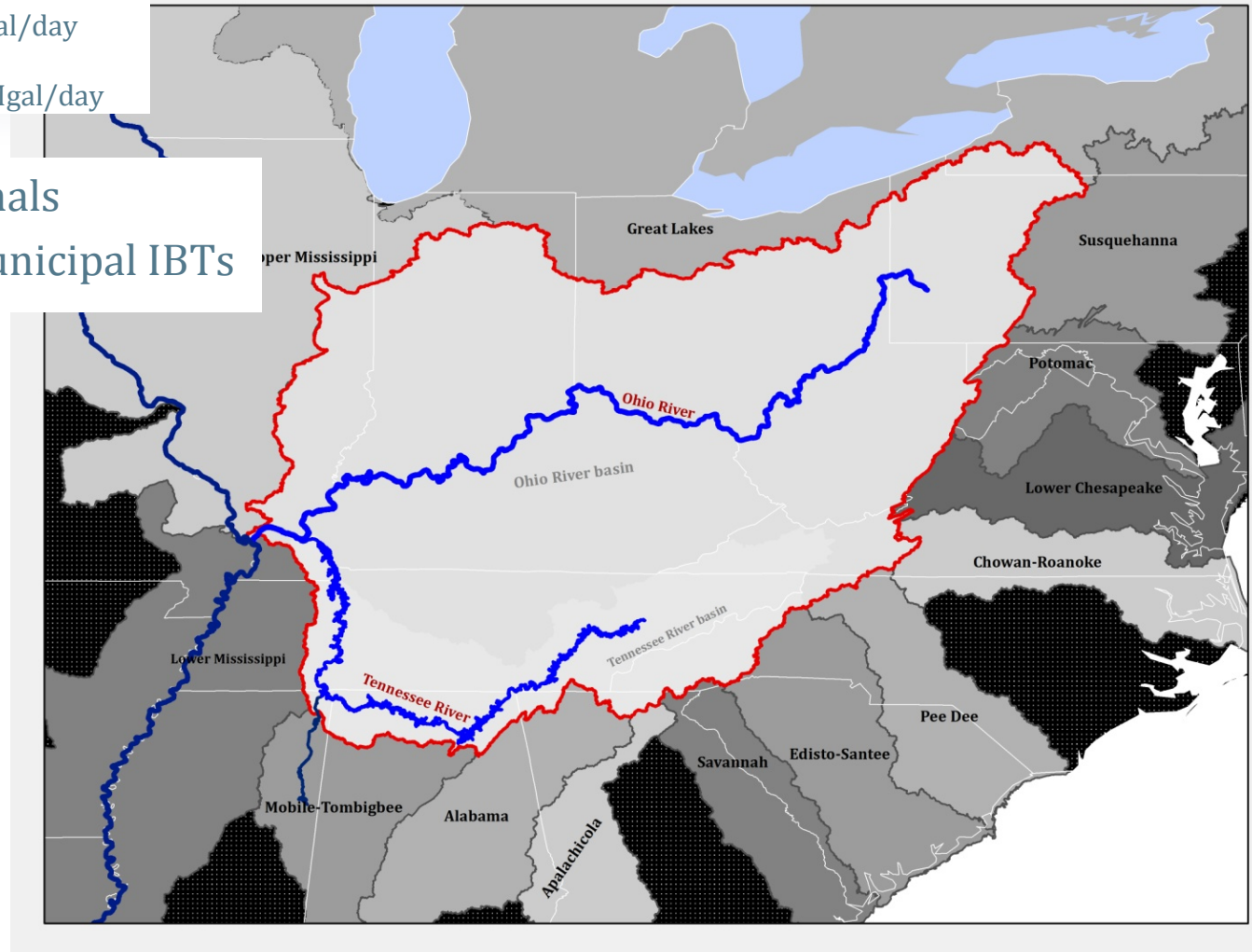


IBT Policies

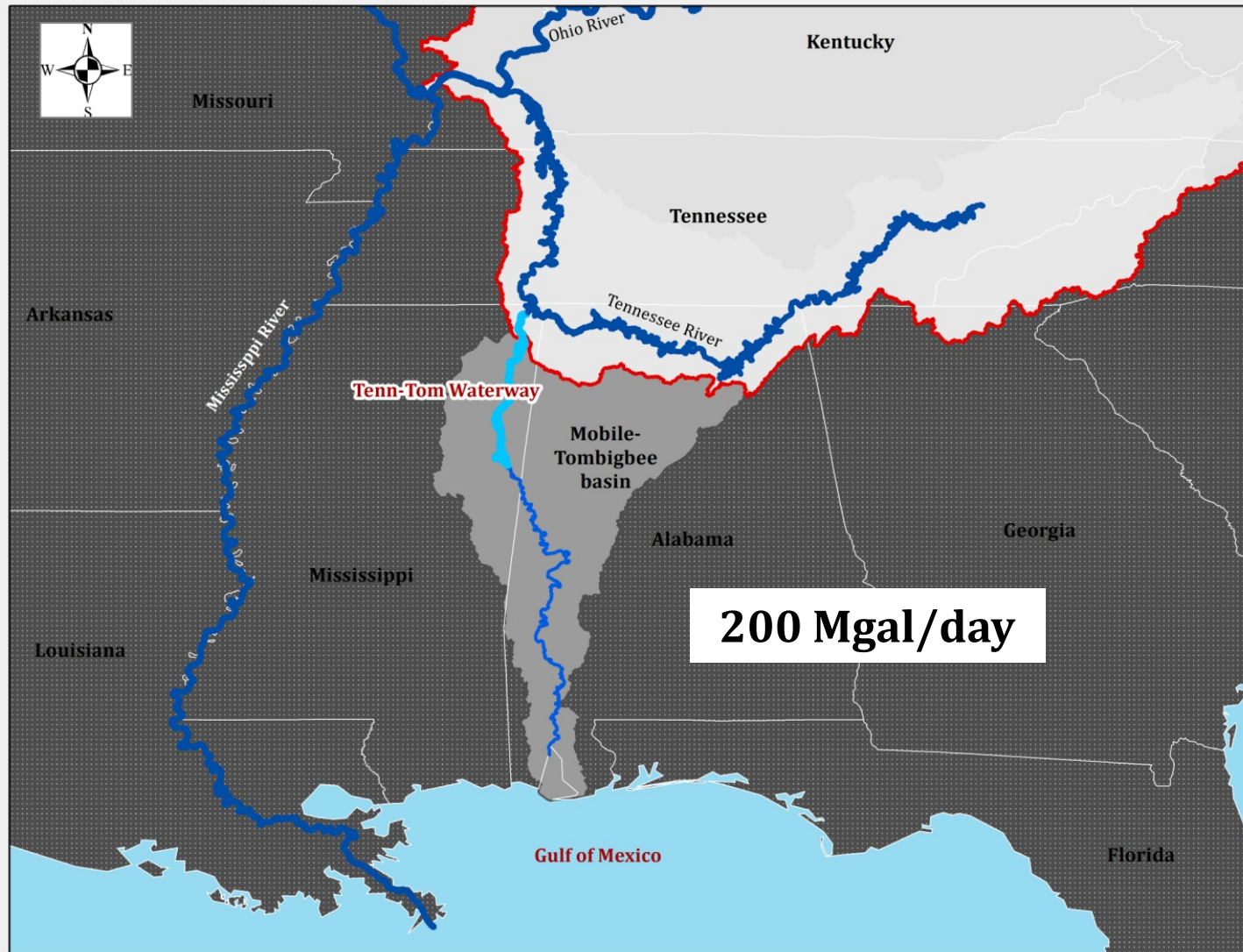
<i>Interstate Basin Commissions</i>	<i>IBT policy</i>
Ohio River Valley Water Sanitation Commission	None
Susquehanna River Basin Commission	Permit
Great Lakes—St. Lawrence River Basin Water Resources Council	Permit
Upper Mississippi River Basin Association	None
Interstate Commission on the Potomac River Basin	None
Apalachicola-Chattahoochee-Flint River Basin Commission	None
Alabama-Coosa-Tallapoosa	None
Tennessee Valley Authority	Permit
Savannah River Basin Partnership	None
Chesapeake Bay Commission	None
<i>ORB States</i>	<i>IBT policy</i>
Alabama	None
Georgia	None
Illinois	None
Indiana	None
Kentucky	None
Maryland	None
Mississippi	None
North Carolina	Permit
New York	Registration
Ohio	Permit
Pennsylvania	None
Tennessee	Permit for PWS only
Virginia	Permit
West Virginia	None

Inter-basin Transfers

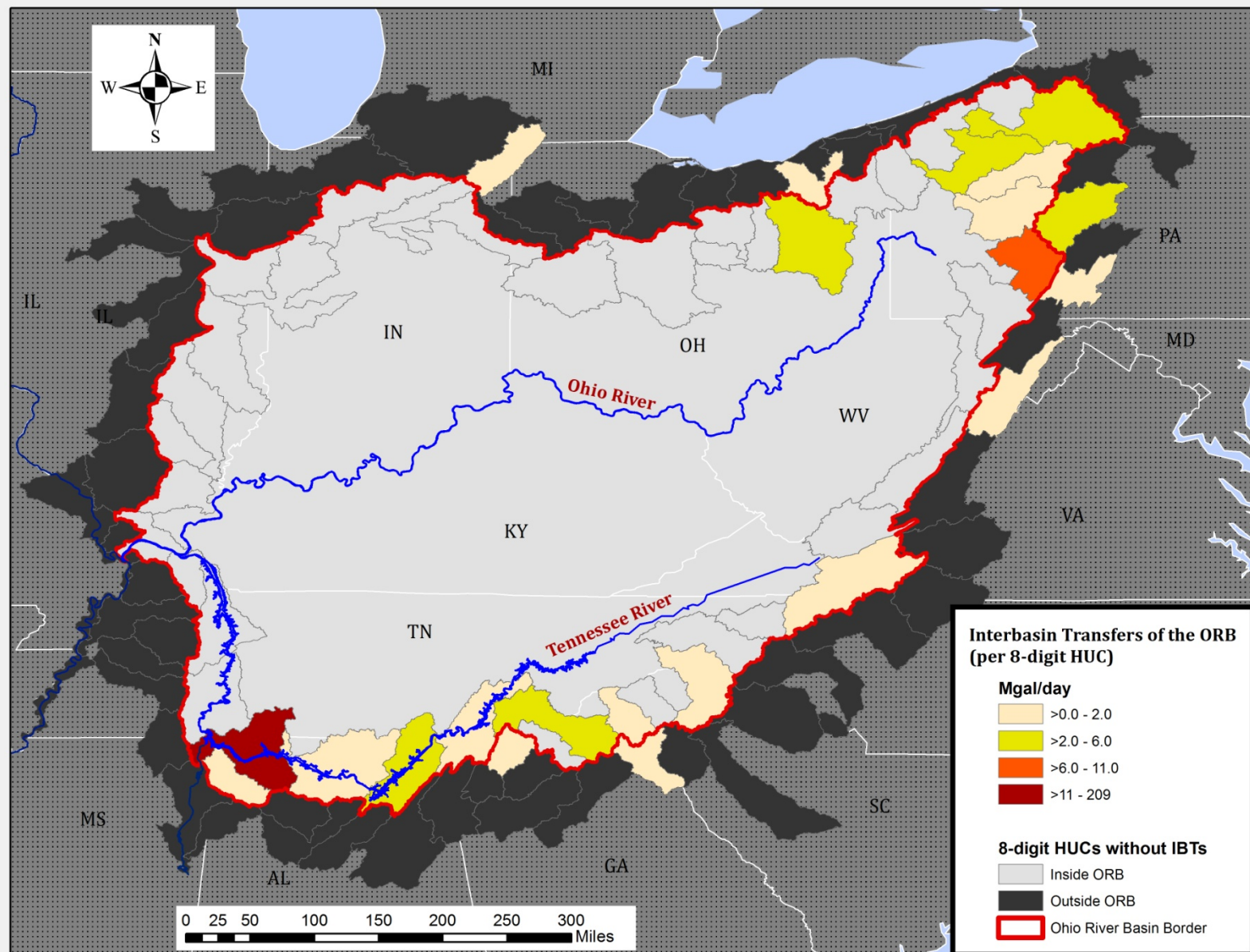
- 37 IBTs identified
 - 28 Exit **235** Mgal/day
 - 9 Enter **6.4** Mgal/day
- Net-loss of **229** Mgal/day
- 206 Mgal/day Exit via Canals
- 29 Mgal/day primarily municipal IBTs



Canalled Diversions

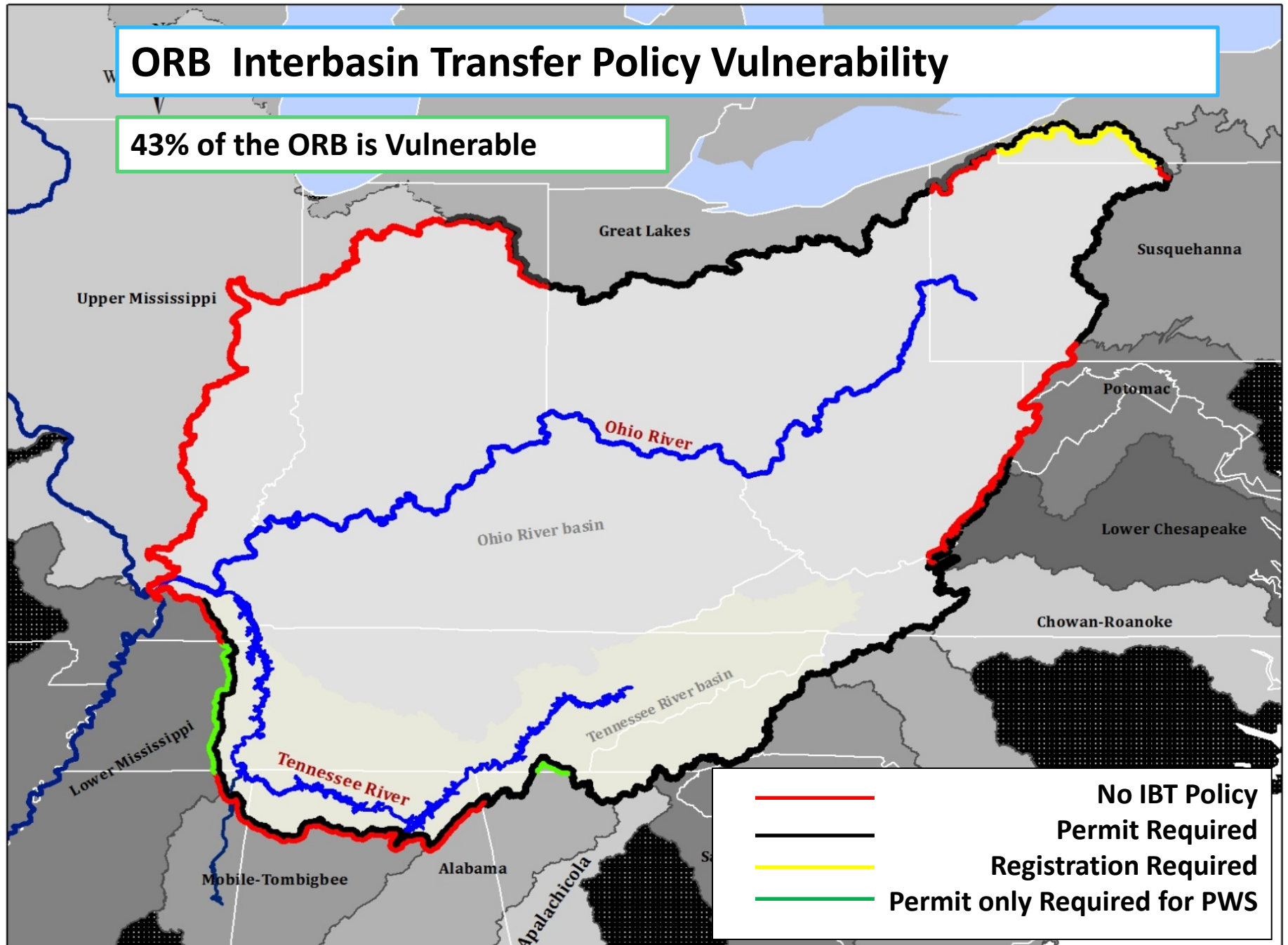


IBTs at HUC_8 Level (gross volumes)



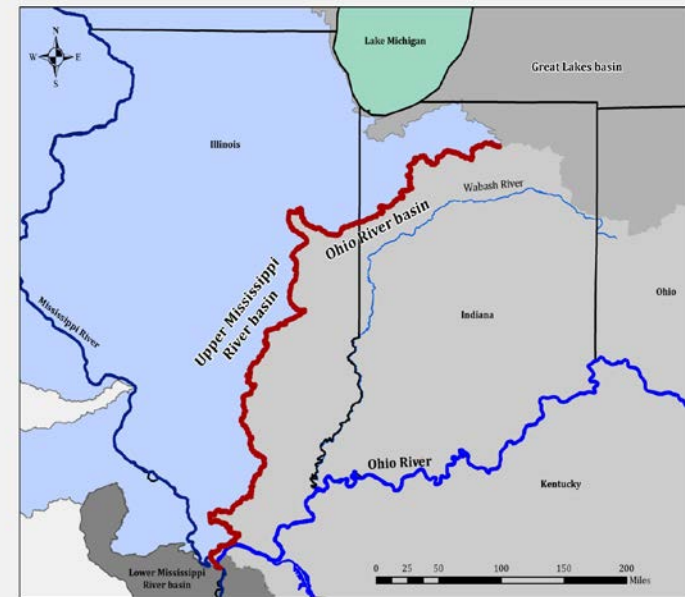
ORB Interbasin Transfer Policy Vulnerability

43% of the ORB is Vulnerable



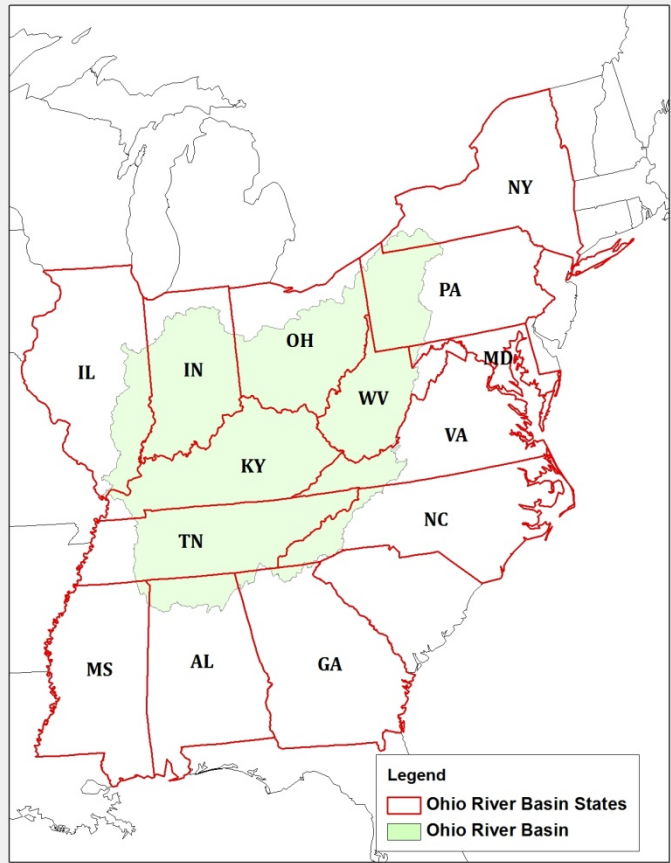
Summary

- ORB is a water-rich basin
 - 3X as many IBTs EXIT
 - 97% by volume
- 43% of the ORB is vulnerable
- ORB states act independently, no overarching IBT policy at the basin scale



Inventory of Water Resource Laws and Regulations

Ohio River Basin

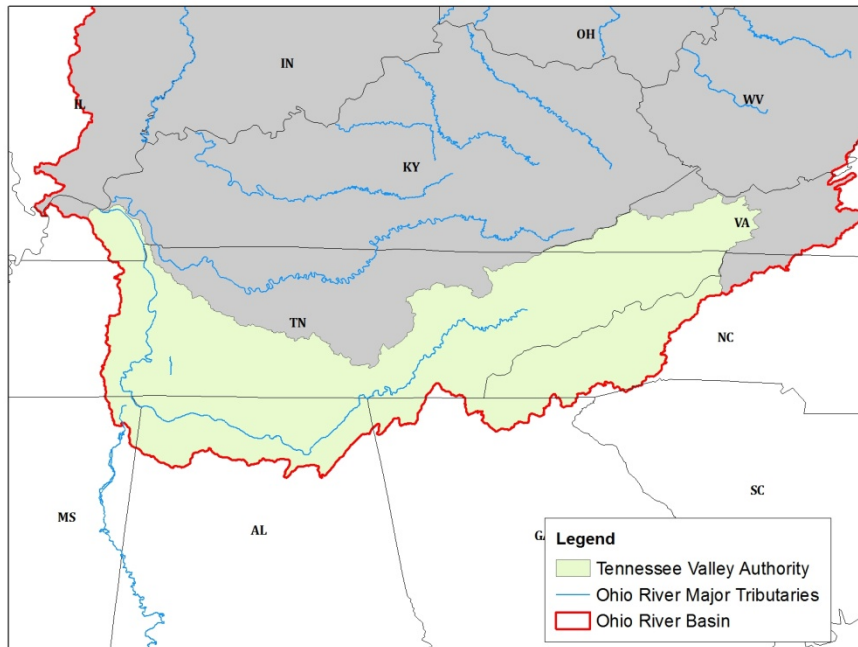


- 14 States
- Multiple Intrabasin Jurisdictions (TVA, USACOE, and more)
- Federal Regulations
- Multiple Neighboring Compacts/Commissions

SUMMARY OF STATES

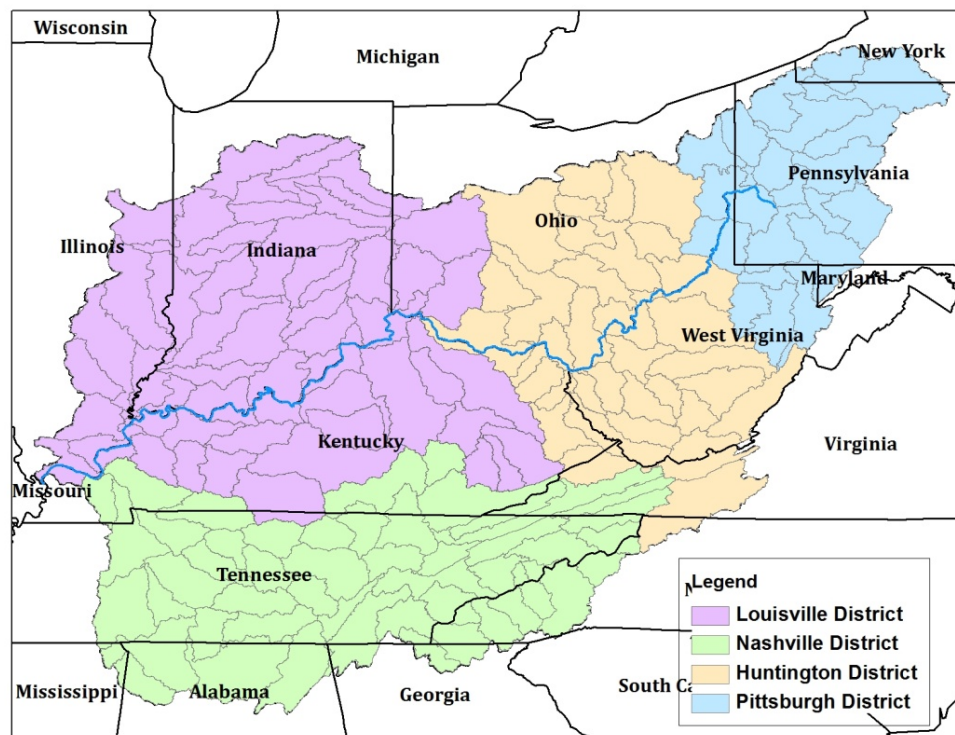
Summary of State Water Resource Laws			
	Register	Permit	Limit (gpd)*
Alabama	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100,000
Georgia	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100,000
Illinois	<input type="checkbox"/>	<input type="checkbox"/>	100,000
Indiana	<input checked="" type="checkbox"/>	<input type="checkbox"/>	100,000
Kentucky	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10,000
Maryland	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	No Limit
Mississippi	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	No Limit
New York	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100,000
North Carolina	<input checked="" type="checkbox"/>	<input type="checkbox"/>	100,000
Ohio	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100,000 & 2,000,000
Pennsylvania	<input checked="" type="checkbox"/>	<input type="checkbox"/>	10,000
Tennessee	<input checked="" type="checkbox"/>	<input type="checkbox"/>	10,000
Virginia	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10,000
West Virginia	<input checked="" type="checkbox"/>	<input type="checkbox"/>	25,000
<i>*Exceptions can exist</i>			

TENNESSEE VALLEY AUTHORITY



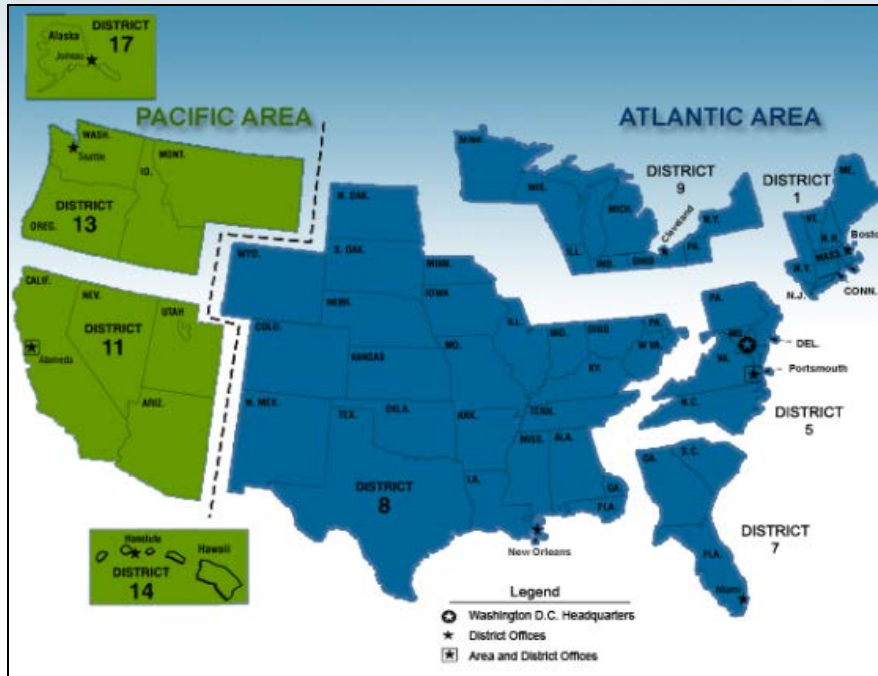
- A U.S. government owned corporation
- Permitting authority for the Tennessee Rivers and its tributaries
- **A permit must be obtained for any construction that may have an adverse impact**
- The permit contains the max withdrawal amount
- Temporary withdrawals do not require a permit, in general
- Interbasin transfers are subject to same rules except Tenn-Tom waterway (loss =200 million gpd)
- Any loss in hydropower must be repaid

U.S. ARMY CORPS OF ENGINEERS



- USACE is a permitting authority for navigable waterways of the U.S.
- 4 districts within the ORB
- **Permit required for any activity that may obstruct navigation**
 - Bridge, pipeline, intake

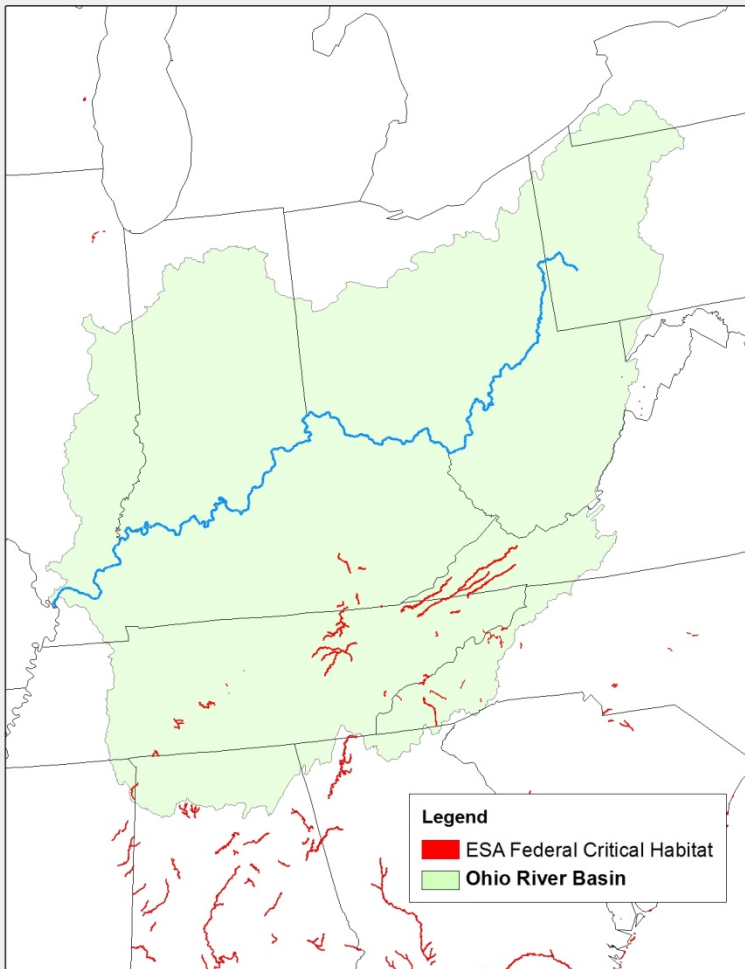
U.S. COAST GUARD



- 4 Districts in the Ohio River Basin (5, 7, 8, 9)
- **Permitting authority for structures that span above a navigable river only**

FEDERAL REGULATIONS ENDANGERED SPECIES ACT

- Endangered Species Act
- Approval Required from FWS and/or NOAA if in a Federal Critical Habitat
- Section 2; “It is declared to be the policy of Congress that **Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species.**”
- Section 7; “...not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary”
- 83 T or E species in the Ohio River alone



FEDERAL REGULATIONS SAFE DRINKING WATER ACT

- Required States to perform a source water assessment for each public water supply
 - Assessment deals primarily with pollutant discharges, not water withdrawals

FEDERAL REGULATIONS CLEAN WATER ACT

- Title I, Section 101; It is the policy of Congress that the authority of each State to allocate quantities of water within its jurisdiction shall not be superseded, abrogated or otherwise impaired by this Act. It is the further policy of Congress that nothing in this Act shall be construed to supersede or abrogate rights to quantities of water which have been established by any State. Federal agencies shall co-operate with State and local agencies to develop comprehensive solutions to prevent, reduce and eliminate pollution in concert with programs for managing water resources.

NEIGHBORING COMPACTS/COMMISSIONS

- Great Lakes – St. Lawrence River Compact
 - Registration required >100,000 gpd
 - No transfers of water out of the GL watershed, few exceptions, >5.7 gallons, straddling communities
 - Starting Dec. 8th 2013, permit if consumptive use >5,000,000 gpd in 90 days
- Susquehanna River Basin Commission
 - Permit if >100,000 gpd
 - Consumptive Use- permit if >20,000 gpd
 - Transfers-permit needed if going in (any amount) or out (>20,000 gpd)
 - Charges a fee for water use
- Delaware River Basin Commission
 - Permit if >100,000 gpd, charges a fee for water
- Upper Mississippi River Basin Association
 - If withdrawal is >5,000,000 gpd in 30 days must “...offer to consult with other signatory states”
- Mississippi River Commission
 - ...improve the condition of the Mississippi River, foster navigation, promote commerce, and prevent destructive floods

Summary of Non-State Water Resource Laws			
	Register	Permit	Limit (gpd)*
TVA	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Construction Activity
USACE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Construction or Navigation Activity
Coast Guard	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Above River only
Great Lakes Compact	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100,000 & 5,000,000
SRBC	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10,000
DRBC	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	100,000 & 1,000,000
UMBRA	<input type="checkbox"/>	<input checked="" type="checkbox"/>	5,000,000
ACT/ACF	<input type="checkbox"/>	<input type="checkbox"/>	
ICPRB	<input type="checkbox"/>	<input type="checkbox"/>	
<i>*Exceptions can exist</i>			

Next Steps

- All 4 draft reports open for review
- Receive comments from Technical Committee by March 31, 2015
- Final review by Water Resources Committee
 - May 2015
- Present for Commission approval at June meeting

QUESTIONS?

Sam Dinkins

sdinkins@orsanco.org

513/231-7719 Ext 108