

Inventory of Water Resource Laws and Regulations in the Ohio River Basin



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ACRONYMS and ABBREVIATION

ACF	Apalachicola-Chattahoochee-Flint
ACT	Alabama-Coosa-Tallapoosa
ADAPT	Alabama Drought Assessment and Planning Team
ADECA	Alabama Department of Economic and Community Affairs
ARAP	Aquatic Resource Alteration Permit
CCPCUA	Central Coastal Plain Capacity Use Area
DENR	Department of Environment and Natural Resources
DMTF	Drought Monitoring Task Force
DNR	Department of Natural Resources
DRBC	Delaware River Basin Commission
DRTF	Drought Response Task Force
EIA	Energy Information Administration
EPD	Environmental Protection Division
gpd	Gallons per Day
HUC	Hydrologic Unit Code
ICPRBC	Interstate Commission on the Potomac River Basin
IDNR	Indiana or Illinois Department of Natural Resources
KDMT	Kentucky Drought Mitigation Team
MSOGB	Mississippi State Oil and Gas Board
NYDEC	New York Department of Environmental Conservation
ODNR	Ohio Division of Natural Resources
OEMA	Ohio Emergency Management Agency
ORB	Ohio River Basin
ORSANCO	Ohio River Valley Water Sanitation Commission
OWR	Office of Water Resources
PEMA	Pennsylvania Emergency Management Agency
SGEIS	Supplemental Generic Environmental Impact Statement
SRBC	Susquehanna River Basin Commission
TDEC	Tennessee Department of Environment and Conservation
TEMA	Tennessee Emergency Management Agency
Tenn-Tom	Tennessee-Tombigbee Waterway
TVA	Tennessee Valley Authority
UMRBA	Upper Mississippi River Basin Association
USACE	United State Army Corps of Engineers
USCG	United States Coast Guard
USGS	United States Geological Survey
WOUS	Waters of the United States
WSTF	Water Shortage Task Force
WVDHSEM	West Virginia Division of Homeland Security and Emergency Management

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Introduction

The Ohio River basin (ORB) (Figure 2) drains 201,967 mi², is 981 miles long, stretches from Pittsburgh, PA to Cairo, IL, where it enters the Mississippi River and is by volume the largest tributary of the Mississippi River. The Ohio River basin is made up of 14 states and many more political, physical and jurisdictional boundaries, each with their own differing water-use rules. The Ohio River watershed (basin and watershed used interchangeably) meets the demands of all water needs and as a result, the water within the basin has many designated uses. These uses include drinking water, thermoelectric power supply, industrial, commercial, recreation, navigation, and many more. Because the uses are so diverse and sometimes in high demand each state or jurisdiction has its own set of regulations to govern water use. The U.S. Army Corps of Engineers, for example, oversees many dams and reservoirs in the basin and controls/regulates flow along with other entities like the TVA in conjunction with the state, and local governments, and sometimes watershed groups. Droughts periodically occur in the Ohio River basin as well. In question is how each state or governing entity operates during a drought. Some states have specific water-use restrictions during a water shortage and some have specific water withdrawal rules for oil and gas drillings while others do not. The Ohio River itself, and many of the major tributaries (>1000 mi²) are considered navigable waterways with their own set of federal regulations. Many of the rivers in the Ohio River basin serve as the actual physical boundary of states forcing these interstate rivers to comply with more than one set of regulations. Individual states are responsible for governing water-use, since the federal government does not regulate water withdrawals. The lack of a central authoritative agency compounded by an expected change in water-use due to changes in weather patterns in and out of the basin, industry, drinking water, population growth and other uses; an inventory of the laws and regulations, drought responses, interbasin transfers, and oil & gas water-use rules of each of the 14 states and other governing bodies in the Ohio River basin would serve as a beneficial use for national, regional, and local stakeholders and others. Appendix A serves as a summary of all water use regulations of the states in the Ohio River basin.

Ohio River Basin Fun Fact

On January 21, 1980, the Supreme Court of the United States ruled that the state boundary is the low-water mark on the northerly side of the Ohio River as it existed in 1792 (OHIO v. KENTUCKY, 444 U.S. 335 [1980])

Overview – Water Resource Law Categories

Throughout this document, several water-use categories are used to define each state governing body's water resource laws and regulations. Five categories were chosen to summarize each state's water-use areas including: water management, water withdrawal, interbasin transfer, drought response, and oil & gas water-use.

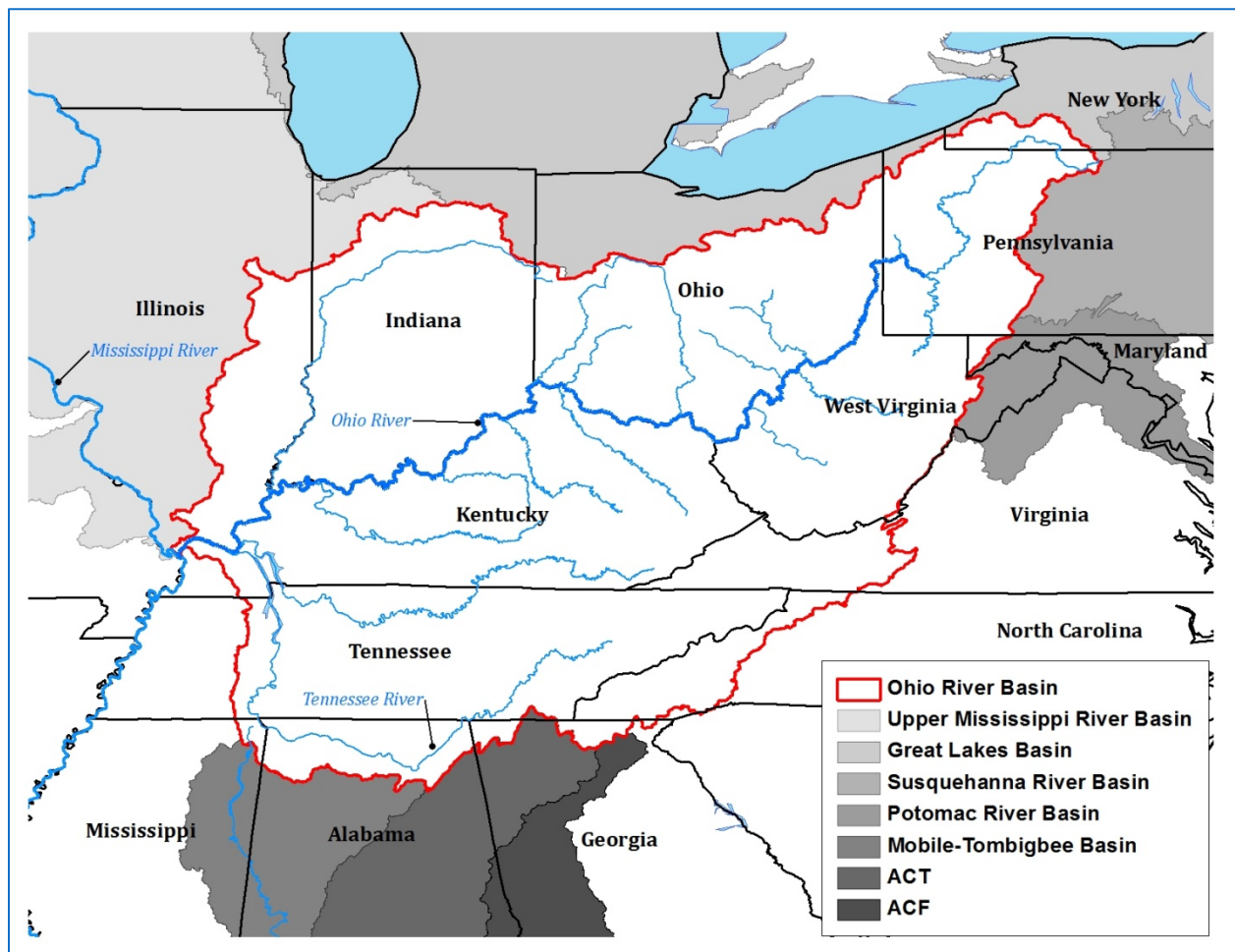


Figure 1: Ohio River basin and the surrounding interstate-basins in existence with Compacts

Water management – This section describes the department(s) responsible for water-use management and the name of any law or act that gives it the duty of water management. Occasionally the state lets other departments handle certain water-use restrictions, for example the Division of Oil and Gas will handle any permits to drill a well and within that permit are water use/withdrawal restrictions. These restrictions will be discussed in the oil and gas water-use category.

Water Withdrawal - This section will describe the governing bodies' water withdrawal regulations. It describes the primary rules for water withdrawal, exemptions and caveats. Some of the details are omitted for simplicity. Portions of the language in this section are taken directly from the statute. It is important to note the relevance of any descriptive adjectives, for example, the language explicitly stating the "capacity to withdraw" means if the intended water use has the capacity to withdraw a certain volume of water must register. If the word "capacity" is excluded



then registration would only be necessary if the actual amount withdrawn was greater than the registration threshold.

Interbasin Transfer – Interbasin transfer refers to water being transferred (diverted used by some states) to any other basin. Each state defines a basin differently and is typically based on USGS’s hydrologic unit codes (HUC’s). For the most part, governing bodies recognize a basin at the 8-digit HUC level.

Drought Response – Every governing body defines and responds to a drought differently. One commonality is the aggregation of environmental data and subsequent incorporation of these data into an index. Information utilized in the declaration of a drought include: precipitation deficit, streamflow, reservoir level, Palmer Drought Severity Index, crop moisture index, U.S. Drought Monitor, etc. The drought severity classification system used by the U.S. Drought Monitor web page (National Drought Mitigation Center, 2013) is one example utilized by many states that defines a drought from multiple indices. During a drought emergency, every State’s governor may declare an emergency for the state, county, or other designated region. Furthermore, to protect human health, the governor may be authorized to restrict water-uses for industry, public, commercial, etc. based on needs and conditions that may not be described in the state’s laws.

Ranges							
Category	Description	Possible Impacts	Palmer Drought Index	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Short and Long-term Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought; short-term dryness slowing planting, growth of crops or pastures. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7	21-30
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low; some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2	11-20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5	6-10
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9	3-5
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0-2	0-2	-2.0 or less	0-2

Short-term drought indicator blends focus on 1-3 month precipitation. Long-term blends focus on 6-60 months. Additional indices used, mainly during the growing season, include the USDA/NASS Topsoil Moisture, Keetch-Byram Drought Index (KBDI), and NOAA/NESDIS satellite Vegetation Health Indices. Indices used primarily during the snow season and in the West include snow water content, river basin precipitation, and the Surface Water Supply Index (SWSI). Other indicators include groundwater levels, reservoir storage, and pasture/range conditions.

Figure 2: U.S. Drought Monitor - Drought Severity Index derived from (National Drought Mitigation Center, 2013)

Oil & Gas Water Use – In recent years, the water demands of water for the oil and gas industry has grown in regionalized areas throughout North America and has extended into the Ohio River basin. “Advances in technology and new applications of existing techniques, as well as supportive domestic energy policy and economic developments, have recently spurred an increase in oil and gas production across a wide range of geographic regions and geologic formations in the United States” (U.S. E.P.A., 2012). This growth is the result of a fairly new type of drilling called horizontal drilling (aka directional drilling, marcellus drilling, fracking, hydraulic fracturing, shale gas production, hydrofacking, high-volume fracking). With the aid of this advance in technology, horizontal drilling is occurring in the northeastern U.S. (including Pennsylvania, Ohio, New York, West Virginia, and more). The drilling process (Figure 3) can require up to 13 million gallons of water per well for shale gas production to fracture the shale and release the product (U.S. E.P.A., 2012). Once the shale has been fractured, the initial waste water that flows back due to pressure in

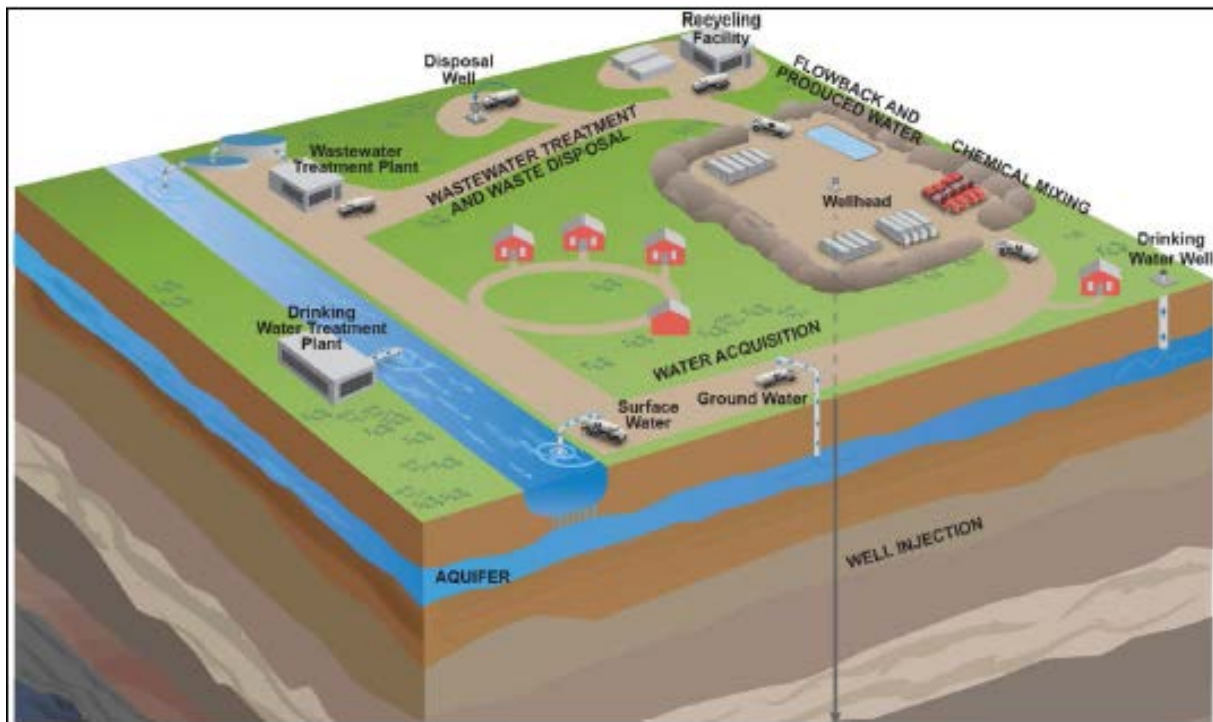


Figure 3: Illustration of the five stages of the hydraulic fracturing water cycle. The cycle includes the acquisition of water needed for the hydraulic fracturing fluid, onsite mixing of chemicals with the water to create the hydraulic fracturing fluid, injection of the fluid under high pressures to fracture the oil-or gas-containing formation, recovery of flowback and produced water (hydraulic fracturing wastewater) after the injection is complete, and treatment and/or disposal of the wastewater (U.S. E.P.A., 2012).

the well is called flowback water. The waste water that is expelled and returned to the surface once the production of the well starts is called produced water. The source of the injected water needed comes from a variety of places like ground water, surface water, municipal supply, treated

wastewater, and can also include the recycling of produced and flow back waters. This water-use is sometimes regulated under the oil and gas division of each state through the permitting process of a well and not by the division of water. Thus, this water-use was given a separate category. The known shale gas basins and plays that exist within the Ohio River basin cover a large portion of the basin (Figure 4) thereby rendering these areas subject to water withdrawal regulations associated with oil and gas policies.

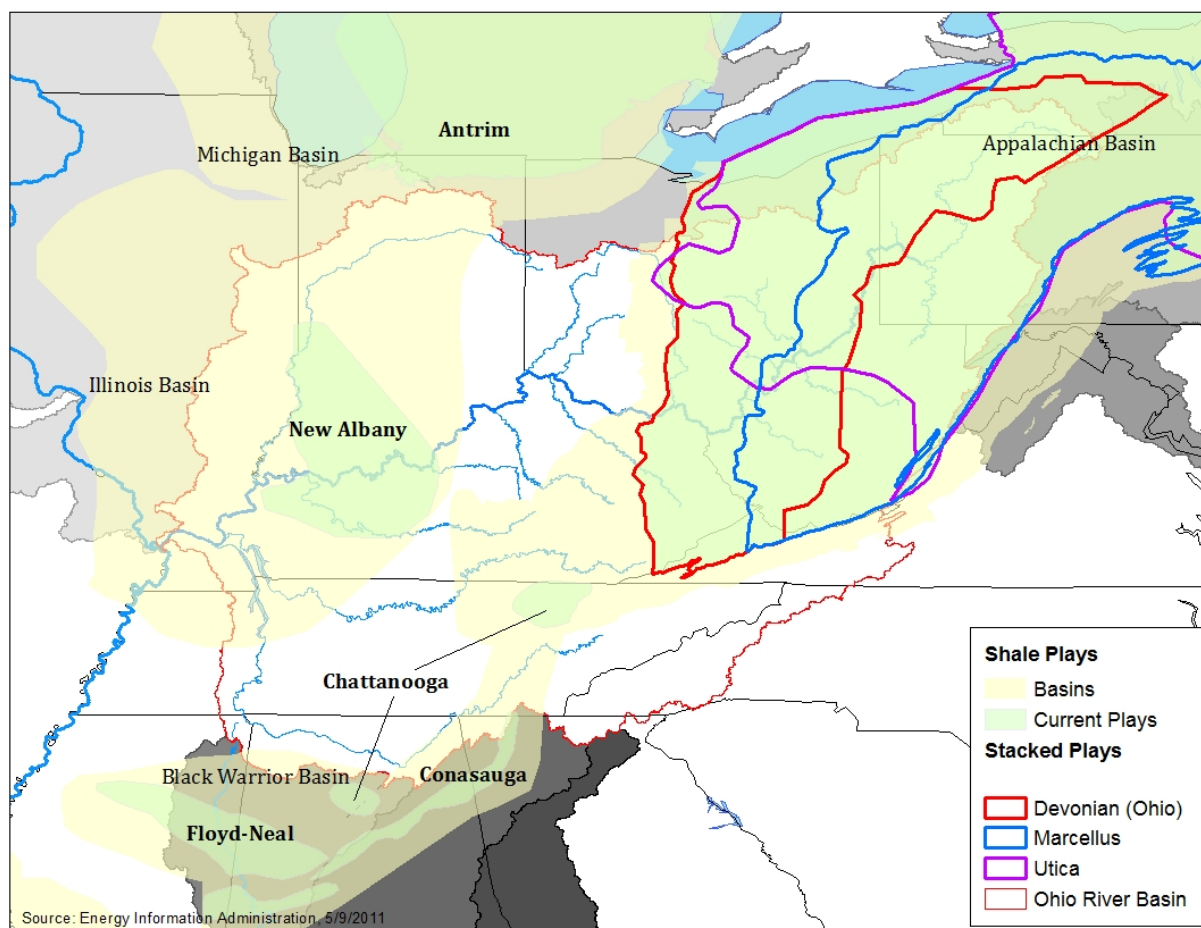


Figure 4: Shale Gas Plays of the Ohio River Basin, updated 5/9/2011 (U.S. Energy Information Administration, 2011).



Alabama

Water Management

Water Resources are managed by Alabama's Office of Water Resources (OWR), first established in 1993 by the passage of the Water Resource Act. The main goal of the OWR was to assess current water-use and trends in the state. The key aspects of the Alabama Water Use Reporting Program involve the registration of water users around the state and the collection of annual water-use data. In addition to the annual collection of water-use data, OWR also reports periodic, comprehensive assessments of Alabama's water resources. For example, in partnership with the USGS, OWR has labored to expand the Alabama component of the National Water Census. For further information, the Code of Alabama Section 9-10B-20 states the water-use rules (ADECA Office of Water Resources, 1994).

Water Withdrawal

In Alabama, all public water systems and those other individuals and organizations that have a capacity to withdraw 100,000 gallons per day (gpd) or more are required to register with OWR and obtain a Certificate of Use. The process begins with the submittal of an application form (called a "Declaration of Beneficial Use") and other required information. Once that information is reviewed and determined to be complete, OWR will issue a Certificate of Use that lists the individual or organization's name and information concerning all registered surface and/or groundwater withdrawal points and associated information. The certificate owner is then required to submit annual water usage information back to OWR. If a water-user would otherwise be required to obtain a Certificate of Use but the withdrawal or diversion is only for a temporary use, it may be eligible for an exemption. However, before beginning any temporary withdrawal for a particular use, users must contact OWR and submit information. Irrigation users are subject to the same rules and/or exemptions. The OWR does not charge a fee for a Certificate of Use. In-stream uses such as hydroelectric generation are exempt from obtaining a certificate of use.

Interbasin Transfer

Alabama does not have any interbasin transfer policy that isn't already covered by normal water withdrawal permitting. Although the lack of an IBT policy has been brought to the attention of the governor in the "Water Management Issues in Alabama" report by the Alabama Water Agencies Working Group.

Drought Response

Alabama's OWR oversees the Alabama Drought Management Plan and the Alabama Drought Assessment and Planning Team (ADAPT) coordinates the states' drought response. Alabama is divided into 9 drought management regions and uses several indices such as crop moisture index, Palmer drought index, streamflow, reservoir elevation to determine the appropriate drought stage. A 5-tier approach is used to determine drought stage: normal, advisory, watch, warning, and emergency.



Advisory – routine monitoring

Watch – press release, increased monitoring

Warning – water conservation encouraged

Emergency – statement from governor’s office describing conservation ordinances
(Alabama Department of Economic and Community Affairs, 2004).

Oil and Gas Water Use

Alabama does have a few shale gas plays within the state and a few horizontal wells have been drilled. While a well permit (a.k.a. certificate of use) is required, there are no specific rules for withdrawing waters in order to drill a well, vertically or horizontally (Alabama Oil and Gas Board, 2011).



Georgia

Water Management

In Georgia, the Environmental Protection Division (EPD) is charged with protecting Georgia's water resources. The Georgia Water Quality Control Act requires that water withdrawals be approved and is the permitting authority (Georgia Department of Natural Resources, 2012).

Water Withdrawal

In Georgia, any person, on a monthly average, withdraws more than 100,000 gpd of surface or groundwater per day must obtain a permit from the EPD. Permittees must submit an annual report of their water use and submit a progress report every five years detailing water conservation techniques and supplemental information. Irrigation uses are subject to the same rules.

Interbasin Transfer

Interbasin transfers are subject to the same permitting rules and reporting of water withdrawals. A permit is required if using more than 100,000 gpd of surface or groundwater. Transfers that occur in connection with mining, conveying, processing, sale, or shipment of minerals (e.g., as in the kaolin industry), or other products transported for further processing or sale shall be exempt from the permitting requirements. Georgia views IBT's on 14 river basins, HUC 6 level. IBT's must demonstrate that downstream uses are met before permission is given.

Ohio River Basin Fun Fact

Before and during the Civil War, the Ohio River represented the border between free and slave states. The Battle of Buffington in Portland, OH (1863) took place on the Ohio River. The River slowed advancing confederate troops, and gave Union troops and boats time to stop the advancement.

Drought Response

Georgia's drought response strategy is defined in the Georgia Drought Management Plan. Drought responses are managed by the Department of Natural Resources (DNR). Georgia evaluates drought conditions based on several indices, groundwater, streamflow, lake level, and more. The state is divided up into 9 climate regions. The Drought Response Committee coordinates with the DNR director to evaluate the drought severity. Georgia uses a 5-tier approach to drought stages (pre-drought, levels 1-4) (Georgia Department of Natural Resources, 2003);

Level 1 – Outdoor watering restrictions

Level 2 – increased outdoor watering restrictions

Level 3 – increased outdoor watering restrictions

Level 4 – complete outdoor water use ban

Georgia already has an outdoor watering schedule rule in place at all times. During a non-drought condition, watering can only take place every other day based on your house number. During a drought response level as described above, the outdoor watering schedule becomes more stringent.



There are a few exemptions like personal food gardens or new landscapes. Carwash owners are also subject to certification (must obtain a Certificate of Use) to prevent unnecessary loss of water.

Oil and Gas Water Use

The Georgia Oil and Gas Board is responsible for well permitting. Directional drilling is allowed in Georgia and very little shale as plays exist in the state (Figure 4). Georgia has no specific rules related to water withdrawals for oil and gas drilling purposes (Georgia EPD, 2012).



Illinois

Water Management

The State of Illinois uses two departments to manage its waters. The Water Use Act of 1983 (Illinois General Assembly, 1983) granted the power to the Department of Agriculture to manage its groundwater's for public interest. The Illinois Department of Natural Resources (ILDNR) has jurisdiction of Illinois' surface waters from the Rivers, Lakes, and Streams Act (Illinois General Assembly, 2012).

Water Withdrawal

There is no permitting program for water withdrawals in Illinois. According to the Water Use Act, a high capacity well is any well with the capacity to withdraw >100,000 gpd from a groundwater source. The Dept. of Agriculture requires high capacity *well* users to register. A High-capacity *intake* is one with the capacity to withdraw >100,000 gpd from a surface water source. The ILDNR does not have a permitting or registration program for surface water withdrawals (referred to as high capacity intakes) except for those located in the Lake Michigan watershed. Waters of Lake Michigan are subject to differing rules under the Levels of Lake Michigan Act. Under this act a permit is required for any amount of water withdrawn from Lake Michigan and all users of high capacity wells and intakes must report water usage annually.

Ohio River Basin Fun Fact

Thomas Jefferson once said "The Ohio is the most beautiful river on earth. Its current gentle, waters clear, and bosom smooth and unbroken by rocks and rapids, a single instance only excepted." 1781-1782

Interbasin Transfer

Illinois has no official policy on interbasin transfers into/out of the Ohio River basin. Under the Levels of Lake Michigan Act and the Great Lakes Compact, no waters shall be transferred from Lake Michigan to another basin without permission from the ILDNR and the other Great Lake states. If withdrawing from Lake Michigan is permissible, a metering device is required to monitor the quantity of water withdrawn after first demonstrating that all other reasonable withdrawal options are not available.

Drought Response

Illinois drought plan can be found in the "State of Illinois Drought Preparedness and Response Plan" (Illinois State Water Plan Task Force, 2011). Several intrastate state agencies, collectively called the State Water Plan Task Force, make up the forum of state representatives that release quarterly reports on state water supply conditions. It is chaired by the director of ILDNR. This task force will convene the Drought Response Task Force (DRTF) which is responsible for determining what areas are of concern and what actions to take. The individual communities set their own restrictions. Many communities are classified as "at-risk" and as such have their own drought response plan



with water-use restrictions. As with most states, the governor, under the Illinois Emergency Management Act (20 ILCS 3305/), is given broad powers to respond as necessary to an emergency. During a drought, communities send out press releases and voluntary conservation techniques. In a more severe drought, mandatory conservation techniques are enforced.

Oil and Gas Water Use

Illinois has no specific rules regarding water withdrawals for drilling wells. According to the most recent map (Figure 4) there are no current shale gas plays formations in Illinois. Although, a recent web search found news articles saying there has been a surge in oil and gas companies leasing land in the southern Illinois region for directional drilling.

Indiana

Water Management

Indiana's Department of Natural Resources (INDNR) manages water resources within the state. The Water Resource Management Act in 1982 (Office of Code Revision Indiana Legislative Services Agency, 2012) enabled the INDNR to monitor water use. The Navigable Waterway Rights Act of 1995also regulates the withdrawal of waters (Indiana Natural Resources Commission, 2012).

Water Withdrawal

In Indiana, there is a registration system for significant surface and groundwater withdrawals administered by INDNR. A significant water withdrawal is defined as the capacity to withdraw more than 100,000 gpd. Registration is required within 3 months of the completed construction of the facility. Those facilities must report annually on their water-use. Under the Navigable Waterway Rights Act, a permit is required for any withdrawal volume from a navigable waterway (Figure 5). The Ohio River and many other portions of rivers in Indiana are considered navigable (Indiana Natural Resources Commission, 2012). Additionally, the Great Lakes Compact implements a restriction for water use in the Great Lakes portion of Indiana. Indiana is also subject to the terms of the Upper Mississippi River Basin Association (UMRBA).

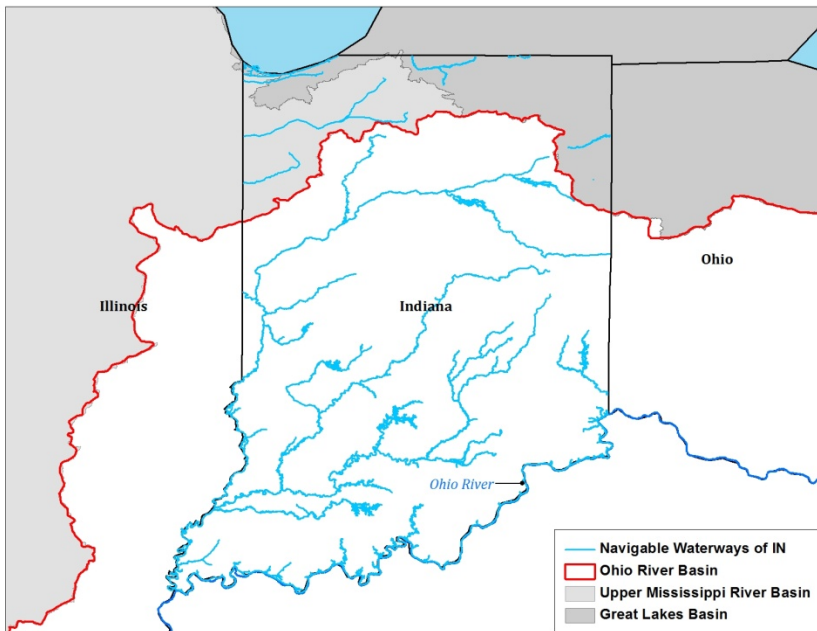


Figure 5: Navigable Waterways of Indiana

Interbasin Transfer

Indiana has no interbasin transfer policy except for that which is stated in the Great Lakes Compact. Under the Great Lakes Compact, no water shall be diverted from the Great Lakes.

Drought Response

Indiana's drought responsiveness is managed by IDNR. Indiana's policy during a water shortage event can be found in

Indiana's Water Shortage Plan (Indiana Department

of Natural Resources, Division of Water, 2009). The water shortage task force (WSTF) is in charge of coordinating the plan during a water shortage. Indiana is divided into 9 climate regions and a 4-tier approach is used to determine water shortage stage (normal, watch, warning, and emergency). The primary objectives of each stage are below:



Watch – a voluntary 5% reduction

Warning – a voluntary 10-15% reduction

Emergency – a mandatory, of at least, 15% reduction

Oil and Gas Water Use

The Indiana Division of Oil and Gas governs Indiana's oil and gas statutes (IC 14-37 & IC 14-38). Indiana has not seen a large amount of directional drilling yet (Herschel McDivitt, 2012) despite the underlying New Albany shale play in the southwestern region of the state (Figure 4). Indiana requires a permit for all wells drilled in the state. Effective July 1st, 2012, all hydraulic fracturing operations must report the volume and source of "base fluids" (i.e. water) to the Division (IN Natural Resource Commission, 2012).



Kentucky

Water Management

In Kentucky, water withdrawals are governed thru the Department of Environmental Protection's Division of Water. All water-use policies can be found in Kentucky's revised statutes 151.140 and Kentucky's Administrative Regulation 4:010 (Kentucky Legislature, 2013).

Water Withdrawal

A permit is required if the water withdrawal rate exceeds 10,000 gpd from surface water, groundwater or spring. There are a few exceptions to this rule. If withdrawals are made on an irregular basis and at an irregular rate, permits may be required if the water withdrawn represents a significant portion of the available water supply or the collection of withdrawal data is necessary for water resource planning purposes. Also, no permit is required if water is used for agriculture, the production of steam-powered electrical generating plants, domestic purposes, or injection underground in conjunction with operations for the production of oil and gas. Kentucky requires the monthly reporting of water withdrawals. If water withdrawals are non-routine, then the reporting frequency will be determined at the Division's discretion.

Ohio River Basin Fun Fact

The name Ohio originates from the Iroquois Indian word for *good river*. This Indian name was later translated by the French as *La Belle Riviere* (the Beautiful River).

Interbasin Transfer

Kentucky does have an IBT policy. Per KYS 151.200, any diversion, on the HUC 6 level, greater than 10,000 gpd requires approval from the cabinet and secretary. Also, the portion of the state that is within TVA's jurisdiction is subject to their IBT policies.

Drought Response

The Commonwealth of Kentucky's water shortage response is defined in the "Kentucky Drought Mitigation and Response Plan" (Commonwealth of Kentucky, 2008). To effectively manage a drought situation, the Plan established the Kentucky Drought Mitigation Team (KDMT). The state is divided up into 15 drought management areas. Kentucky uses multiple drought indicators (reservoir level, precipitation deficit, soil moisture, stream flow, etc) to determine severity. A 5-tier approach is used to define the drought stage (normal, drought advisory, Levels 1-3). The plan does not designate an "emergency" level, but rather leaves that up to the discretion of the local or state authority. Drought emergencies are lead by the Kentucky Division of Emergency Management. Specifics of each drought level are outlined below, but not limited to;

Drought Advisory – early notification of KDMT

Level 1 Drought – Press release, increased monitoring and inventory

Level 2 Drought – press release, increased monitoring, situation reports



Level 3 Drought – press release, increased monitoring, discuss possible Declaration of Emergency

Oil and Gas Water Use

In Kentucky, the Division of Oil and Gas regulates oil and gas statutes. A large portion of the Devonian shale lies under Kentucky (Figure 4). The majority of Kentucky's hydraulically drilled wells are fracked with nitrogen gas and not high-volume treatments commonly used in Utica and Marcellus shale areas (KY Division of Oil and Gas, 2012). Kentucky has no specific rules relating to water withdrawals for drilling. However, the state does require a permit to drill, and the operator must protect any freshwater zone.



Maryland

Water Management

In Maryland, the Department of Environment, Water Management Administration manages all water withdrawal activities. Details of the rules and regulations can be found in the Annotated Code of Maryland Environment Article (Maryland Department of Environment, 2012)

Water Withdrawal

Any water withdrawal of any amount in the state of Maryland must be permitted to do so however some exceptions do exist. Exempted from permits are emergency fire use, agriculture use less than 10,000 gpd, individual domestic use, and other use of ground water less than 5,000 gpd. If a withdrawal is >10,000 gpd more specific requirements exist (e.g. aquifer testing). Any increase to water withdrawals in amounts greater than 10,000 gpd requires permit modification. All permits are valid for a maximum of 12 years and there is no fee to apply. Water use reporting is required semi-annually; agriculture use is required to report annually.

Ohio River Basin Fun Fact

The first modern oil well drilled was in Titusville, PA on Oil Creek near Oil City, PA in 1859. This was the well that started the oil boom. Oil reserves of northeast Ohio and western Pennsylvania were considered the Middle East of the time.

Interbasin Transfer

Maryland does not address interbasin transfers in there state laws but are subject to the same permitting requirements as water withdrawals. Portions of Maryland are subject to the interbasin transfer policies of the Susquehanna River Basin Commission (SRBC) and are discussed later.

Drought Response

Maryland's drought guidance is described in the "Maryland Statewide Water Conservation Advisory Committee" report of 2000 (Maryland Statewide Water Conservation Advisory Committee, 2000). Maryland has a committee formed by the Governor to address drought response with assistance from the Department of Environment. Maryland divides the state into 6 regions and they primarily use 4 drought indicators (precipitation, stream flow, groundwater levels, and reservoir storage). Maryland uses a 4- tier approach to defining drought stages (normal, watch, warning, and emergency);

Watch – press release, 5-10% voluntary reduction goal

Warning – press release, 10-15% reduction goal, request/require restrictions

Emergency – press release, 15-20% reduction goal, mandatory nonessential restrictions

Maryland's water use restrictions during a drought emergency are very specific in their report, and are primarily for nonessential uses like watering of lawns. All other business and industries must reduce water use by 10%.



Oil and Gas Water Use

In Maryland, the Department of the Environment manages mining activities in the state and a permit is required to drill in Maryland however specific rules regarding water withdrawals for well drilling do not exist. A Marcellus shale formation does exist in three of Maryland's most western counties (Figure 4). On June 6th, 2011, Governor Martin O'Malley established the Marcellus Shale Safe Drilling Initiative to assist state policymakers and regulators in determining whether and how gas production from the Marcellus shale in Maryland can be accomplished without unacceptable risks of adverse impacts to public health, safety, the environment and natural resources (MD Dept. of Environment, 2011). As a result of the Initiative, Senate Bill 514 was passed which, prohibited hydraulic fracturing within the state as of January 31, 2013.



Mississippi

Water Management

In Mississippi, the Department of Environmental Quality, Office of Land and Water Resource's, Division of Permitting and Monitoring is responsible for water use. Regulation LW-2 by the Mississippi Commission on Environmental Quality (MCEQ) states the water withdrawal rules (Mississippi Commission on Environmental Quality, 2009).

Water Withdrawal

Any water withdrawal of any amount from surface water requires the approval from MCEQ. If a withdrawal is from groundwater, a permit is required if the surface casing is equal to or greater than six inches in diameter. A few exemptions do exist, for example, groundwater wells for one household. No permit will be issued if the water withdrawal interferes with navigation or water quality. Permits usually last for ten years and require a \$10 fee. Modification of a permit requires approval as well.

Interbasin Transfer

Mississippi does not have any interbasin transfer policy that isn't already covered under normal water withdrawals.

Drought Response

Mississippi does not have an official drought response plan. The Mississippi Emergency Management Agency will oversee any natural disaster including a drought. The State of Mississippi Standard Mitigation Plan of 2010 states that "...drought does not pose a serious statewide threat capable of being addressed in this plan" (Mississippi Emergency Management Agency, 2010). Mississippi may issue a Water Use Warning for any area of the state where existing water resources are inadequate to meet needs. Two possible outcomes of the water use warning area may be coordinating with permit holders or restricting volumes withdrawn.

Oil and Gas Water Use

In Mississippi, the Mississippi State of Oil and Gas Board (MSOGB) is responsible for managing wells of which all require a permit. Shale plays do exist in the state of Mississippi (Figure 4) and some horizontal drilling is occurring in the state (Associated Press, 2013). However there are no rules regarding water withdrawals for drilling.

North Carolina

Water Management

In North Carolina, the Department of Environment and Natural Resources (DENR), Division of Water Resources is responsible for managing water-use. North Carolina General Statute (North Carolina General Statute, 1991) originally passed in 1991 details the rules. North Carolina also has a water-use area with special regulations called the Central Coastal Plain Capacity Use Area (CCPCUA) [Figure 6].

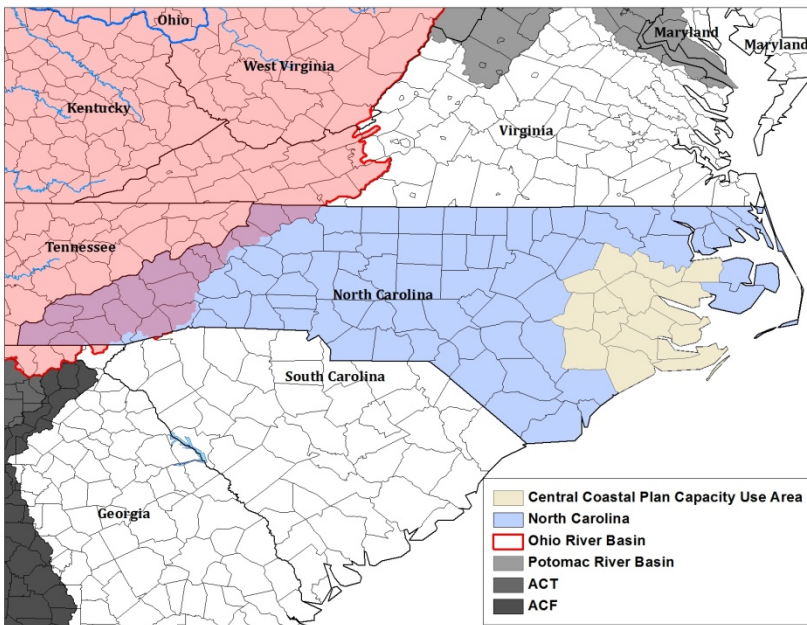


Figure 6: North Carolina's CCPCUA

Registrants must also report their annual water-use to the DENR. The CCPCUA in eastern North Carolina (outside the Ohio River basin) has special rules to water withdrawals. In this area, a permit is required if withdrawing > 100,000 gpd from groundwater only, and users must register if withdrawing more than 10,000 gpd for any other source.

Interbasin Transfer

Interbasin Transfers in North Carolina are under the same rules as water withdrawals. If it's greater than 100,000 gpd, or 1,000,000 gpd for agriculture use, then they must register with the state. In 1993, North Carolina adopted the Regulation of Surface Water Transfers Act (North Carolina Division of Water Resources, 2009). The act requires that an interbasin transfer certificate (permit) be obtained if a new transfer of 2,000,000 gpd or increase by 25%, moves water from one river basin to another. NC recognizes basins on the HUC 8 level. There are 38 HUC 8 basins in NC.

Water Withdrawal

North Carolina has no permitting program in place for water withdrawals but does require surface and ground water withdrawals of > 100,000 gpd register their water withdrawals with the State and update those registrations at least every five years. Agricultural water users that withdraw 1,000,000 gallons of water or more a day must also register. The registration is required within 6 months from the first withdrawal.

Extended Interbasin Transfer Boundary

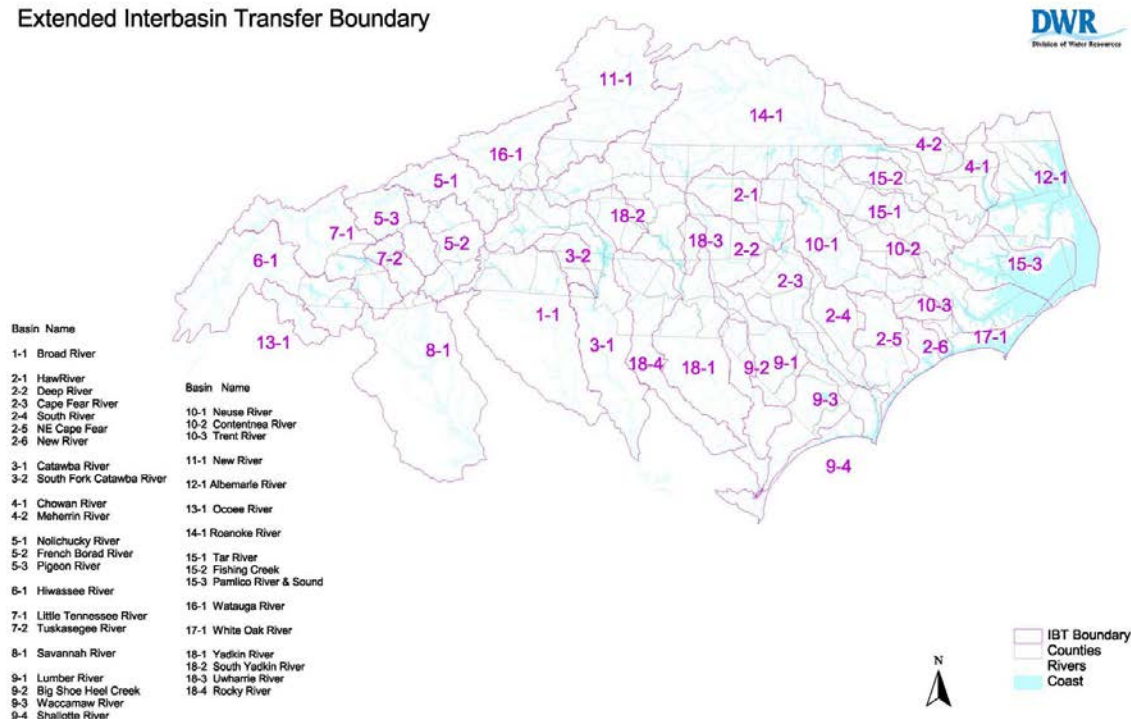


Figure 7: The 38 basins of North Carolina

Drought Response

North Carolina's drought response is coordinated by the State Emergency Operation Center. The drought response report can be found in the Emergency Operation Plan, Drought Assessment and Response Plan section updated in 2005 (North Carolina Dept. of Environment and Natural Resources, 2001). A drought occurrence will call upon the North Carolina Drought Management Advisory Council. North Carolina uses multiple drought indices but most commonly are the U.S. Drought monitor and the Palmer Drought Severity Index. A 5-tier approach is used to define drought stages (normal, dry, moderate, severe, and extreme). The action details of each stage are outlined below;

Dry – trend analysis

Moderate – drought advisories issued to public and state agencies

Severe – press release, task force activation

Extreme – reallocate resources if necessary, governor disaster declaration

In addition to the 5 stages, North Carolina also has additional return-to-normal stages not outlined above. No specific water-use restrictions were mentioned in the plan.

Oil and Gas Water Use

In North Carolina, the Division of Energy, Mineral, and Land Resources is responsible for oil and gas exploration. All wells in N.C. must be permitted before drilling begins. According to the Energy Information Administration in 2011, very little shale gas plays exist in N.C. (U.S. Energy Information Administration, 2011) (Figure 4). A recent internet search of news articles revealed that there is

some interest in horizontal drilling by oil and gas companies in N.C. This interest even takes place into central and eastern North Carolina, far beyond the reach of the Appalachian basin (Figure 7) where most of the Utica, Devonian, and Marcellus shale plays exist. As of March 14th 2013, horizontal drilling is banned in North Carolina. The state does recognize the benefits and consequences of horizontal drilling and is conducting an environmental and economic impact study on shale gas directional drilling. Proposed regulations, if horizontal drilling were allowed, would be a waste and water management plan would be required in which water withdrawals would be limited during times of drought and periods of low flows (N.C. Dept. of Environment and Natural Resources, 2011).

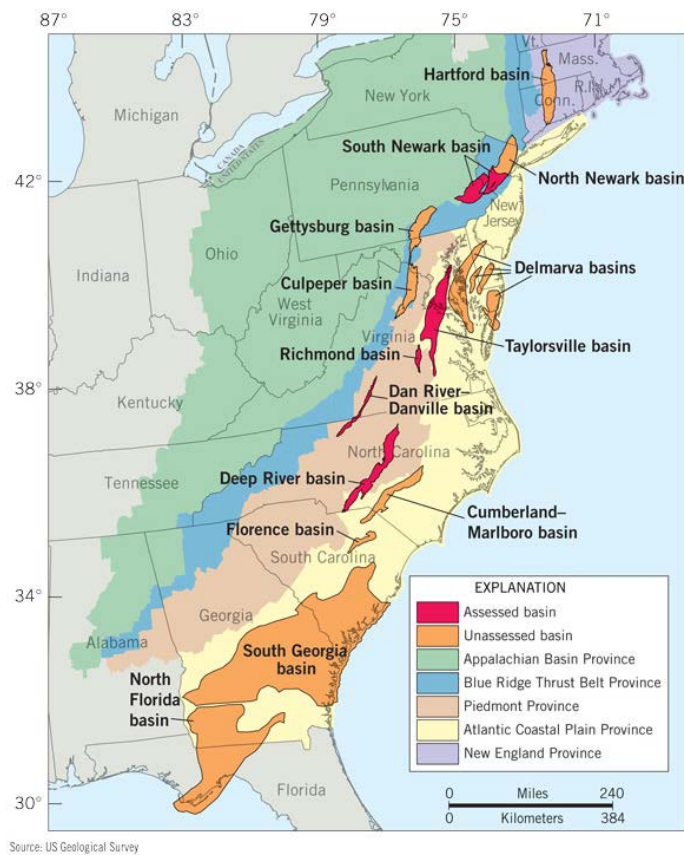


Figure 8: U.S. East Coast Mesozoic Basins (USGS, 2011)



New York

Water Management

In New York, the Department of Environmental Conservation (NYDEC) is responsible for water withdrawal permitting. As of April 1, 2013, a new law went into effect requiring water withdrawal permits (New York Dept. of Environmental Conservation, 2012). Within New York are many other water quantity related compacts including the Susquehanna River Basin Compact, the Delaware River Basin Compact, and the Great Lakes-St. Lawrence River Basin Water Resources Compact.

Water Withdrawal

A permit is required for any water withdrawal with a capacity greater than 100,000 gpd from surface or ground water. Few exemptions do exist like fire suppression, ocean water withdrawals, etc. This law also requires agricultural withdrawals of more than 1,000,000 gpd to register with the state. Any water withdrawal user must submit a report annually if the capacity is greater than 100,000 gpd. A fee of \$50 is collected for each annual report. Water Withdrawals are also subject to terms defined within interstate basin commission compacts (e.g. SRBC, DRBC, etc.). If a facility already has approval through SRBC or DRBC, then that facility does not need to be permitted through the state.

Ohio River Basin Fun Fact

Marcellus shale is named after an outcrop of Marcellus shale found in the town of Marcellus, New York

Interbasin Transfer

In New York, if a permit is not already assigned, inter basin transfers >1,000,000 gpd require registration. New York defines there basins on the HUC-4 level and has 17 major drainage basins in the state (Figure 8).

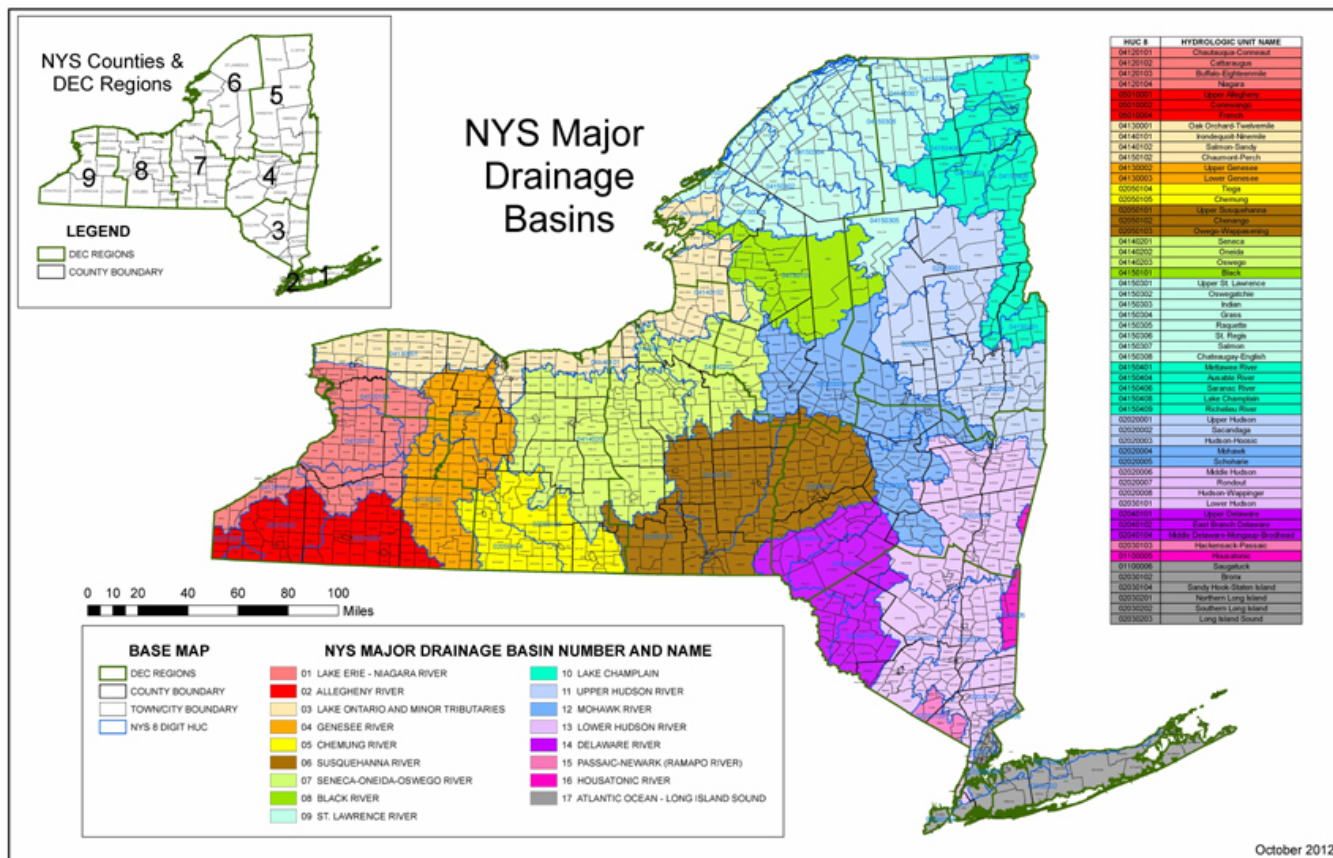


Figure 9: New York's 17 major drainage basins (NYDEC, 2012)

Drought Response

In New York, a drought is coordinated by the NYDEC (New York Dept. of Environmental Conservation, 2012). Drought conditions are measured using many indices like stream flow, precipitation, reservoir level, and groundwater. The Drought Management Task Force will help guide policy-making during a drought. New York is divided into 9 drought management regions and the state uses a 5-stage approach to address drought conditions (normal, watch, warning, emergency, and disaster);

Watch – Public water suppliers conserve water, urge customers to do the same

Warning – voluntary water conservation, users update drought plans

Emergency – possible local water restrictions

Disaster – further water use restrictions, governor declaration

Oil and Gas Water Use

In New York, the Division of Mineral Resources oversees all well permitting. There is a large portion of the Marcellus shale region under New York (Figure 4 and Figure 10). A permit is required for all wells drilled; directional drilling requires additional approval from the division. Surface and ground waters must be protected at all times for any well. At the time of this report, there are no specific rules regarding water withdrawals for the purpose of oil and gas drilling. New York currently has a moratorium for natural gas drilling in the Marcellus shale region only. The drilling is banned until the final SGEIS is completed. If a company decides to continue with the permitting process they must submit their own site-specific Supplemental Generic Environmental Impact Statement (SGEIS). Currently, the revised draft SGEIS is done and is still pending approval. Public comment period for the revised draft SGEIS ended on January 11, 2012 (NY Dept. of Environmental Conservation, 2012).

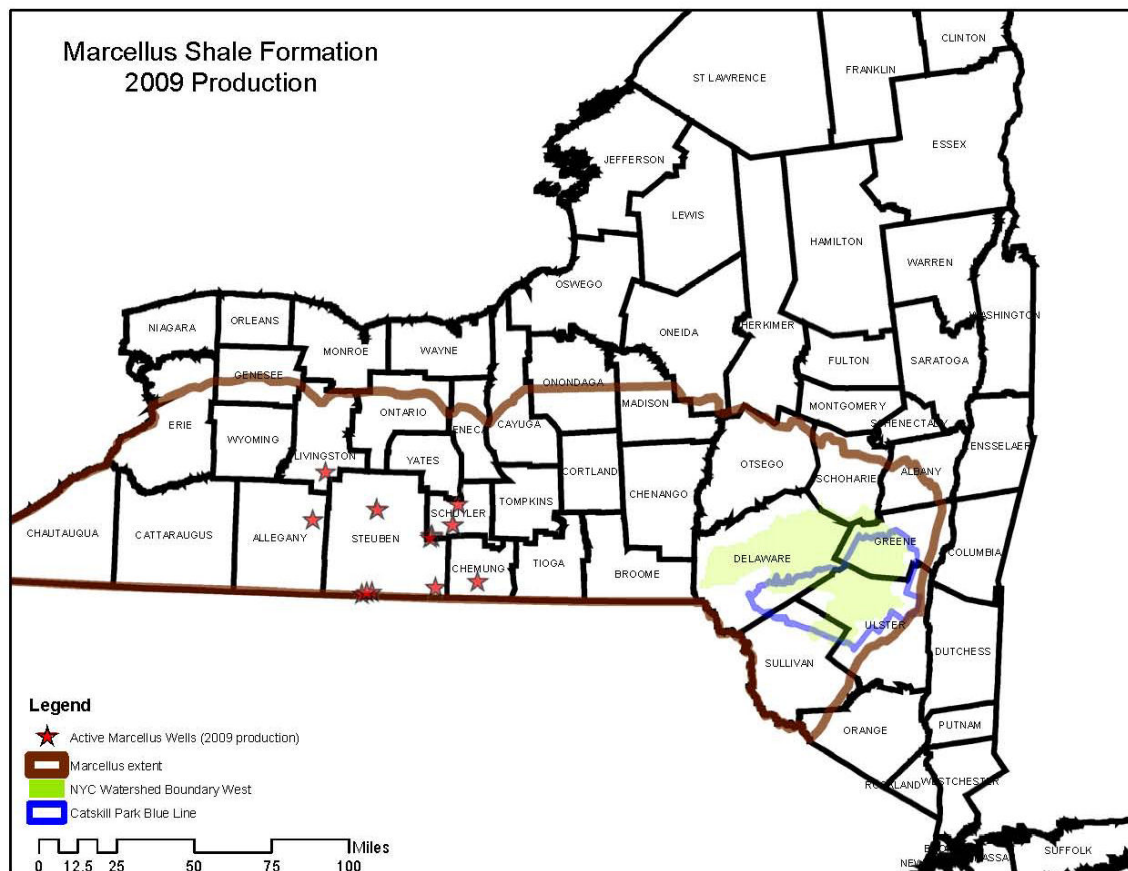


Figure 10: New York Marcellus Shale Extent (NY Dept. of Environmental Conservation, 2009)



Ohio

Water Management

In Ohio, the Department of Natural Resources (ODNR), Division of Soil and Water Resources manages water withdrawals. Laws pertaining to water-use can be found in Chapter 1501 of the Ohio Revised Code (Ohio Laws and Rules, 2012). Ohio is also subject to the Great Lakes Compact, and the Conservancy Act which gave local land owners or political subdivisions rights to solve water management problems.

Water Withdrawal

Ohio has registration and permitting programs for water withdrawal. If any type of facility has the capacity to withdraw more than 100,000 gpd (surface or ground water) over a 30-day period that facility must register with ODNR. Within the Great Lakes watershed, if a water body is classified as of “high-quality water,” then a permit is required if withdrawing more than 100,000 gpd. Water withdrawal facilities must report annually. For consumptive uses only, no facility may increase water withdrawals by more than 2 million gpd over 30 days without first obtaining a permit from ODNR.

Interbasin Transfer

Ohio refers to interbasin transfers as diversions. Ohio defines there basins on the HUC-2 level (Figure 10), meaning there are only two basins in the state, the Ohio River basin and the Great Lakes Basin. A permit is required to divert more than 100,000 gpd over 30 days from Ohio River basin to any other basin. Currently, there are 4 permits issued for diversions out of the Ohio River basin. The Great Lakes Compact prohibits interbasin transfers from Lake Erie to any other basin.



Figure 11: The Ohio River and Lake Erie Watershed divide

Drought Management

Ohio's drought response is managed by the Ohio Emergency Management Agency (OEMA) (State of Ohio Emergency Operations Plan, 2012). Ohio is split up into 10 climatological divisions, and several indices are used to determine drought stage (precipitation, groundwater, Palmer Drought Severity Index, etc). The Drought Assessment Committee helps coordinate actions during a water shortage. Ohio takes a 4-tier approach to categorizing droughts (pre-drought, increased monitoring, conservation actions, and emergency response);

Increased Monitoring – increase monitoring of drought indicators

Conservation Actions – voluntary conservation tactics employed

Emergency Response – possible drought emergency declaration, review supply allocations

Any permit may be suspended if it's determined that a withdrawal may endanger public health, safety or welfare. If a drought emergency is declared, The Governor may issue a Drought Emergency Declaration when water supplies are inadequate to meet projected demands and



emergency response measures must be taken. A Drought Emergency Declaration may empower State agencies to review the allocation of supplies in communities not adequately responding to their water shortages and to implement emergency programs and actions as provided in the Ohio Revised Code.

Oil and Gas Water Use

In Ohio, the Division of Mineral Resources Management is responsible for oil and gas wells. Much of Ohio is underlain by Devonian, Utica, and Marcellus shale (Figure 4). Most of the horizontal well activity is presently occurring in the Utica shale formation. A map (Figure 11) showing Ohio Utica shale activity up to year 2012 is below. A permit is required for all wells drilled. Ohio refers to high volume injection to increase recovery of the gas as “Enhanced Recovery.” (Lawriter: Ohio Laws and Rules, 2012). A permit is required for all enhanced recovery projects. Within that permit must be the estimated amount of gas or fluid being injected, source of water and rate. No other regulations related to water withdrawals and oil and gas wells exist.





Pennsylvania

Water Management

In Pennsylvania, the Department of Environmental Protection is responsible for water resources. Water related rules can be found in chapter 110 of the Pennsylvania Code (Oneckle, 2012) and the Water Rights Act of June 24, 1939 (Pennsylvania Dept. of Environmental Protection, 2012). Pennsylvania is also a member of the SRBC, DRBC, Great Lakes Compact and Interstate Commission on the Potomac River Basin (ICPRB).

Water Withdrawal

Pennsylvania employs a registration program for any withdrawal of more than 10,000 gpd averaged over a 30-day period. All registered users must report annually. A permit is only required for public water supply companies withdrawing from surface waters. All other withdrawals, surface or ground waters, are subject to common laws that govern landowners to use water on their own property.

Interbasin Transfer

Pennsylvania has no specified policy on interbasin transfers except by those governed by SRBC, DRBC, and the Great Lakes Compact

Drought Response

Pennsylvania's management of water resources during a drought is done by the Pennsylvania Emergency Management Agency (PEMA) and is coordinated by the Drought Task Force (Commonwealth of Pennsylvania, 2007). Drought conditions are monitored by multiple indices, in order of priority; rainfall, stream flow, groundwater level, soil moisture, and reservoir storage. Pennsylvania does have specific water use restrictions during a drought emergency (Pennsylvania Dept. of Environmental Protection, 2012). Drought stages are on a 4-tier approach (normal, watch, warning, and emergency);

Watch – press release, voluntary 5% reduction

Warning – press release, voluntary 10-15% reduction

Emergency – nonessential uses are restricted (lawn watering, car washing, etc),

Although SRBC and DRBC have the authority to declare a drought emergency, they both rely on Pennsylvania to implement and enforce drought responses.

Ohio River Basin Fun Fact

In Johnston, PA (70 miles east of Pittsburgh) was the Great Flood of 1889. On May 31, 1889 rising waters and poor dam maintenance caused the South Fork Dam to collapse causing 2,209 deaths. One of the worst disasters in U.S. History. Bodies were found a month later approximately 540 miles downstream near Cincinnati, OH.

Oil and Gas Water Use

In Pennsylvania, the Office of Oil and Gas Management is responsible for the oil and gas programs. Most of the state is covered by shale gas plays (Figure 4) and accounts for the majority of the horizontal drilling within the Ohio River basin. Pennsylvania refers to horizontal drilling for gas extraction as “unconventional wells.” Figure 12 below shows the number of unconventional wells permitted and drilled in 2012 alone. All wells drilled in Pennsylvania require a permit (The Pennsylvania Code, 2012). All wells drilled that deviate from the vertical also require additional approval. For Marcellus shale drilling, a water management plan is required and within that plan the operator must identify water sources, volumes, and comply with any applicable pass-by flow conditions. The plan also requires submittal of the approval from other basins such as the SRBC or DRBC. The application fee for a well in PA is \$5,500 or more based on depth.

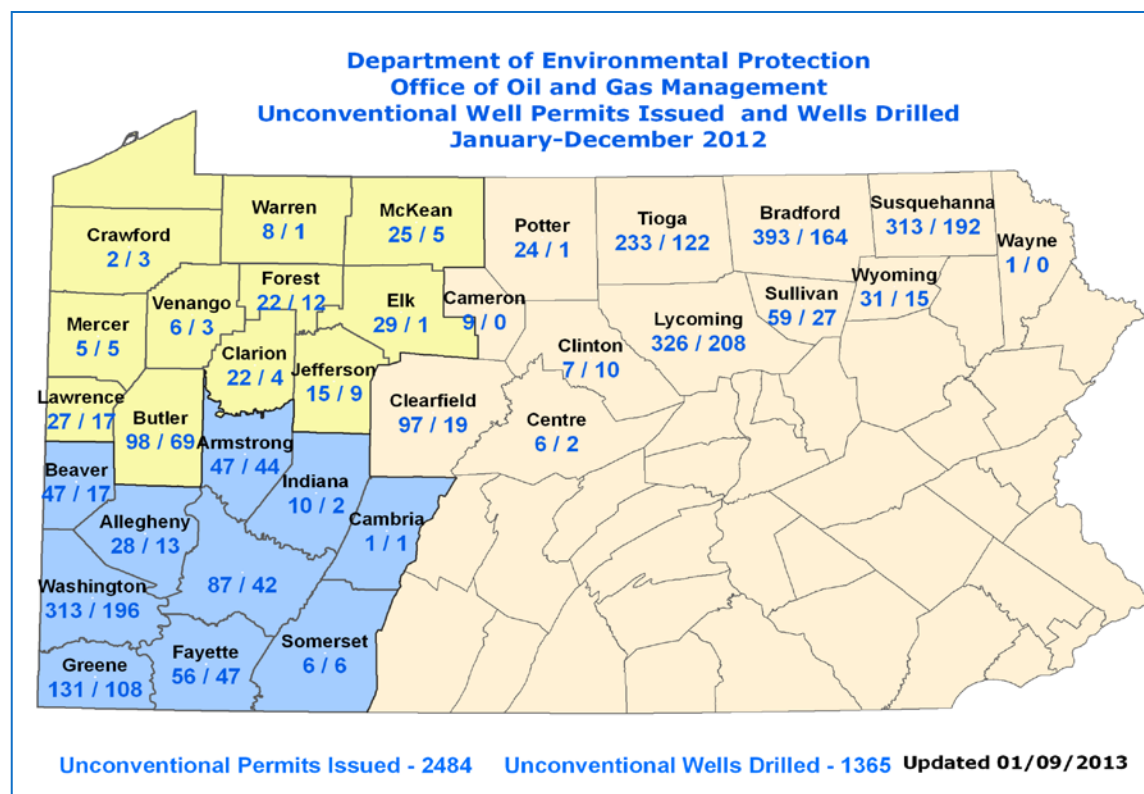


Figure 13: PA Unconventional Well permits and Drilled in 2012 (PA Dept. of Environmental Protection, 2013)

Ohio River Basin Fun Fact

Pennsylvania has more miles of rivers and streams than any other state except Alaska.



Tennessee

Water Management

In Tennessee, the Department of Environment & Conservation, Division of Water Resources is responsible for its water-use. Laws related to water-use can be found in Tennessee Code Annotated, Title 69 (LexisNexis, 2012). Some Tennessee waters are also governed by the Tennessee Valley Authority (TVA).

Water Withdrawal

Under the Water Resources Information Act of 2002, the registration of water withdrawals applies to withdrawals over 10,000 gpd for surface or ground waters, except those excluded by the Act. Uses specifically exempt from registrations include water used for agriculture, nonrecurring withdrawals of water, and water withdrawn for emergency uses. All entities withdrawing water, whether required or excluded by the Water Resources Information Act of 2002, are encouraged to submit an annual Water Withdrawal Registration to the Division of Water Supply so that accurate documentation of water-use is available for present and future Tennessee water resource studies. All registered withdrawals must be reported annually. Any activity that may negatively affect navigation requires a permit. Physical alterations to properties of waters of the state requires an Aquatic Resource Alteration Permit (ARAP) or a §401 Water Quality Certification (§401 certification). One example of a stream alteration is water diversions or withdrawals (Rules of TN Dept. of Environment and Conservation, 2012) that will or will likely result in alteration of the source stream.

Ohio River Basin Fun Fact

Tennessee is home to Oak Ridge, the site of the Manhattan Project where the first atomic bomb was produced. Runoff from these areas goes into East Fork Poplar Creek and into the Tennessee River. The site was chosen due to its low population, ease of accessibility and utilities such as water were readily available. Currently the only two remaining uranium enrichment plants in the U.S are both in the Ohio River basin, one in Paducah, KY, and one in Portsmouth, OH.

Interbasin Transfer

A permit is required for any new or increased interbasin transfer for public water supply purposes only. Tennessee defines their basins in Tenn. Code Ann. § 69-7-203 (LexisNexis, 2012) and are not the typical HUC-8 divisions but divided up into 10 sections (Figure). One exception to permitting is the Tennessee-Tombigbee Waterway (Tenn-Tom) which is a human-made waterway that connects the Tennessee River to the Gulf of Mexico via the Tombigbee River system. Water from the Ohio River basin is diverted to this waterway.

Drought Response

Tennessee's drought response is managed by the Department of Environment and Conservation (TDEC). Details of their response can be found in the "Drought Management Plan" revised in 2010 (Tennessee Dept. of Environment and Conservation, 2010). The TDEC and the Tennessee Emergency Management Agency (TEMA) monitor drought conditions using multiple indices. TEMA is the lead authority during a drought emergency. TEMA and TDEC both setup groups to handle droughts. TEMA uses the Tennessee Drought Task Force, and TDEC uses the Water Resources Technical Advisory Committee. These two agencies work together to determine drought stages and responses. Tennessee uses a 5-tier approach to defining drought stage;

Drought Alert – press release, monitor conditions

Voluntary Reductions – voluntary reductions for public, industrial, and agricultural

Mandatory Restrictions – implement mandatory restrictions, restrictions can vary

Emergency Management - governor may declare emergency

The TVA is also a major part of the drought planning process of Tennessee and other TVA states' drought plans. TVA has its own drought plan called the "Tennessee River Drought Management Plan." TVA is also a member of the Water Resources Technical Advisory Committee of TDEC.

Oil and Gas Water Use

In Tennessee, the TDEC handles all oil and gas well permits. Some shale gas plays exist within the state (Figure 4). All wells drilled in the state require a permit. Tennessee has no specific rules related to water withdrawals for drilling.

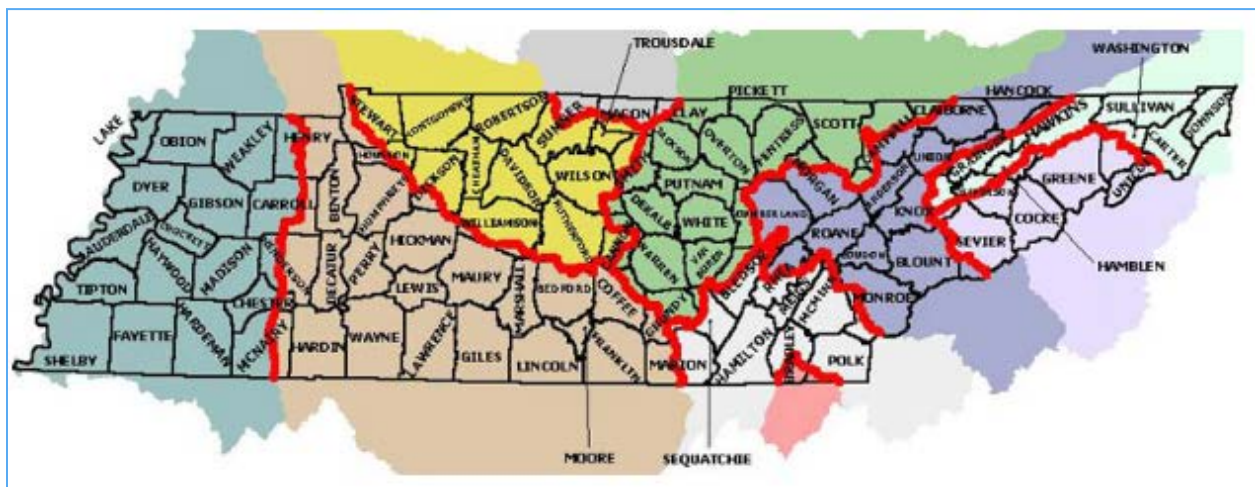


Figure 14: The 10 river basins as defined by Tennessee (TNDEC, 2012)



Virginia

Water Management

In Virginia, The Department of Environmental Quality (DEQ), through the State Water Control Board, regulates water resources. Laws pertaining to water-use can be found in the Virginia Administrative Code, Chapter 210 (Virginia's Legislative Information System, 2012).

Water Withdrawal

A permit is required if a user withdraws more than 10,000 gpd from non-tidal surface waters. An in-stream, beneficial use, flow must also be achieved as determined by DEQ staff. Annual reporting is also required. Agriculture uses do not need a permit unless they withdraw more than 1,000,000 gpd for irrigation purposes only. Surface water withdrawals placed into portable containers by persons owning property on, or holding easements to, riparian lands also do not require permits. DEQ may require any owner or operator of a withdrawal system excluded from permit requirements to cease withdrawals and file an application and receive a permit prior to resuming any withdrawal when the Board's assessment indicates that a withdrawal, whether individually or in combination with other existing or proposed projects, among others, causes or contributes to, or may reasonably be expected to cause or contribute to, a significant impairment of the state waters. Virginia also has separate laws for Surface Water Management Areas. No Surface Water Management Areas are currently assigned in Virginia. There are no permitting requirements for ground water except in certain areas designated as ground water management areas (Virginia's Legislative Information System, 1992) (Figure 14) which are located in counties of eastern Virginia (outside the Ohio River basin). A groundwater permit is not required in these areas if the withdrawal is less than 300,000 gpd or if it's for the exploration of oil and gas. Ground water or surface water management areas can be assigned anywhere in the state.

Interbasin Transfer

Virginia does not address interbasin transfer of waters specifically but the state does define consumptive use as "...withdrawal of surface waters, without recycle of said waters to their source of origin" (Virginia's Legislative Information System, 2012). Thus, any interbasin transfer of greater than 10,000 gpd must obtain a permit first. There are 43 such permits approved in Virginia throughout the state as of January 2013.

Drought Response

Virginia's drought plan can be found in the "Virginia Drought Assessment and Plan" of 2003 (Drought Response Technical Advisory Committee, 2003). The Virginia Drought Monitoring Task Force (DMTF) is responsible for monitoring drought conditions in the Commonwealth. Virginia utilizes multiple indices to determine drought conditions. The state is divided up into 13 drought evaluation regions and uses a 4-tier approach to determine drought severity (normal, watch, warning, and emergency);

Watch – increased public awareness

Warning – voluntary reductions of 5-10%

Emergency – mandatory reductions of 10-15%, non-essential uses restricted

Oil & Gas Water Use

Virginia uses the same water-use regulations for the oil and gas industry uses. If a drilling pad needs to use water, a water withdrawal permit is required if the withdrawal is greater than 10,000 gpd. Instream flow with a beneficial use is also a constituent of the permit.

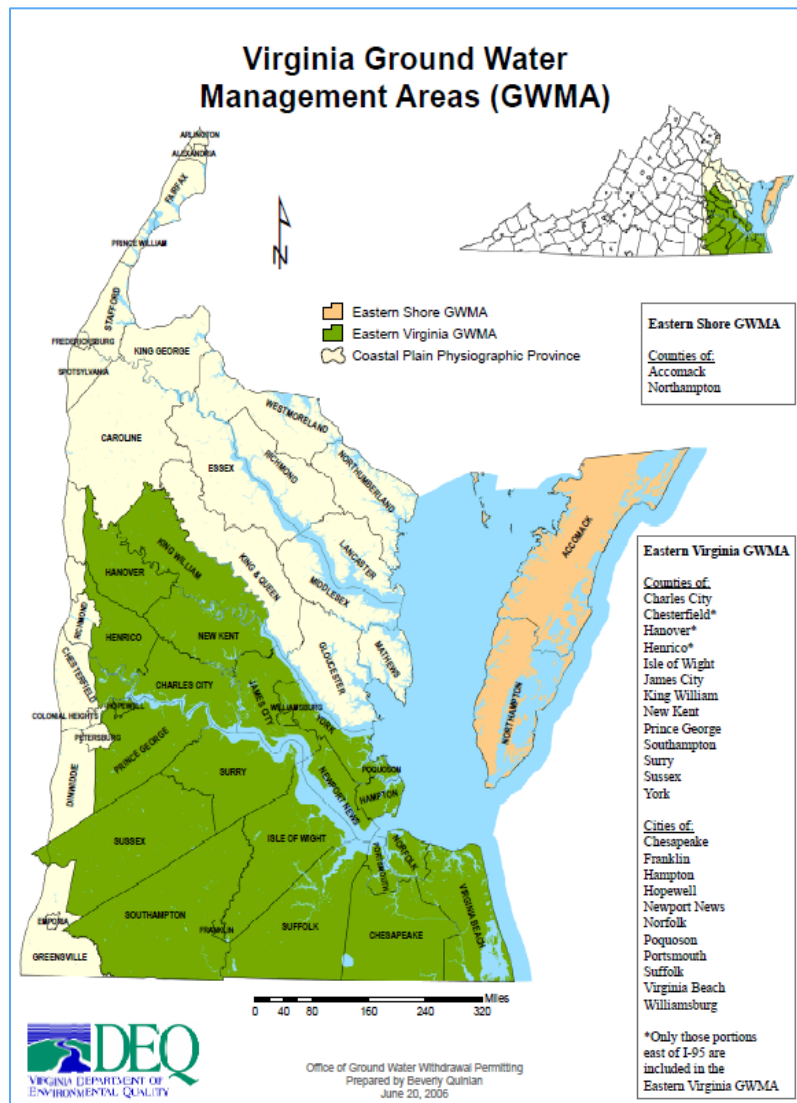


Figure 15: Ground Water Management Area of Virginia (Virginia Department of Environmental Quality, 2006)



West Virginia

Water Management

In West Virginia, the Department of Environmental Protection's Water Use Section is responsible for water resources. Laws pertaining to water-use can be found in West Virginia Code, Chapter 22 (West Virginia Legislature, 2012).

Water Withdrawal

There are no water withdrawals permitting requirements in West Virginia. All users must register if they withdraw more than 750,000 gpd (300,000 gallons per 30 day period effective Jan.1,2015) (referred to as large-quantity user). Annual reporting is also required. Agricultural users voluntarily submit their use.

Ohio River Basin Fun Fact

Within the Big Sandy Watershed is the Tug Fork River, the border of Kentucky and West Virginia. This was the site of the famous Hatfields and McCoys family feud where 12 people died and the basis of the TV series "Hatfields and McCoys." Today, the annual festival involves a tug-of-war over the Tug Fork River.

Interbasin Transfer

West Virginia has no policy regarding interbasin transfers other than that of reporting and registering of water-use by the user. Interbasin transfers are reported in the State Water Resources Plan.

Drought Response

In West Virginia, the lead drought response agency is the West Virginia Division of Homeland Security and Emergency Management (WVDHSEM). The drought plan can be found in WV Emergency Operations Plan, Annex U (West Virginia Department of Agriculture, 2012). Multiple indices are used to determine drought conditions including the Palmer Drought Severity Index, reservoir level, and others. West Virginia takes a 4-tier approach to drought stages (normal, alert, conservation, and emergency);

Alert – issue a drought alert

Conservation – increased monitoring

Emergency – governor may declare drought emergency

Oil & Gas Water Use

West Virginia is nearly 100% covered by shale gas plays (Figures 4 & 15). As a result, the state has a lot of drilling activity. West Virginia has adopted the Natural Gas Horizontal Well Control Act on December 14, 2011. It requires any horizontal well utilizing more than 210,000 gallons of water in 30 days (7,000 gpd) have a water management plan. Within that plan they must demonstrate, for surface water withdrawals, that sufficient in-stream flow will be available immediately downstream of the point of withdrawal and methods to be used for surface water withdrawals minimize adverse

impacts to aquatic life (West Virginia Legislature, 2011). If a well used 750,000 (300,000 gallons in a 30 day period effective Jan. 1, 2015) gallons of water to hydrofrack a well, regardless of formation, water-use must be reported. Associated with the application is an initial permit fee of \$10,000 for each well drilled and a \$5,000 fee for each additional horizontal well. Also, record-keeping of all water used and disposed of must be maintained for each well.

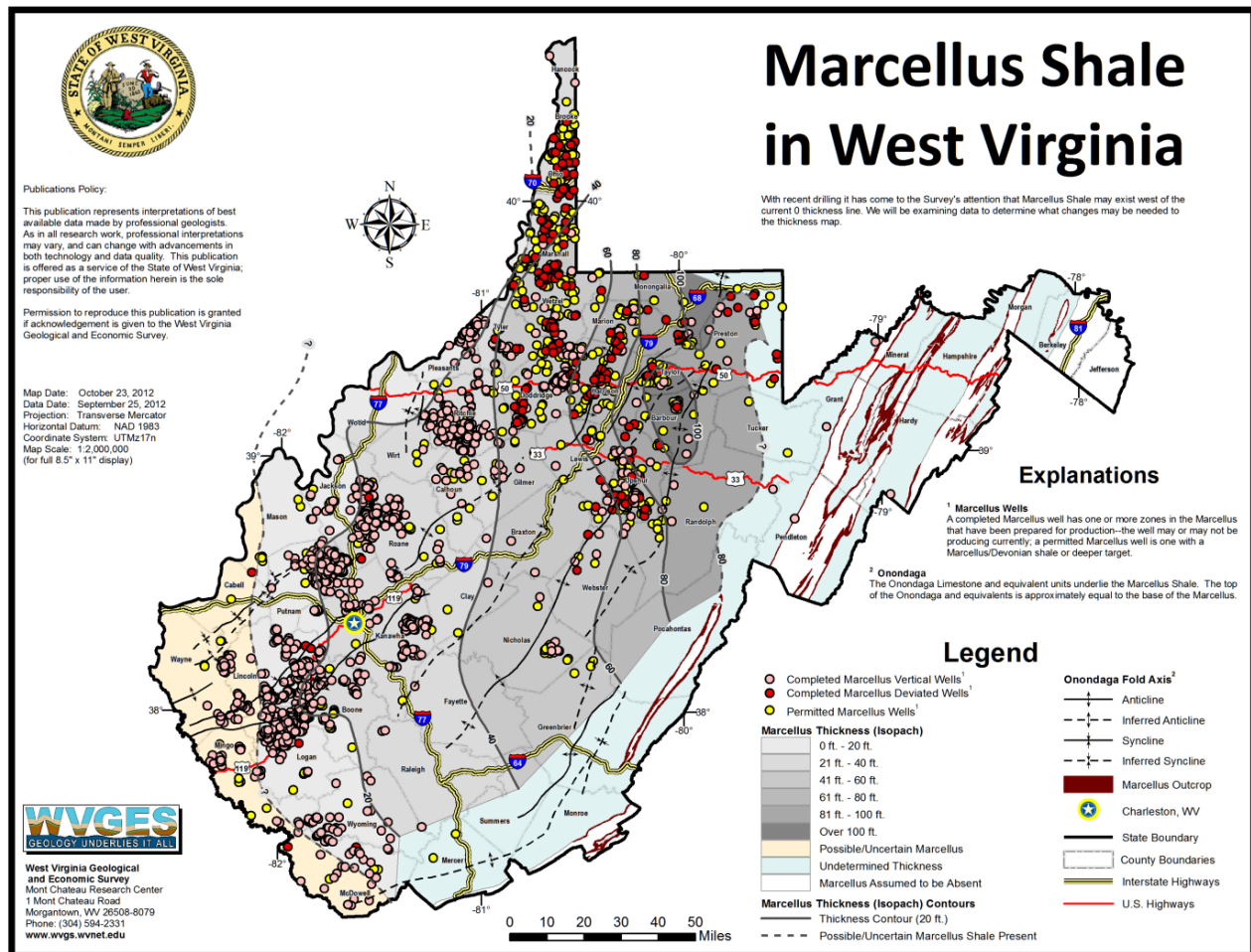


Figure 16: WV Marcellus Shale Wells (WVGES, 2012)

South Carolina

South Carolina is not in the ORB but it does share 22 miles of its border with the ORB and thus needs to be included. South Carolina requires a permit for any interbasin transfer of 1,000,000 MGD or five percent of the seven-day, ten-year low flow is withdrawn. South Carolina recognizes fifteen basins in the state, for the most part on a HUC 6 level.

Other Jurisdictions or Permitting Authorities

Multiple permitting authorities exist within the Ohio River basin as well, each one with different goals and missions in mind. To follow is a non-exhaustive list of these jurisdictions in the basin. Not included in the list below are conservancy districts. Some states like Ohio, give water management rights to conservancy districts made up of land owners or political subdivisions. There are 20 such districts in the state of Ohio alone.



Tennessee Valley Authority (TVA)

Within the Ohio River Basin is a separate USGS-defined HUC 2 watershed called the Tennessee River basin, however, it does flow into the Ohio River. The TVA is a U.S. government-owned corporation which provides electricity, navigation, land management, etc. to the Tennessee valley watershed (Figure 16). They are the permitting authority for the waters of the Tennessee River and its tributaries. A permit is required, under the TVA Act, for any construction activity that may affect navigation, flood control, or public lands. The building of a water intake would be one such construction activity. The permit will contain the maximum withdrawal amount. Generally, a temporary withdrawal does not require a permit. TVA reports about 208 million gpd of water leaves the basin via interbasin transfers, 200 million of which goes to the Tenn-Tom Waterway. TVA's interbasin transfer policy is the same as its permitting policy with one exception; the amount of hydropower lost must be repaid if the transfer is outside the power utility area. (Tennessee Valley Authority, 2012)

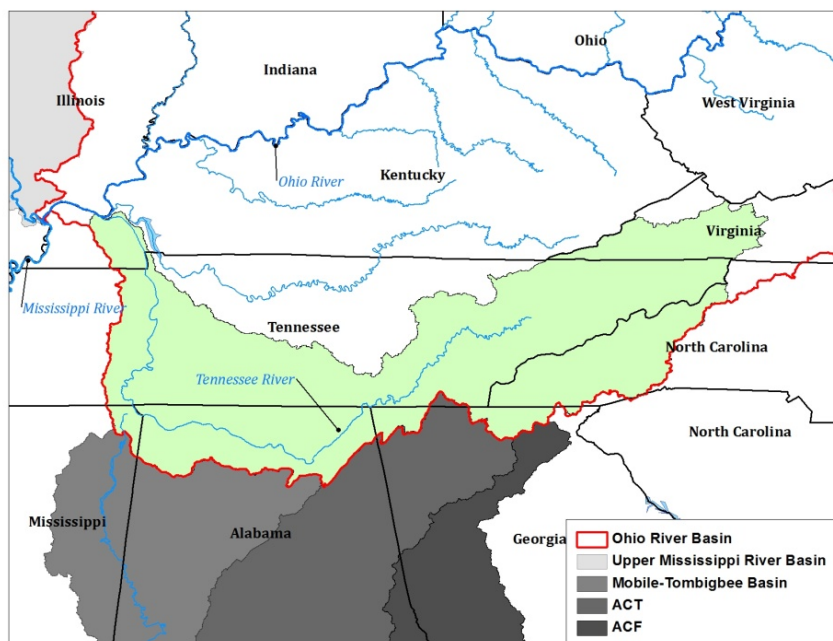


Figure 17: Tennessee River Basin



**US Army Corps
of Engineers®**

U.S. Army Corps of Engineers (USACE)

The USACE is a permitting authority for navigable water ways of the United States (WOUS). There are 4 districts in the Ohio River basin (Figure 17). Section 10 of the Rivers and Harbors Act gives their authority (U.S. Army Corps of Engineers, 2012). The Ohio River and some of its tributaries are such waterways. The USACE requires a permit for any activity that may obstruct navigation including above, in, and below the river e.g. bridge, pipeline, etc. The building of a canal or waterway also requires a permit from the Corps as would horizontal direction drilling under any WOUS.

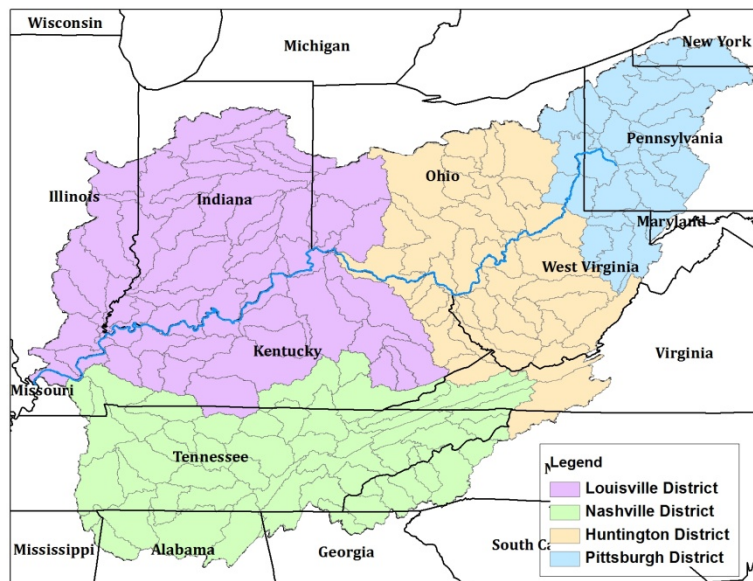


Figure 18: USACE Districts within the Ohio River basin

U.S. Coast Guard



The U.S Coast Guard's (USCG) mission is to protect the maritime economy, environment, and borders. The Ohio River basin is located in the Atlantic Area (Figure 18), encompasses 4 districts (5, 7, 8, and 9) and has 5 Marine Safety Units. The USCG only has permitting authority if a bridge or other type of transportation vessel, e.g. pipeline, spans above a navigable river. The USACE will allow the USCG to review any permits the USACE receive but approval from the USCG is not required.

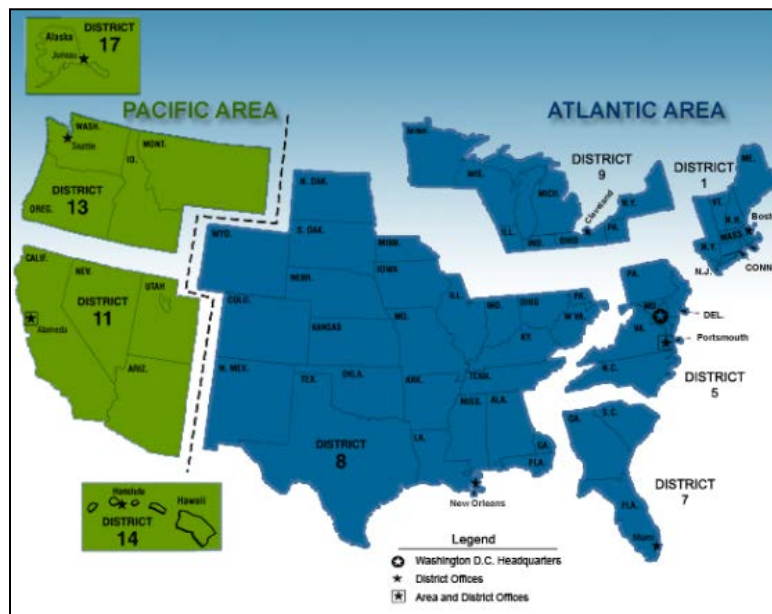


Figure 19: USCG Districts

Conservancy Districts

Conservancy districts are political subdivisions of the state. They are formed at the initiative of local landowners or political subdivisions to solve water management problems, most frequently flooding. Many formed in the 1940's as a result of the Dust Bowl. In addition to controlling floods, other potential authorized purposes include: conserving and developing water supply, improving drainage, collecting and disposing of waste, providing for irrigation. Many conservancy districts also provide recreational opportunities in connection with their water management facilities (Ohio DNR, 2014). For example, there are 20 active conservancy districts in Ohio. Each conservancy district operates under the jurisdiction of a conservancy court, consisting of one common pleas judge from each county that is within the district. Pursuant to implementing its court-approved work plan, a conservancy district has the right of eminent domain, and may charge user fees, levy special assessments, and issue bonds. The Muskingum Watershed Conservancy District (MWCD) is the largest in Ohio (HUC 4 level). The MWCD acts independently from other districts. The MWCD has been in the news recently for legally selling water from there district to oil and gas drillers for fracking purposes. The water is then injected into wells, potentially in different basins. This practice of selling water has since ceased until a water availability report is finished, which is being done by MWCD and USGS. The MWCD can sell its water to another HUC 4 watershed and not be subject to the state's IBT policy because it's at the HUC 2 level. Many of the ORB states have conservancy districts while only Ohio gives water use authority to its watershed (Table 1).



Table 1. List of ORB Conservation Districts

Ohio River Basin Conservation Districts				
State	County or Watershed Representative	# of Members	Eminent Domain?	District Scale
Alabama	Alabama Association of Conservation Districts	67	No	County
Georgia	Georgia Association of Conservation District Supervisors	40	No	Multi-County
Illinois	Association of Illinois Soil & Water Conservation Districts	98	No	County Level
	Illinois Watershed Association	183	No	Multiple
Indiana	Indiana Association of Soil & Water Conservation Districts	92	No	County Level
Kentucky	Kentucky Conservation Districts	121	No	County
	Kentucky Watershed Conservancy Districts	36	No	Watershed
Maryland	Maryland Association of Soil Conservation Districts	24	No	County
Mississippi	Mississippi Association of Conservation Districts	82	No	County
New York	New York Association of Conservation Districts	58	No	County
North Carolina	North Carolina Association of Soil and Water Conservation Districts	96	No	County
Ohio	Ohio Federation of Soil and Water Conservation Districts	88	No	County
	Ohio Watershed Conservancy Districts	20	Yes	Watershed
Pennsylvania	Pennsylvania Association of Conservation Districts	66	No	County Level
Tennessee	Tennessee Association of Conservation Districts	Unknown	No	County
Virginia	Virginia's Soil and Water Conservation Districts	47	No	County
West Virginia	West Virginia Conservation Agency	14	No	Multi-County



Compacts outside of the Ohio River Basin

Multiple neighboring basin compacts (Figure 1) exist outside of the Ohio River basin which can cause a conflict of interest between the state and interstate agency. Many of these compacts have water withdrawal regulations that are different compared to their member state(s).

Great Lakes - St. Lawrence River Compact (aka Great Lakes Compact)

The Great Lakes Compact is made up of 8 U.S. States and 2 Canadian Provinces and was created by the Council for Great Lakes Governors. The Compact for the states came into law Dec. 8, 2008. The compact details how the members manage the water supply. One goal of the compact is to prevent/fix current or future water supply controversies. Registration is required for any water withdrawal amount >100,000 gpd in any 30 days. All Diversions are prohibited with few exceptions (e.g. straddling communities, portable containers that are <5.7 gallons). The Great Lakes Compact defines diversions as water leaving the basin. Water going into the Great Lakes basin is still acceptable. Starting December 8, 2013, a permit will be required if a withdrawal's consumptive use >5,000,000 gpd in 90 days. (Great Lakes—St. Lawrence River Basin Water Resources, 2008)



Susquehanna River Basin Commission (SRBC)

The Susquehanna River Basin Commission is an interstate commission of New York, Pennsylvania, and Maryland focused on water resource management. The SRBC requires water withdrawals of greater than 100,000 gpd to obtain a permit. If the withdrawal is greater than 20,000 gpd for consumptive- use, a permit is also required. Any water being transferred into the basin requires a permit, and a permit is required if the transfer is leaving the basin and greater than 20,000 gpd. Wells drilled within the basin require SRBC approval. The SRBC charges a fee for water use.



Delaware River Basin Commission (DRBC)

The DRBC is an interstate water resource agency that is made up of New York, Pennsylvania, Delaware, and New Jersey. The DRBC requires a permit if the water withdrawal is greater than 100,000 gpd. The DRBC also charges a fee for water use. All drilling in the basin requires DRBC approval regardless of geological formation or direction of drill head. All drilling has been postponed until new regulations are finalized.



Upper Mississippi River Basin Association (UMRBA)

UMRBA is a 5 member state meant to maintain communication and cooperation among the states on matters related to water planning and management (Upper Mississippi River Basin Association, 2012). UMRBA asks that if a water withdrawal is greater than 5,000,000 gpd in any 30 days, the withdrawal must offer to consult with other signatory states.



Interstate Commission on the Potomac River Basin (ICPRB)

ICPRB is a 4- member state commission including Virginia, Pennsylvania, Maryland, and West Virginia. They have water resource and quality management responsibilities for the Potomac River basin. ICPRB does not have water resource regulations in place at the time of this report.

ACT/ACF Tri-State Water Basin Compacts

The ACT/ACF compacts are congressionally authorized negotiation processes for Georgia, Alabama and Florida to negotiate water allocation formulas for the Apalachicola-Chattahoochee-Flint (ACF) and the Alabama-Coosa-Tallapoosa (ACT) River basins (ACT/ACF Tri-State Water Basin Compacts, 2002). While the ACT/ACF compacts still exist, the commissioners of the compact have not met for quite some time and is not functioning at full potential as of late.



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Appendix A: Summary of Water Resource Laws and Regulations in the Ohio River Basin

State	Water Source ¹⁰	Water Withdrawals			Interbasin Transfer Policy	Drought Response	Water Withdrawals with regards to Oil and Gas Wells
		Reporting Required if	Registration Required if	Permit Required if			
Alabama	Surface Water	>100,000 ¹	>100,000 ¹		No specified policy	Normal - routine monitoring	No specified policy
	Ground Water	>100,000 ¹	>100,000 ¹	>100,000 ¹		Advisory - routine monitoring	
	PWS ¹⁴	Any amount	Any amount	>100,000 ¹		Watch - press release, increases monitoring	
				Any amount		Warning - water conservation encouraged	
Georgia	Surface Water	>100,000 gpd		>100,000 gpd	No specified policy	Pre-drought - outdoor watering schedule	No specified policy
	Ground Water	>100,000 gpd		>100,000 gpd		Level 1 - increased outdoor watering schedule	
	Agriculture	>100,000 gpd ²	Covered under permitting requirements	>100,000 gpd ²		Level 2 - increased outdoor watering schedule	
						Level 3 - increased outdoor watering schedule	
Illinois	Surface Water	>100,000 ¹	>100,000 ¹		No specified policy		No specified policy
	Ground Water	>100,000 ¹	>100,000 ¹	It affects navigation		Individual communities set own restrictions	
	PWS	Any amount	>100,000 gpd ¹				
Indiana	Surface Water	>100,000 gpd ¹	>100,000 gpd ¹		No specified policy	Normal - routine monitoring	Source and amount of "base" fluids must be reported
	Ground Water	>100,000 gpd ¹	>100,000 gpd ¹	From a navigable waterway in any amount		Watch - voluntary 5% reduction	
						Warning - voluntary 10-15% reduction	
						Emergency - mandatory 15% reduction	
Kentucky	Surface Water	>10,000 gpd ⁶		>10,000 gpd ⁶	Permit Required	Normal - routine monitoring	No specified policy
	Ground Water	>10,000 gpd ⁶		>10,000 gpd ⁶		Drought Advisory - notification of KDMT	
	Agriculture		Covered under permitting requirements	Agriculture is exempt		Level 1 - press release, increased monitoring	
						Level 2 - press release, increased monitoring	
Maryland	Surface Water	10,000 gpd ¹²		Any amount	No specified policy	Normal - routine monitoring	As of January 31, 2013 hydraulic fracturing is prohibited
	Ground Water	10,000 gpd ¹²		>5,000 gpd ¹²		Watch - press release, 5-10% reduction goal	
	Agriculture	10,000 gpd ¹²	Covered under permitting requirements	10,000 gpd ¹²		Warning - 10-15% reduction, some restrictions	
						Emergency - 15-20% reduction mandatory	

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State	Water Source ¹⁰	Water Withdrawals			Interbasin Transfer Policy	Drought Response	Water Withdrawals with regards to Oil and Gas Wells
		Reporting Required if	Registration Required if	Permit Required if			
Mississippi	Surface Water	Any amount		Any amount => 6 inch Surface casing diameter		No specified policy	No specified policy
	Ground Water	>20,000 gpd	Covered under permitting requirements		No specified policy		
North Carolina	Surface Water	>100,000 gpd	>100,000 gpd			Normal - routine monitoring	Horizontal drilling banned until regs established Horz. wells require water management plan
	Ground Water	>100,000 gpd	>100,000 gpd	No specified policy	New withdrawals >2,000,000 gpd requires a permit	Dry - trend analysis	
	Agriculture	>1,000,000 gpd	>1,000,000 gpd			Moderate - drought advisory issued Severe - press release, task force activation Extreme - reallocate resources if needed	
New York	Surface Water	>100,000 gpd ¹ >10,000 gpd ¹³		>100,000 gpd ¹ >10,000 gpd ¹³		Normal - routine monitoring	Natural gas drilling banned in the shale region
	Ground Water	>100,000 gpd ¹	Covered under permitting requirements	>100,000 gpd ¹	Registration is required if >1,000,000 gpd ¹¹	Watch - public supply conserve water	
	Agriculture	>100,000 ⁴		>100,000 ⁴		Warning - voluntary conservation, update plans	
	PWS	>10,000 gpd from PWS outside the water service area		>10,000 gpd from PWS outside the water service area		Emergency - possible local water restrictions Disaster - further water use restrictions	
Ohio	Surface Water	>100,000 gpd ¹	>100,000 gpd ¹		Permit required if >100,000 gpd ⁵	Normal - routine monitoring	Enhanced Recovery drilling requires a permit, must contain volume, source, and rate of water
	Ground Water	>100,000 gpd ¹	>100,000 gpd ¹			Increased Monitoring - increase monitoring	
	Consumptive Use	>10,000 gpd ⁷	>10,000 gpd ⁷	>2,000,000 gpd ⁵		Conservation Actions - voluntary conservation Emergency Response - review supply allocations	
Pennsylvania	Surface Water	>10,000 gpd	>10,000 gpd	No specified policy	No specified policy	Normal - routine monitoring	Water management plan required Identify source & amount of water used pass-by flow req'd
	Ground Water	>10,000 gpd	>10,000 gpd			Watch - press release, voluntary 5% reduction	
	PWS	Any amount	Already covered	Any amount		Warning - press release, voluntary 10-15% red. Emergency - nonessential uses restricted	
Tennessee	Surface Water	>10,000 gpd	>10,000 gpd	Will or will likely	Any new or	Normal - routine monitoring	No specified policy

Appendix A: Summary of Water Resource Laws and Regulations in the Ohio River Basin

State	Water Source ¹⁰	Water Withdrawals			Interbasin Transfer Policy	Drought Response	Water Withdrawals with regards to Oil and Gas Wells
		Reporting Required if	Registration Required if	Permit Required if			
	Ground Water	>10,000 gpd	>10,000 gpd	alter the source stream Affects navigation	increase in transfer for public supply requires a permit	Drought Alert - press release, monitor cond. Voluntary Reductions - voluntary reductions Mandatory Restrictions - mandatory restrictions Emergency Management - emer. declaration	
Virginia	Surface Water	>10,000 gpd ²		>10,000 gpd Portable containers are exempt	Same as permitting process (defined as consumptive loss)	Normal - routine monitoring Watch - increase public awareness	No specified policy
	Ground Water	>10,000 gpd ²	Covered under permitting requirements	No specified policy		Warning - voluntary 5-10% reductions	
	Agriculture	>1,000,000 gpd ²		>1,000,000 gpd		Emergency - mandatory 10-15% reductions, nonessential uses restricted	
West Virginia	Surface Water	>25,000 gpd ⁸	>25,000 gpd ⁸		No specified policy	Normal - routine monitoring	Horizontal wells using >210,000 gpd have a water management plan must demonstrate in-stream flow if >750,000 ⁸
	Ground Water	>25,000 gpd ⁸	>25,000 gpd ⁸	No specified policy		Alert - drought alert issued	
	Agriculture	Voluntary	Voluntary			Conservation - increased monitoring Emergency - may declare drought emergency	

1 if facility has capacity to pump threshold limit

2 average daily withdrawal in a single month

3 capacity to withdraw in any 30 day consecutive period (3 million gallons during a 30 day period)

4 permit only required if failed to register prior to Feb. 15, 2012 and has capacity to withdraw >100,000 gpd

5 30 day average

6 average rate

7 if in a groundwater stress area

8 >750,000 gallons in a calendar month (will be 300,000 per 30 day period effective 01-01-2015)

9 in-stream uses are exempt

10 ground & surface water always included, all other sources are excluded unless different

11 registration not required if already permitted

12 Annual Average

13 if taken by vessel

14 PWS stands for Public Water Supply