# 2021 Annual Report

## Kentucky Division of Water

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# EXECUTIVE SUMMARY

Dear Reader,

The Kentucky Division of Water (the Division) is pleased to provide its Annual Report for Fiscal Year 2021 (July 1, 2020 – June 30, 2021). The Annual Report summarizes the achievements of Division scientists, specialists, engineers, and administrative staff in meeting the goals of:

- Protecting, managing, and restoring water resources
- Full compliance with the Safe Drinking Water Act and Clean Water Act
- Conducting effective water resources planning
- Promoting better data management and communication

The Division approached the ongoing challenges presented by the COVID-19 pandemic by comprehensively assessing and streamlining many of its processes and leveraging available electronic resources to expand online information, data, and communication capability for staff, constituents, and stakeholders, while continuing to provide outstanding customer service to the regulated community and the public.

Online communication options enabled the Division to develop and provide training for Municipal Separate Stormwater Systems (MS4s) and pretreatment personnel, offer a remote, monitored examination option for water well drillers, and allow virtual inspection of drinking water facilities for sanitary surveys. The Division also expanded the ability of the regulated community to submit documentation online, with the additional benefit of reducing the time and costs associated with sending and receiving physical mail. Additionally, an expanded database now provides users with easy access to information from the Division's Water Resources Branch.

In early June 2021 the Division placed the Triennial Review of Kentucky water quality standards, contained in administrative regulations located at 401 KAR Chapter 10, on public notice. For the first time, the Division was able to offer an online public hearing, which was the most well-attended Triennial Review public forum that the Division has ever hosted. Additionally, stakeholders have submitted several comments that will be considered for water quality standards updates.

The $16 million Bullock Pen Lake Dam repair project, which began in 2019, has progressed and the Division anticipates completion by October 2021. The long-term improvements made to this dam will help protect and preserve the main water supply for customers served by the Bullock Pen water district and maintain an ongoing Kentucky Division of Fish and Wildlife Resources (KDFWR) fishery.

Division partnerships with federal, state, regional, and local agencies and non-governmental organizations enabled more efficient and streamlined responses to flooding and water outages during the winter of 2020-2021. The Division also partnered with the U.S. Environmental Protection Agency (EPA) to introduce the new Circuit Rider Program, which provides technical and operational assistance to water systems with ongoing compliance issues. These activities, in addition to continued efforts that include training and support to a large network of volunteers, has allowed the Division to implement and support its mission.

I invite you to read more about the important accomplishments the Division achieved in the last year, and look forward to continuing to work with stakeholders and the public to manage, protect, and enhance the quality and quantity of the Commonwealth's water resources for present and future generations through voluntary, regulatory, and educational programs.

Sincerely,

Carey Johnson
Director

# COMPLIANCE & INSPECTIONS

## EPA Circuit Rider Program

The EPA Circuit Rider Program provides technical assistance to rural water systems to address day-to-day operational, technical, or financial issues. The "circuit" encompasses a group of systems that are regionally in close proximity to each other and meet the following criteria:

- Categorized as small (<10,000 customers)
- Each facility is within a two-hour drive of the others so all systems can be visited within one week
- Employs operators who are willing to participate and pro-actively work with the Circuit Riders
- Need assistance to attain or maintain compliance

The EPA established an eastern Kentucky circuit consisting of the Cities of Lynch, Fleming-Neon, and Cumberland in Harlan County. EPA Region 4 and the Division held coordination planning meetings in March and April of 2021 to facilitate implementation of the program, with the first visits scheduled in 2022. Facilities will continue receiving assistance for 18 months, with the goal of helping them achieve and maintain compliance with their KPDES permits.

## Winter Water Outages

Late December 2020 brought a winter storm to the holiday season in Kentucky. The effects of the storm and fluctuating temperatures were pronounced in the city of Hazard and all of Perry County. The day before Christmas started with rainfall and temperatures in the 50's, but changed to snow and ice with temperatures falling into the teens on Christmas Day. The Hazard Water Department began observing and repairing water line breaks on December 24, which accelerated by December 28 with breaks occurring across the county due to rapidly rising temperatures.

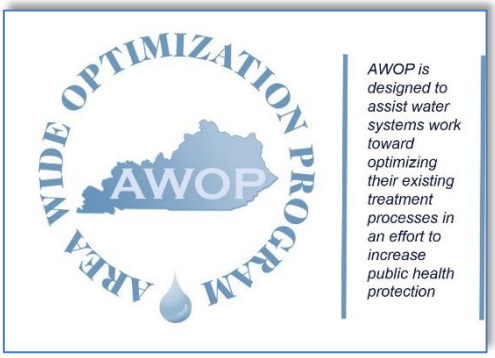
On December 30, the City of Hazard issued an emergency declaration to conserve water as line breaks, low tank levels, and water outages spread throughout the county. The system continued to identify and repair leaks into the New Year, often turning a line section back on only to discover formation of a new leak. Water shortages and total outages in Perry County persisted until January 13, when the system reported that it restored water service to all customers. A team consisting of the Division, the Kentucky Emergency Response Team, and Kentucky Rural Water Association coordinated their efforts for the duration of the event to track emerging issues and coordinate assistance to affected areas and customers. As a result, the system was able restore water service much quicker than in similar past events.

# DRINKING WATER

## Area Wide Optimization Program (AWOP)

The Division recognizes and appreciates drinking water systems across the Commonwealth that have achieved better performance standards while participating in the AWOP. The EPA administers, and the Division implements, this initiative to facilitate voluntary efforts by drinking water systems to achieve optimization goals that exceed current regulations. Participation in the AWOP expands the Division's ability to provide technical assistance to public water systems, and the successful protocols instituted in Kentucky are used as best management practices in the national AWOP.

Drinking water systems utilize AWOP tools and methods to increase consumer protection by reducing turbidity and disinfection byproducts (DBPs). Turbidity, or cloudiness, is a measurement of particles in water including soil, algae, bacteria, viruses, and other substances. DBPs form when chlorine, used for disinfection, reacts with organic material found in source water.




This year, the Jamestown Municipal Water Works water treatment plant and the Jackson County Water Association received the Kentucky AWOP Champion Award. This award recognizes a large and a small system – Jamestown Municipal Water Works and Jackson County Water Association, respectively – and the overall compliance record achieved by each system for the previous three years, while taking into account the high level of turbidity optimization achieved.

Fourteen drinking water plants earned special recognition for achieving the AWOP turbidity goals 100% of the time in 2020, and forty-eight plants received a certificate for meeting the AWOP turbidity goals and criteria. Additionally, seven drinking water systems received a certificate for meeting the AWOP DBP goals and criteria in 2020.

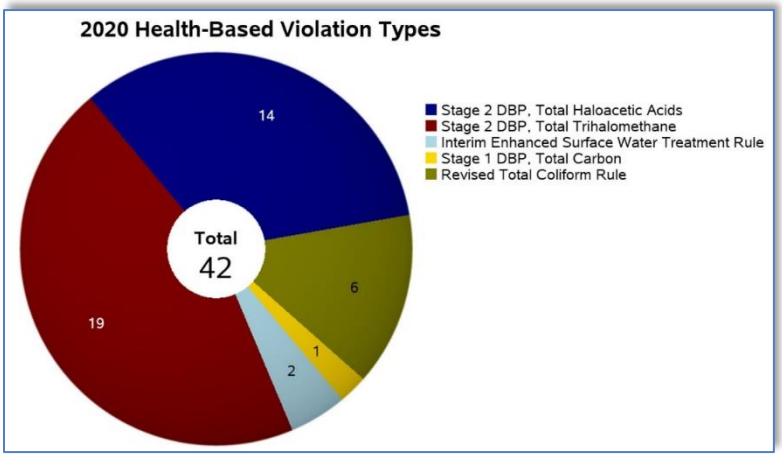
For additional information about the AWOP, visit https://tinyurl.com/KYAWOP.

## Annual Safe Drinking Water Act (SDWA) Compliance Report

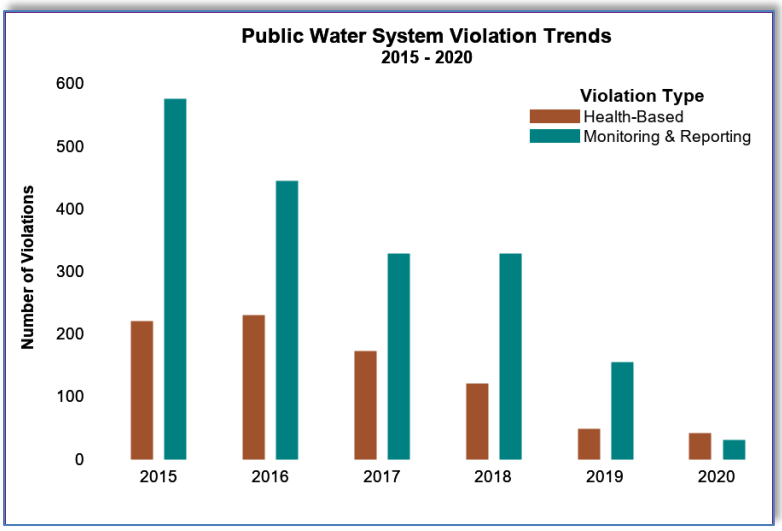
The SDWA requires systems to test produced water regularly for more than 100 contaminants, and to take corrective action and notify its customers when a contaminant exceeds drinking water standards. Kentucky's 2020 Drinking Water Compliance Report demonstrates that 433 public water systems in the Commonwealth consistently produce excellent quality water and have a high rate of compliance with the SDWA.

The report summarizes monitoring results and compliance data, and shows that monitoring and reporting violations decreased by 80% in 2020 in comparison to 2019. The availability of a new electronic submittal process prompted by the COVID-19 pandemic and increased compliance assistance provided by the Division, technical assistance partners, and the efforts of public water system personnel, all contributed to the significant improvement in SDWA compliance.

Violations related to disinfection byproducts (DBPs) constituted approximately 78% of all 2020 health-based drinking water violations in Kentucky, but have dramatically decreased from 118 in 2018 to just 33 violations in 2020. Additionally, no water system exceeded federally established limits in 2020 for volatile and synthetic organic compounds or inorganic compounds.




Since 2016, overall health-based violations have decreased by approximately 79%. An anticipated increase in health-based violations occurred in 2015 and 2016 when consecutive systems, which purchase water from another system and re-distribute it to customers, first became subject to the DBP rule and its new requirements. Since then, public water systems have addressed and mitigated many DBP occurrences, resulting in a nearly 86% decrease in DBP violations since the initial increase in 2015 and 2016.




The Kentucky Annual Drinking Water Compliance Report is online at: https://eec.ky.gov/Environmental-Protection/Water/Drinking/Pages/Annual-Compliance-Reports.aspx.

## Virtual Sanitary Surveys

A "sanitary survey" is an inspection to determine the capability of a public water system to supply safe drinking water to its customers, and is one of the most intensive reviews performed by the Division. The Division's Sanitary Survey efforts continued through the COVID-19 pandemic of 2020 and 2021, but the pandemic limited the ability of Division staff to enter physical premises to conduct certain activities.

In response, the Division proactively developed new virtual Sanitary Survey procedures to fill onsite assessment gaps caused by the pandemic. Newly developed correspondence explains the process to water systems and provides instruction on a new electronic form that facilitates sharing facility records and large documents with the inspector. The new inspection procedure adds virtual components to Sanitary Surveys, including using video and web-based conferencing tools to ensure adequate visual observation of facilities and documents that are important components of the Sanitary Survey. To continue adhering to Kentucky's Healthy at Work guidelines, the Division developed and provided virtual Sanitary Survey training to all Division staff involved in the Sanitary Survey process.

# FLOODING & DAMS

**Flooding – February/March 2021**

Several rounds of severe storms in February and March 2021 deposited excessive rainfall, snow, and ice across the state, which resulted in widespread flooding and power outages that affected many drinking and wastewater systems, especially in eastern Kentucky. Consequently, two federal disasters were declared for these events.

A team including the Division, the Kentucky Emergency Response Team, the Office of Energy Policy, and Kentucky Rural Water Association met daily to track emerging issues and coordinate assistance to affected systems. The Division also recorded data on a daily basis that became critical in tracking issues and allowing the team to assess and prioritize needs, relay information to appropriate personnel, and efficiently dispatch resources to the affected areas. Lessons learned from previous years and emergency events helped the Division and its partners address 2021 storm damage and issues more efficiently and effectively, all while continuing to evaluate improving responses to disruptive events.

Additionally, the Division assisted 87 homeowners and 29 businesses with permitting for flood-damaged structures, and issued 49 approvals to counties and municipalities for flood-damaged roads, bridges, and water lines. Staff worked with community officials and local floodplain managers during and after these events to provide guidance in applying for public and individual assistance, and to provide help through the expedited permit review process, local permitting procedures and ordinance requirements, and mitigation funding opportunities.

The Division provided additional coaching to local floodplain managers through a series of Community Assistance Contacts and general technical assistance, which focused on specific flood response and recovery circumstances in each community.

## Silver Jackets

Silver Jackets is a state-led, US Army Corps of Engineers (USACE)-supported consortium that discusses and seeks innovative solutions to flood risk management in the Commonwealth. The Kentucky Silver Jackets "team" consists of representatives from the Division, USACE, the Federal Emergency Management Agency (FEMA), US Geological Survey (USGS), National Weather Service (NWS), Nature Resources Conservation Service (NRCS), KY Emergency Management, KY Geologic Survey (KGS), KY Transportation Cabinet, KY Department for Local Government and others from local governments, and The Nature Conservancy. Silver Jackets collaborative efforts over the years have led to development of multiple Flood Inundation Mapping (FIM) interactive tools, flood resilience feasibility and alternatives analysis studies, and more recently, an effort to promote Nature Based Solutions to mitigate flooding, drought, and landslide natural hazards. More information on the Kentucky Silver Jackets Team efforts is located at https://silverjackets.nfrmp.us/State-Teams/Kentucky.

## Bullock Pen Lake Dam Repair

The Division oversees the State Owned Dam Repair (SODR) program that rehabilitates state-owned dams that do not meet state regulatory requirements. The largest project undertaken by the SODR program includes upgrades to the Bullock Pen Lake Dam in Grant and Boone Counties, which provides the main water supply source for the Bullock Pen water district. Construction on the nearly $16 million dollar project began in early 2019, and involved installation of a concrete labyrinth spillway to upgrade the hydraulic capacity (ability to pass or store water) of the dam. A new stilling basin constructed below the labyrinth spillway, decommissioning of the original, severely eroded spillway channel, and earthen embankment improvements will enhance the dam's long-term stability and decrease maintenance requirements for the owner (KY Dept. of Fish and Wildlife Resources). The Division expects project completion prior to October 2021. View progression of the project in this video: https://youtu.be/b7Ip4Wggjx8.

## Dam Inspections

The Division inspected all high hazard dams (classified as having "structures located such that failure may cause loss of life or serious damage to houses, industrial or commercial buildings, public utilities, main highways or major railroads") it regulates during calendar year 2020, including 283 inspections completed during State Fiscal Year 2021. The Division had oversight and received construction reports for 32 dam construction projects, with construction completed on 11 projects. The Division also issued Authority to Impound letters for four new dam construction projects.

## Public Access Portal – Dams, Floodplain Development, and Water Quality Certification eSearch

The Division significantly expanded online public access to permit applications and final decision documents to enable efficient public inspection and review. Beginning in January 2020, all dam safety and floodplain development applications became available on the Department of Environmental Protection (DEP) eSearch Site for pending approvals: http://dep.gateway.ky.gov/esearch/search_pending_approvals.aspx. This generally occurs within 5 days of application receipt. The application documents remain available until the Division issues a final permitting decision. As of June 2021, over 1300 development applications were available for public inspection prior to issuance of the final permitting decision.

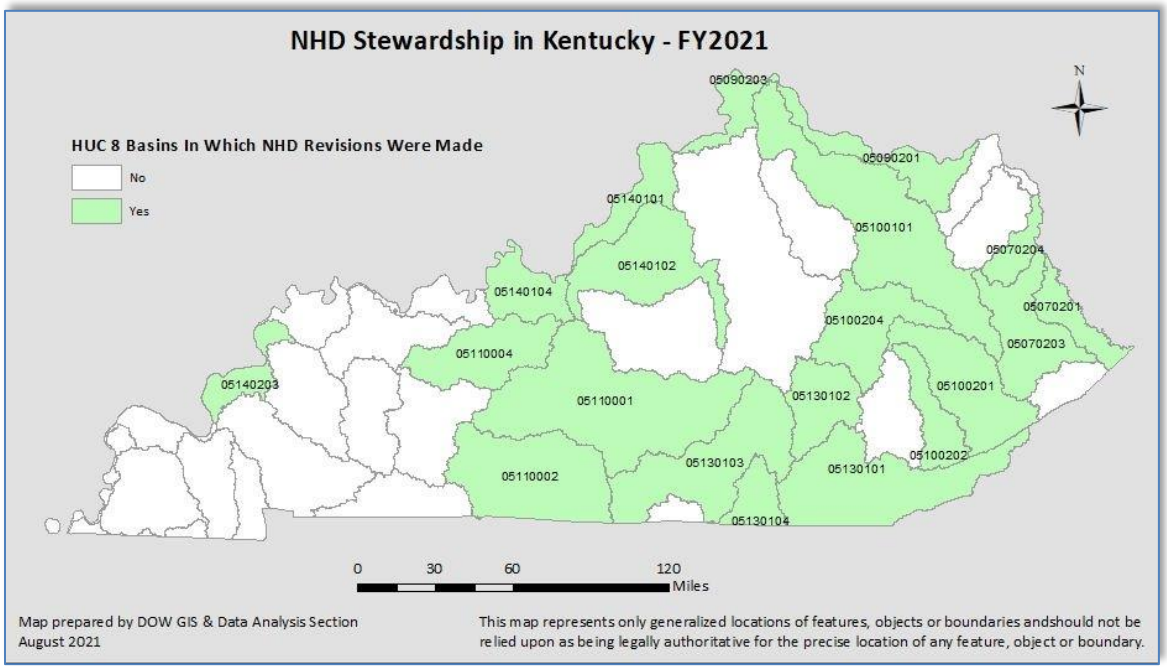
The Division also completed a 9-month project to provide historic water quality certifications and dam safety and floodplain development permits, issued after December 2018, on the DEP eSearch Site for issued approvals: http://dep.gateway.ky.gov/esearch/search_issued_approvals.aspx. As of June 2021, over 2500 permits and certifications were available. Additional search fields are available to help users narrow search results to their specific documents of interest.

# GIS & MAPS

## National Hydrography Dataset (NHD) Stewardship

Through a Memorandum of Understanding and other agreements with the US Geological Survey (USGS), the Division became Kentucky's principal steward for the NHD in 2009 and for the National Watershed Boundary Dataset (WBD) in 2017. Stewardship of the NHD and WBD relies heavily on state stewards, who represent the interests of their state's hydrography user community and provide the USGS with the most widely accepted representation of surface water characteristics.

The Division accepts input from other agencies and organizations, considers any changes to the NHD/WBD, and updates the NHD/WBD if appropriate. Typical issues addressed by the Division include changes due to human activities (road construction, mining, etc.), stream rechanneling (due to natural and/or human activities), or changes to waterbodies.

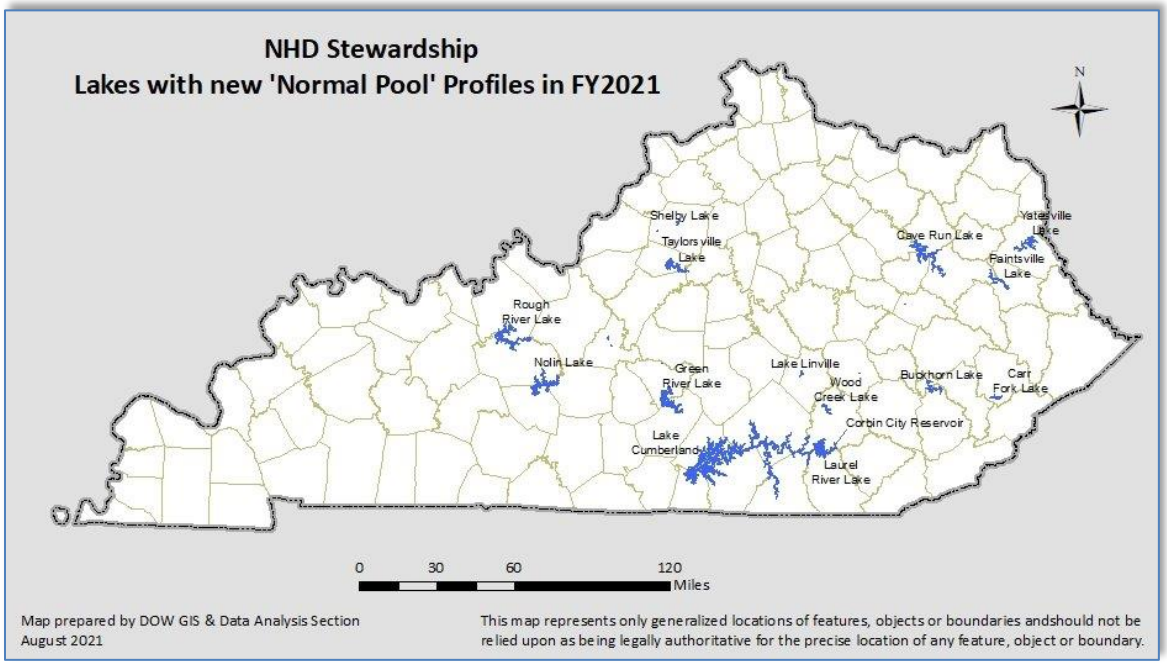



## NHD Normal Pool Lake Profiles

In late 2019, the Division began a project to update the NHD waterbody polygon profiles of over 900 impounded lakes to reflect the lake profile at its normal pool elevation. The purpose of this project was to enable the proper calculation of water quality assessments that the Division conducted for the 2020

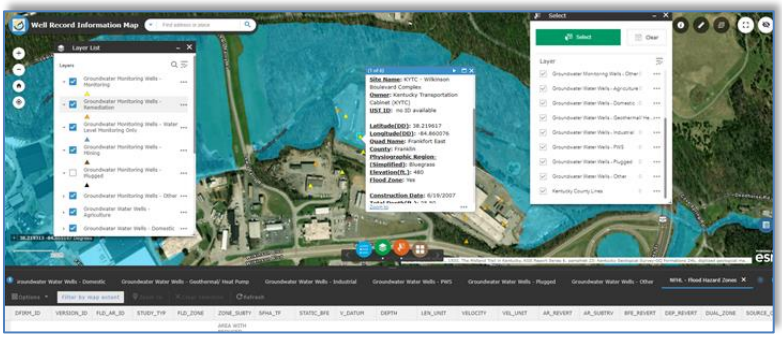
Integrated Report to Congress. Lake profiles were generated using Light Detection and Ranging (LiDAR) elevation data collected as part of the Kentucky From Above program (https://kyfromabove.ky.gov), which the Division has invested in heavily over the years.

From August 2020 through June 2021 normal pool profiles were generated for eleven US Army Corps of Engineers lakes using summer pool elevations. Normal pool profiles were not generated for Kentucky Lake and Lake Barkley due to both lakes crossing the state boundary into Tennessee.




## Well Record Information Viewer

The Well Record Information Viewer is an interactive tool created to provide Kentucky certified well drillers access to available well record information, current Agency Interest information, and a portal link to historic data. This viewer is easily accessible via an electronic form (e-form) link at time of submittal, but is also available to the public from the Division's Water Maps Portal (http://watermaps.ky.gov/well). Upgrades to this viewer in FY2021 include tools that allow a more robust interaction with data, including flood hazard boundaries and the ability to filter, search, and export information.

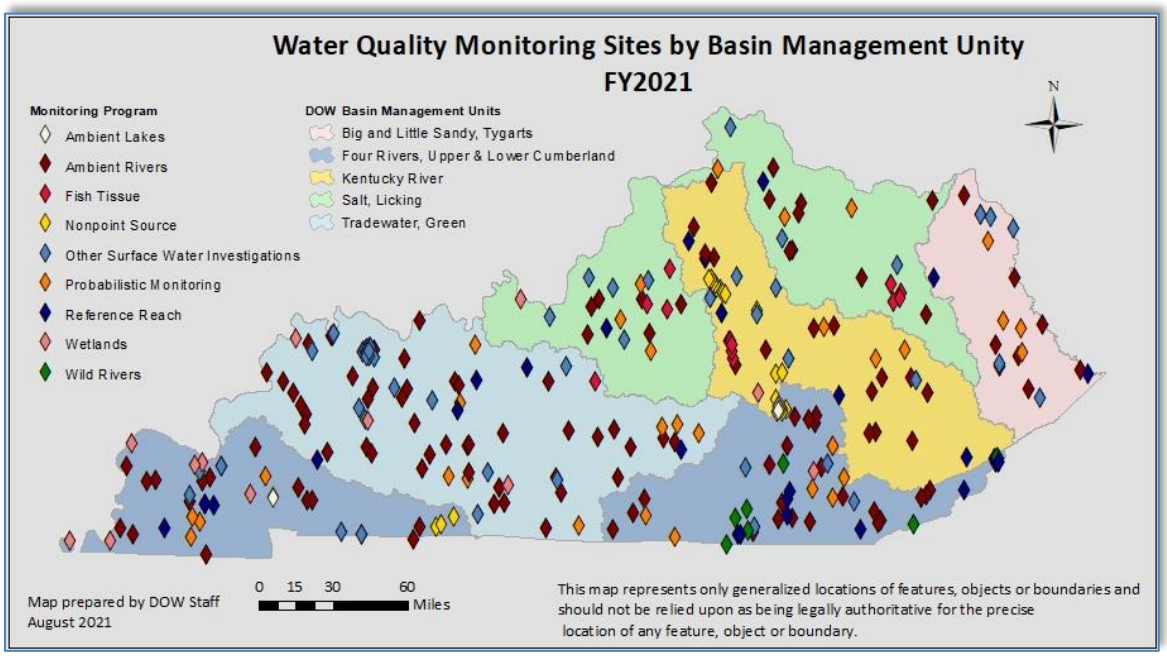


# MONITORING & ASSESSMENTS

## Surface Water Monitoring

From July 2020 through June 2021, the Division conducted approximately 1,400 monitoring site visits at 289 locations across the Commonwealth. This work includes collecting samples from streams, rivers, springs, wetlands, lakes, and reservoirs to assess water quality. It also assists in better understanding of the condition of Kentucky's water resources through:

- Targeted monitoring of streams with high quality aquatic habitats, watersheds with emerging water quality concerns or issues, and watersheds with projects designed to improve water quality;
- Probabilistic monitoring of streams and wetlands using randomly selected sites to project current aquatic conditions statewide or in a particular river basin;
- Monitoring for potential fish consumption, drinking water, or recreational advisories through fish tissue collection and response to harmful algal bloom reports; and
- Intensive water quality monitoring in watersheds to support the development of nonpoint source watershed plans.




Monitoring highlights from the past year include:

- **Ambient Rivers** and **Ambient Lake** sampling occurred at 129 stream and lake stations, with 911 total station visits to assist in water quality assessments and determining long-term trends.

- The **Fish Tissue Program** collected both whole body and filets to examine contaminant levels in fish at 14 stations among six lakes.
- The **Probabilistic Stream Bio-Assessment Program** sampled randomly selected target streams to assess stream conditions across the Commonwealth to meet federal Clean Water Act (CWA) requirements. Samples from 33 stream segments for water chemistry, fish, and insects were collected.
- The **Reference Reach Program** sampled trend monitoring sites to determine variation in water chemistry and aquatic life in Kentucky's least-disturbed streams. Condition checks at other reference locations are used to periodically evaluate whether stream segments are still high quality and minimally disturbed. Aquatic bugs, fish, and water chemistry samples were collected from 29 sites over the last year.
- The **Intensive Surveys Monitoring Program** collected data used by the Division to support watershed plan development and efforts to improve area water quality. The program monitored 26 stations in West Hickman Creek (Fayette County), Sinking Creek (Logan County), Renfro Creek (Rockcastle County), Glenns Creek (Frankfort and Woodford Counties), and Paint Lick Creek (Madison County), totaling 191 station visits.
- The **Wetlands Program** conducted 11 avian surveys and 12 amphibian surveys at 12 stations selected for EPA's 2021 National Wetland Condition Assessment survey. Additionally, vegetation surveys occurred at 26 stations in the Western Alleghany Plateau region. This monitoring data will be utilized for the continued development and reevaluation of wetland assessment tools.

## 2021 Triennial Review

The federal Clean Water Act (CWA) gives states the responsibility to establish objectives or goals for managing, maintaining, and enhancing water quality within their boundaries. States are required to review state water quality standards (WQS) and hold a public hearing and comment period every three years; this process is known as a "Triennial Review", pursuant to Section 303(c)(1) of the CWA.

On June 7, 2021, the Division gave public notice of its 2021 Triennial Review, including a 60-day public comment period, and held a virtual public listening session to satisfy CWA requirements. The virtual listening session, held on June 22, was the most well attended that the Division has hosted for a Triennial Review in recent years. Additionally, the recording of the virtual listening session was made available on the Division's website.

In evaluating potential updates to WQS, the Division will consider the latest recommended water quality criteria updates from the EPA, updating criteria for aquatic life for ammonia, establishing aquatic life criteria for aluminum, updating human health criteria for 94 pollutants, and designating new Outstanding State Resource Waters and Exceptional Waters in addition to considering input from stakeholders. The

Division tentatively plans to pursue any proposed WQS changes, pursuant to KRS Chapter 13A requirements, in 2022.

More information regarding the 2021 Triennial Review can be found online: https://eec.ky.gov/Environmental-Protection/Water/Regs/Pages/Triennial-Review.aspx.

Existing Kentucky WQS regulations in 401 KAR Chapter 10 can be found on the Legislative Research Commission website at https://apps.legislature.ky.gov/law/kar/TITLE401.HTM.

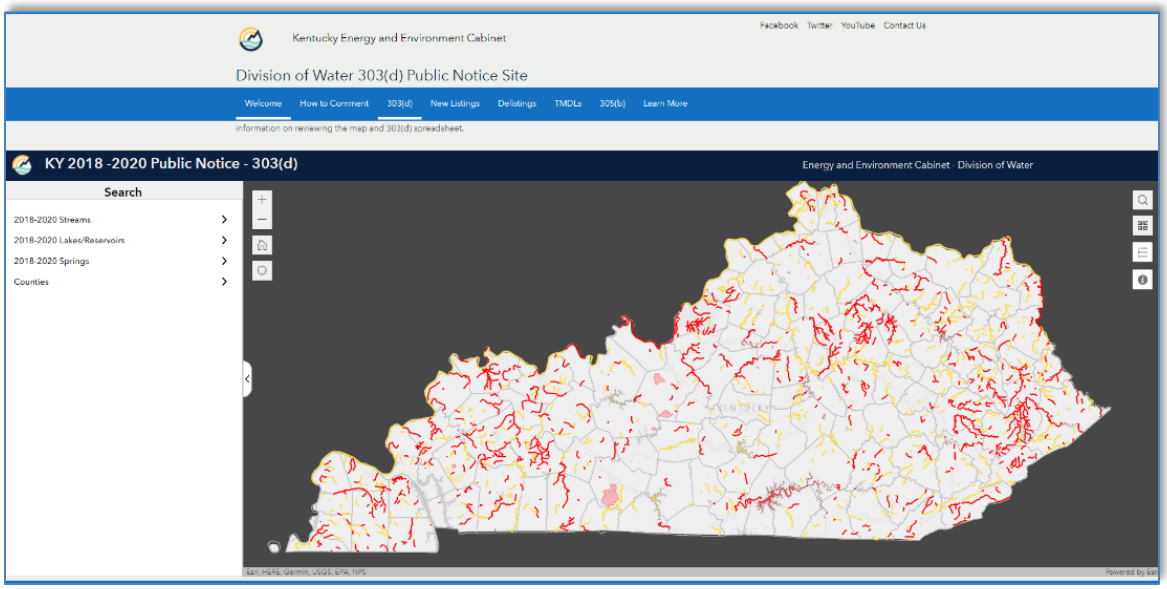
### 2018/2020 305(b)/303(d) Assessment Updates and New 303(d) Public Notice Web Site

On June 4, 2021, the Division opened a 60-day comment period on the 2018/2020 draft 303(d) list of impaired waters, as required by KRS 224.70-150.

Section 305(b) of the CWA requires states to report the health of the waters of the Commonwealth to Congress every two years. This includes an assessment regarding whether the water quality of individual waterbodies is sufficient to support designated uses that, in Kentucky, include primary contact recreation, secondary contact recreation, aquatic life, domestic water supply, fish consumption, and outstanding state resource waters. Designated use attainment is based on water quality sampling and assessment methodologies developed by the Division and approved by the EPA. Information on all assessed waters is presented in the draft 2018/2020 305(b) list.

Section 303(d) of the CWA requires states to identify impaired waters, the pollutant(s) causing the impairment, and to develop a total maximum daily load (TMDL) for each pollutant. A TMDL is the amount of a pollutant a water body can receive and still meet water quality standards, and is intended to support strategies for restoring water quality. Information on impaired waters and priority rankings are presented in the draft 2018/2020 303(d) list.

Monitoring that occurred to update assessments for the draft 2018/2020 305(b) and 303(d) lists was primarily from streams, rivers, and reservoirs in the Green and Tradewater Rivers Basin Management Unit (BMU), the Kentucky River BMU, and the Upper Cumberland and Four Rivers BMU. Monitoring also occurred outside of these particular BMUs to provide statewide assessment updates. In total, 915 assessments were completed to support developing the draft 2018/2020 305(b) and 303(d) lists.




Division staff collaborated with Energy and Environment Cabinet GIS and web developers to create a new, dedicated public notice website for the 2018/2020 assessment cycle. The site provides the public with interactive maps, videos, and spreadsheets to view the draft 303(d) list, new listings, proposed delistings, waters with completed TMDLs, and the 305(b) list. Assessment summaries and TMDL documents are also available through the map dashboards or in the provided spreadsheets. The website can be accessed at https://2018-2020-303d-public-notice-kygis.hub.arcgis.com/.

## Total Maximum Daily Load (TMDL) Development Updates

In June 2021, the Division opened a 30-day public comment period on two draft reports that address bacteria-impaired streams within the Big Sandy River, Little Sandy River, Tygarts Creek, and Kentucky River basins. These TMDL reports provide critical information needed to restore water quality in these waters.

The two new reports complete TMDLs for 90 impaired stream segments in the following counties: Bell, Boyd, Boyle, Breathitt, Carter, Casey, Clark, Clay, Estill, Fayette, Floyd, Franklin, Garrard, Grant, Jessamine, Johnson, Lawrence, Leslie, Letcher, Lincoln, Madison, Martin, Mercer, Perry, Pike, and Wolfe. The reports are part of the Kentucky Statewide Bacteria TMDL, an ongoing effort to complete TMDLs for more than 350 stream segments by the end of 2022.

After EPA approval, these reports will be available at https://eec.ky.gov/Environmental-Protection/Water/Protection/TMDL/Pages/Approved-TMDLs.aspx.

For more information on the TMDL Program, visit https://eec.ky.gov/Environmental-Protection/Water/Protection/TMDL/Pages/default.aspx.

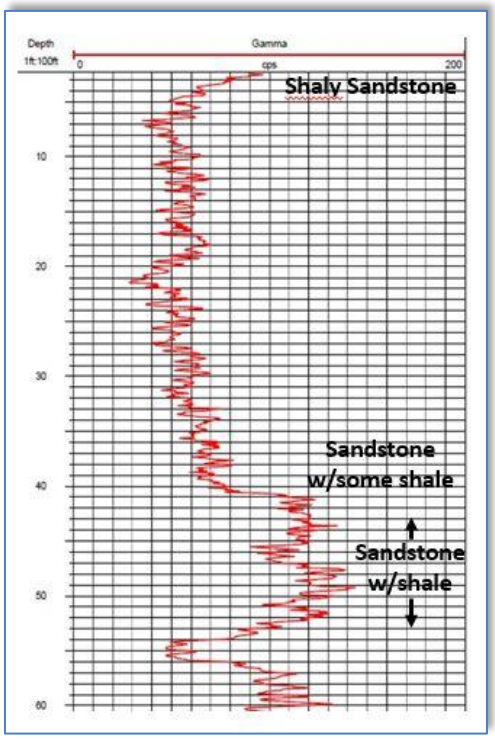
**Collaborations with Kentucky Geological Survey (KGS)**

The Division works closely with KGS on programs related to groundwater. This includes the Kentucky Inter-agency Statewide Ambient Groundwater Monitoring Network, as well as groundwater research projects focused on unique aquifers across the state.

The Division and KGS have worked together to characterize groundwater resources and manage related data for several decades. While the Division oversees the planning and logistics of statewide groundwater monitoring, KGS assists with sample collection at numerous springs in the Bluegrass Region.

During the summer of 2020, KGS had a unique opportunity to investigate an agricultural water supply well that connects to the Royal Spring karst aquifer near the Kentucky Horse Park. Royal Spring supplies drinking water to the City of Georgetown and most of Scott County. The agricultural well near the Kentucky Horse Park intercepts the Royal Spring main conduit system, and regularly scheduled maintenance on the well allowed the opportunity to evaluate it with a specialized camera.

Unfortunately, the COVID 19 pandemic restricted the ability to conduct much of the planned fieldwork, so Division staff collaborated with KGS to collect valuable data that will help better characterize this groundwater resource.




A second major collaboration with KGS focused on an industrial water supply well and determining the amount of water available for water withdrawal. The agencies conducted an investigation in a deep well drilled in the sandstone aquifers of western KY, which are located hundreds of feet below ground level and represent valuable groundwater resources in their immediate vicinity. The aquifers from which water is withdrawn must be identified in order to responsibly manage water withdrawals that meet current needs but also maintain the resource for future use. Due to the age of the water supply well, very little information was known about the aquifer in which it was located. KGS assisted the Division by deploying a gamma logging probe in the water supply well to a depth of 850 feet below ground level. The naturally emitted gamma radiation from rocks penetrated by the water supply well were measured, recorded, and interpreted (see example above) to determine their composition and water content. This enabled identification of water-bearing sandstone horizons to inform Division staff of groundwater availability and aid in water withdrawal permitting decisions.

## Watershed Watch in Kentucky (WWKY) Volunteer Monitoring Program

As a founding member of WWKY, the Division continued to support the activities of citizen scientists throughout the Commonwealth in 2021. The WWKY program is comprised of a dedicated group of volunteers that assists the Division in monitoring streams, rivers, and lakes across the Commonwealth and provides invaluable data for areas in which the state has limited resources for sampling. The Division supports the group through technical assistance, logistical support, and training. Division staff that are trained samplers participate three times each year to provide leadership and resources to volunteers.

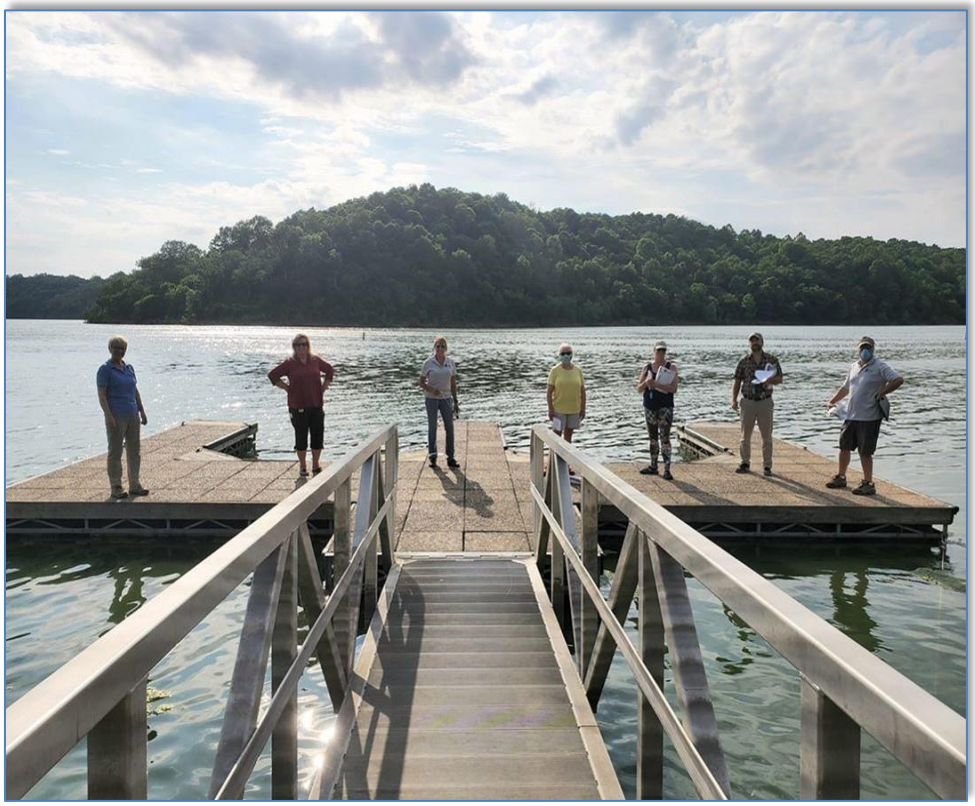
Due to limitations brought on by the pandemic in 2020 and 2021, WWKY focused on supporting the existing volunteer network and increasing awareness across the Commonwealth.

**Youth Stream Team Program**

The Division collaborated with Kentucky 4H Youth Development to engage children from ages 9 - 18 across the Commonwealth in becoming citizen scientists to promote a broader understanding and appreciation of water resources. Through these efforts, 4H leaders and volunteers receive training on scientific field observations and collection of *E. coli* data. Additionally, 4H leaders and volunteers receive a variety of hands-on lessons related to water quality that they can perform with their stream teams. Stream teams collect samples throughout the year, analyze associated data, and complete a community service project.

**Volunteer Lakes Monitoring Program (VLMP)**

In 2019, WWKY began promoting the VLMP across Kentucky, with an initial focus on monitoring lakes that serve as drinking water sources. Program volunteers collect basic data about general lake conditions that is used in tandem with remote sensing models to identify waterbodies that may have various problems, including harmful algal blooms (HABs). This program now includes 28 volunteers at 52 sites in four river basins. In 2020 and 2021, the Division and WWKY organized and conducted outdoor, socially distanced trainings in collaboration with lake associations in the Kentucky, Salt, and Licking River Basins.



Basin Coordinator Perry Thomas (left) and VLMP volunteers at a training event at Taylorsville Lake.

**Cyanobacteria Monitoring**

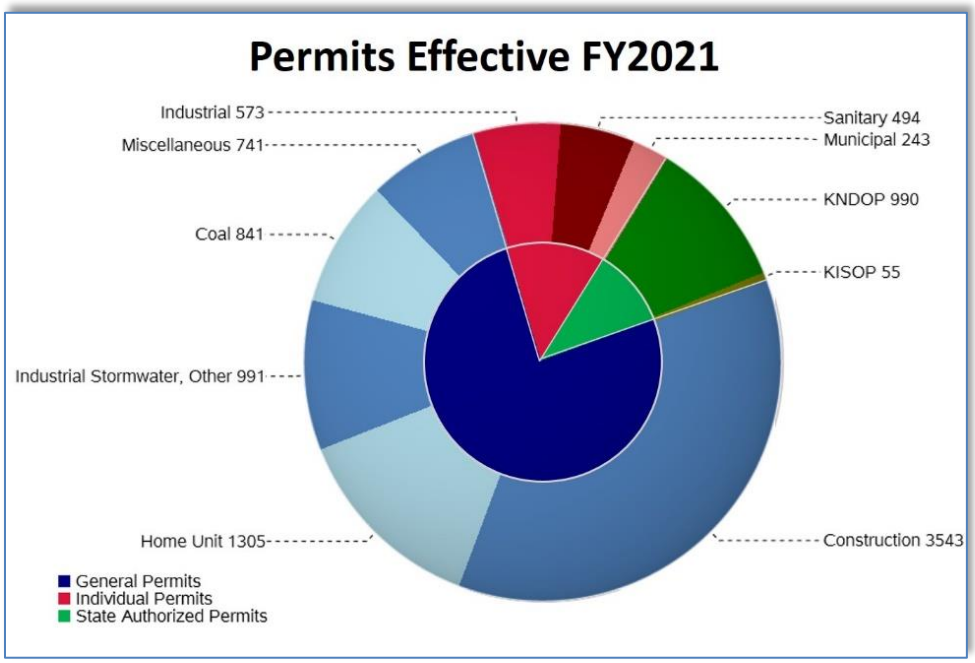
In 2020, Division staff joined EPA Region 1 states to beta-test updates to the bloomWatch App that was introduced in 2019 for citizens to monitor and report cyanobacteria (blue-green) algal blooms. In 2021, the Division incorporated methods for using bloomWatch in standard lakes trainings, and has developed plans to deploy the app to support the citizen stream monitoring program as well.

# PERMITS, CERTIFICATIONS & APPROVALS

**Kentucky Pollution Discharge Elimination System (KPDES) Permits**

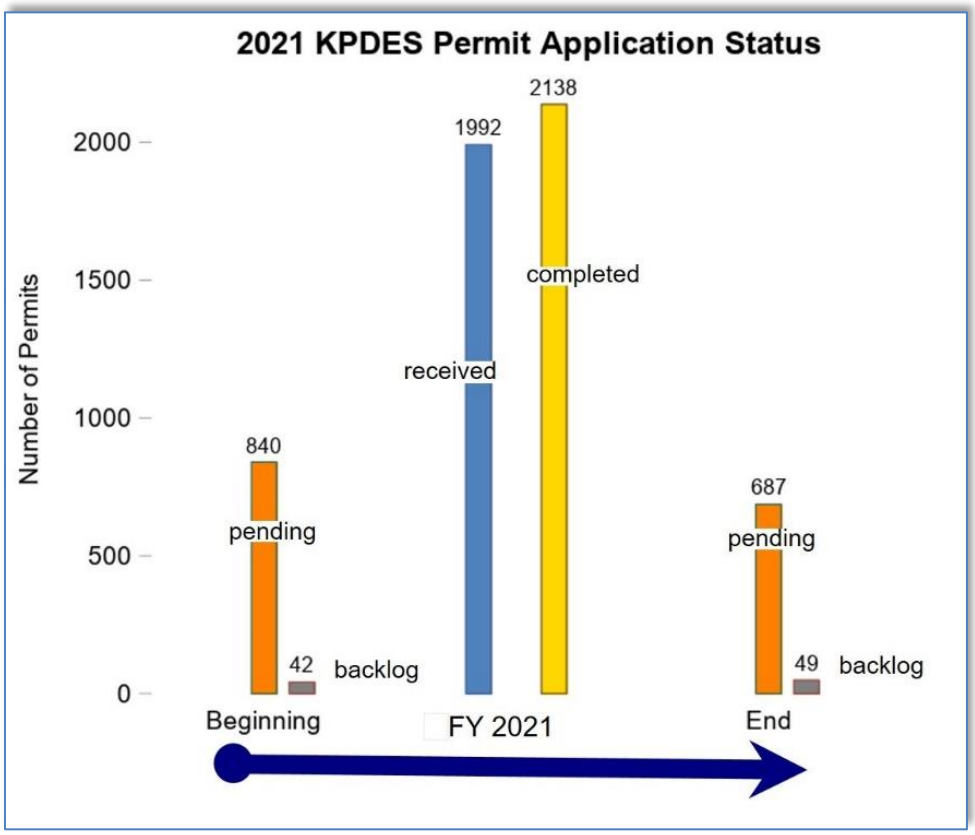
The federal Clean Water Act (CWA) and state regulations require a KPDES permit to discharge wastewater into waters of the Commonwealth. To ensure that wastewater discharges from industrial facilities, publicly owned treatment works, and other sources are not harmful to human health or the environment, KPDES permits contain technical and water quality-based limits on what can be discharged, and requirements to monitor and report the quality and quantity of wastewater being discharged.

The Division authorizes and manages approximately 9,800 total permits consisting of individual, general, and state-authorized permits. Individual permits apply to single entities and reflect site-specific requirements. General permits cover fifteen categories of dischargers with similar facilities, operations, and wastewater discharges, which a facility can obtain by filing a request for coverage with the Division. State-authorized permits include In-System Operational Permits (KISOP) for facilities that collect and transfer wastewater to a treatment system owned by another party, and No Discharge Operational Permits (KNDOP) for facilities that dispose of wastewater other than through point source discharges.




There are approximately 1,300 individual permits, more than 7,400 facilities covered by general permits, 55 KISOPs, and 815 KNDOPs in Kentucky

Most permits issued by the Division have a five-year validity period; this results in the Division receiving an average of 2,500 new and renewal permit applications each year. During the past year, the Division received 1,992 total permit applications, issued final decisions on 2,138 applications, and ended the state fiscal year with 687 pending applications and only 49 in backlog status.




**Floodplain Development Permits**

Any type of development in, along, or across a stream requires a floodplain permit from the Division. Typical activities that require a permit include residential & commercial structures, stream crossings, fill, stream alterations & relocations, excavation, grading, and small stream impoundments. The Division issues two types of permits for floodplain development –General or Individual Permits.

The Floodplain General Permit (FPGP) pre-approves fifteen activities provided they will not affect the Base Flood Elevation (BFE) in a community, and have minimal flood risk potential. The Division does not require a permit application for eligible activities that comply with all conditions established in the FPGP, though

a local government permit may still be required through administration of the National Flood Insurance Program (NFIP) or other local ordinance or rule. Any proposed development that does not meet the eligibility requirements of the FPGP, or that has the potential to affect the Base Flood Elevation requires an Individual Permit (IP) from the Division.

During FY2021, the Division issued nearly 950 final floodplain permit actions, which included notifying almost 40 applicants of coverage under the FPGP rather than needing an IP, saving both time and considerable effort. Division staff worked with water, wastewater, pipeline construction, and other small project applicants to understand the FPGP eligibilities to reduce the cost of compliance with applicable regulations. The Division also completed over 20 compliance investigations, assisting property owners return to compliance with state and federal floodplain regulations.

### Clean Water Act §401 Water Quality Certifications

The Clean Water Act §401 Water Quality Certification Program (§401 program) reviews development projects that involve discharges into waters of the United States within Kentucky state boundaries, and affirms that those activities will comply with Kentucky water quality standards. The §401 program also reviews mitigation plans, such as the restoration or creation of wetlands, when an activity will result in unavoidable impacts to a wetland and also participates in reviewing stream and wetland mitigation banking projects where restored, established, created, or preserved resource areas provide compensation for activities that impact wetlands.

During FY2021, the Division issued 200 water quality certification final actions, reviewed annual mitigation monitoring reports for 22 projects, and released one of these projects from future monitoring in accordance with the §401 certification approval. The Division also reviewed 13 proposed stream and wetland mitigation banking projects through the Interagency Review Team process, which includes the Division, KDFWR, US Army Corps of Engineers, EPA, and US Fish and Wildlife Service.

In 2020, revisions to federal regulations affecting the §401 Certification Rule required changes to the §401 program application, review, and enforcement processes. The Division collaborated with the USACE districts in Kentucky (Louisville, Nashville, Huntington, and Memphis) to develop guidance to assist permit applicants with the new process. The two agencies also developed better procedures for interagency communications for more efficient review of certification requests and permit applications.

# PLANNING & PROTECTION

### Unmanned Aerial Vehicle ("Drone") and Bathymetry Programs

The Division continued to expand Unmanned Aerial Vehicle (UAV or drone) capability and cooperative efforts across state agencies. The two fundamental purposes of drone activities are to provide near-real-time data, and to keep personnel safe by conducting inspections remotely. Drones also complement fieldwork by collecting data at large sites in a matter of minutes, sometimes eliminating the need for staff to conduct in-depth investigations. By working collaboratively, agencies have the ability to leverage equipment and software to spread costs and maximize outcomes.

Drone flights produce data products such as geo-located photographs that are stitched together into an orthomosaic of terrain data to facilitate development of 3D models to depict sites. The Division has been collecting these data products at various dams undergoing construction or rehabilitation, which translates into an overall savings in time and effort for the Division that allows innovative technology use to support programmatic priorities.

Boltz Lake Dam Orthomosaic
https://sitescan.arcgis.com/share/4f045c53-0b20-4f4b-92b4-57fb5a7f07e9

Scenic Lake Dam Rehab Project
https://sitescan.arcgis.com/share/242d1ee2-7575-4eb8-bc29-dfc2980a2be7

### Drone Program Expansion

The drone program continues to expand its capabilities by acquiring equipment with additional features. The new Phantom 4 RTK Multispectral drone (P4) captures imagery in the red, green, blue, near infrared, and red edge wavelengths. Imagery analysis enables observation of plant health, soil moisture, and invasive species. Plans include using the P4 to monitor progress at restoration projects, seepage at dams and landfills, and to detect harmful algal blooms on lakes. Division staff partnered with Division of Waste Management staff to collect data for a number of sites in multiple water and waste management programs.

**Drone Partnerships and Best Practices**

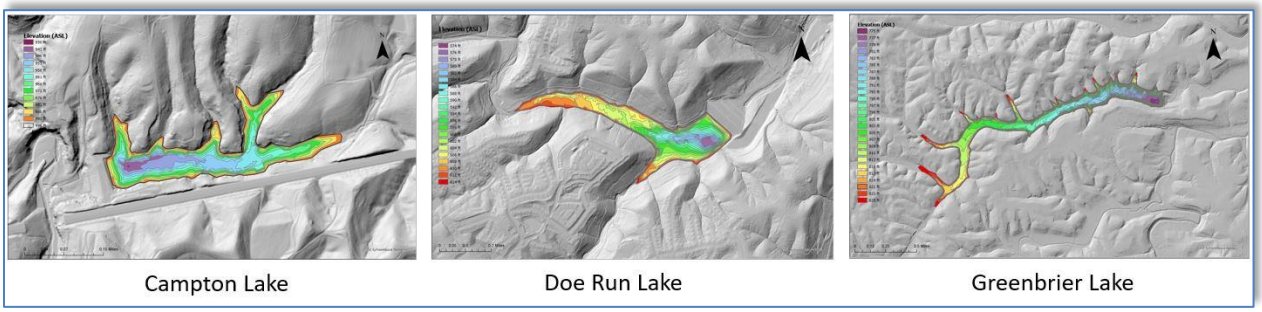
The Division worked in partnership with the Division of Waste Management (DWM) on the Long Lane Superfund project to conduct numerous flights with shared equipment. Personnel from both agencies flew the site using the Mavic Pro 2 quadcopter. The mission consisted of collecting data to acquire sufficient imagery to produce quality high-resolution imagery mosaics. Approximately two hours of total flight time covered almost 58 acres, and the resulting orthomosaic map had a pixel resolution of 0.5 inches. The agencies also created a cut and fill model based on a recommended elevation, a 3D model, and a hillshade model. These data resulted in approximately a $40k savings to the Cabinet while providing valuable data for potential future work at the site.

Long Lane Hillshade- this view shows the relief of the site:
https://sitescan.arcgis.com/share/0699a361-9db0-46bc-ab73-8b0a7d6199ea

The drone team also flew Willisburg Lake Dam with the P4 and a Zenmuse thermal camera to detect potential leaks. The comparison of multiple flights and imagery will help develop a data signature to detect leaks that the Division will apply to other issues, such as the possible detection of leaking water lines.

Willisburg orthomosaic and thermal imagery:
https://sitescan.arcgis.com/share/8216b810-e57b-446d-b303-25ffc909c121

**Bathymetry Program**




Bathymetric data at three water supply lakes in Kentucky.

Bathymetric studies collect images to help reveal features beneath the surface of a waterbody. The bathymetric team has primarily collected data to estimate the capacity of water supply lakes. Over the past year, the bathymetric team has collected data on Fagan Branch, Campton, Doe Run, Greenbriar, and Boltz lakes and helped map the underwater portion of Boltz Lake Dam to help evaluate the dam for possible rehabilitation. The team also worked with Kenton County officials to determine if Doe Run Lake,

a flood control lake, had enough capacity to handle additional runoff from a new housing development. The Division intends to collaborate with other agencies such as USGS and US Army Corps of Engineers to expand and enhance the application of bathymetry data.

### Natural Resources Conservation Service (NRCS) Collaboration

The Division works closely with the Natural Resources Conservation Service (NRCS) by providing feedback on its initiatives through the NRCS State Technical Committee, and the collecting and sharing of water quality data. In 2020 and 2021, the Division invested significant time assisting NRCS with several programs, including the National Water Quality Initiative (NWQI) and Kentucky Focused Conservation Projects.

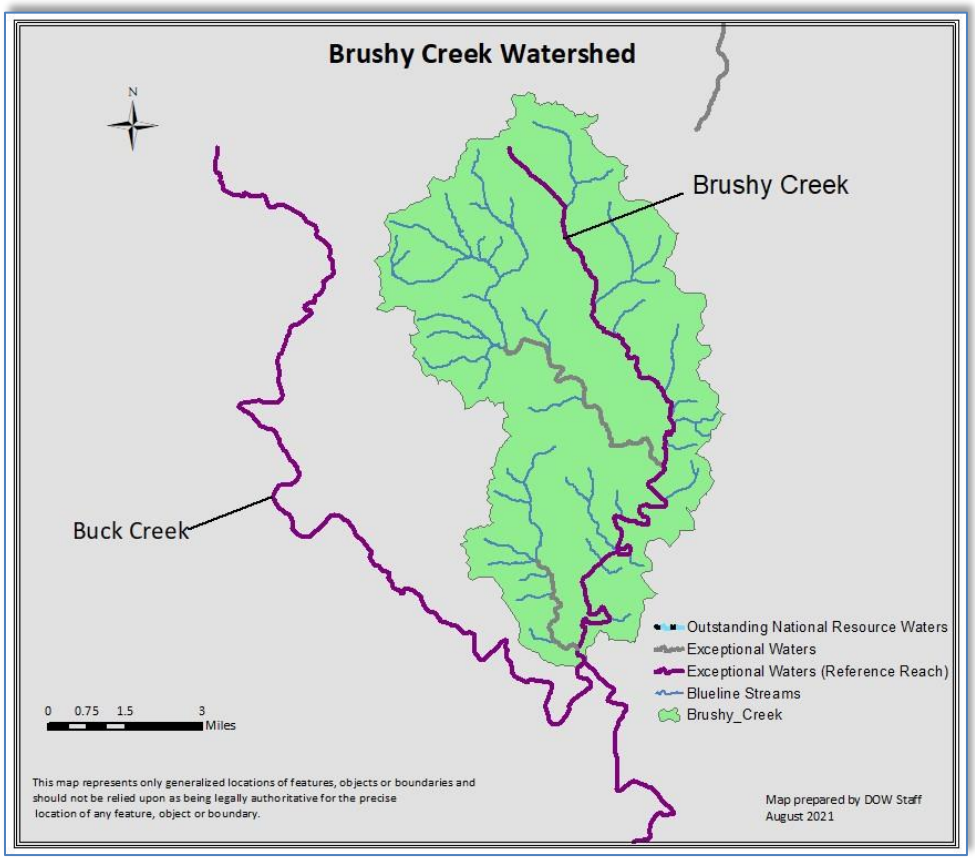
Kentucky Focused Conservation Projects utilize Environmental Quality Incentive Program (EQIP) funds to target specific project areas with known water quality issues for intensive best management practice implementation. In 2020 and 2021, the Division supported efforts to develop and implement water-focused conservation projects to receive funds for up to five years of implementation. The projects selected for EQIP funding used input from workgroup meetings involving the Division, NRCS, the Kentucky Division of Conservation, Kentucky Department of Fish and Wildlife Resources, local agricultural producers, and other interested entities. Division staff attended meetings in the 12 conservation districts and provided information to the selection committees about existing watershed planning areas, known impairments, technical resources, and potential partners such as volunteer monitoring groups.


Kentucky Focused Conservation Projects (FCPs) with active DOW involvement and National Water Quality Initiative (NWQI) Watersheds.

While NRCS has limited funding and expertise regarding data collection needed to quantify water quality enhancement successes, the Division is supporting the Kentucky Focused Conservation Projects by providing monitoring data in three areas: Lees Creek, Sinking Creek, and Lake Linville. The Division may also provide future training in the Step-L model, which estimates nutrient load reductions based on best management practices and the impacted area. More information about Kentucky NRCS's Focused Conservation Projects is located in the Focused Conservation Projects Story Map: https://nrcs.maps.arcgis.com/apps/Shortlist/index.html?appid=14b01367ec2d4d6b87d87653a623cfd9.

### Brushy Creek Watershed Project

The Brushy Creek watershed is located in the northern portion of the Upper Cumberland River Basin in parts of Lincoln, Pulaski, and Rockcastle Counties. It is a priority watershed for the Division due to its unique water characteristics and the potential impact on nearby threatened and endangered species. Brushy Creek is notable for its special-use designations - the main stem of the creek and two of its tributaries (the lower reaches of Bee Lick Creek and Clifty Creek), are Outstanding State Resource Waters, and all three are Exceptional Waters, as designated in 401 KAR Chapter 10. Brushy Creek is also a "Reference Reach" stream, which sets an example of least-disturbed conditions for the bioregion.



The area provides habitat for over 30 species of freshwater mussels, 77 species of fish, and one endangered bat species. Brushy Creek has the potential for range expansion of these species through natural recruitment or migration.

The Division supports the Pulaski County Conservation District's (PCCD) implementation of an EPA-approved Brushy Creek Watershed Plan using funding from the Clean Water Act 319(h) grant program. Using this plan, PCCD works with watershed partners to reduce nonpoint source pollution through best management practices (BMPs). The funding supports a dedicated watershed coordinator who is responsible for recruiting participants and providing water-based education and outreach to improve recruitment.

As part of the Brushy Creek Watershed Plan, the PCCD focused on agricultural BMP installations, including seven heavy use areas, eight watering facilities, acres of cover crops, nine pipelines, six spring developments, and nine fences. The PCCD also purchased a drone with a normalized difference vegetation index sensor that can show the impacts of nonpoint source BMPs on plant health.

Field day demonstrating drone capabilities regarding agricultural management.

When COVID-19 health and safety protocols impacted community outreach efforts, the PCCD showed remarkable creativity by organizing safe outreach events that included the state's first "virtual farm field day", where pre-recorded events were made available at the Somerset Drive-In theatre. The event was a partnership with the Pulaski County Cattlemen's Association, NRCS, the Kentucky Beef Network, and the University of Kentucky's Cooperative Extension Service. The project will extend through 2023 with more agricultural BMP installations and community outreach events planned.

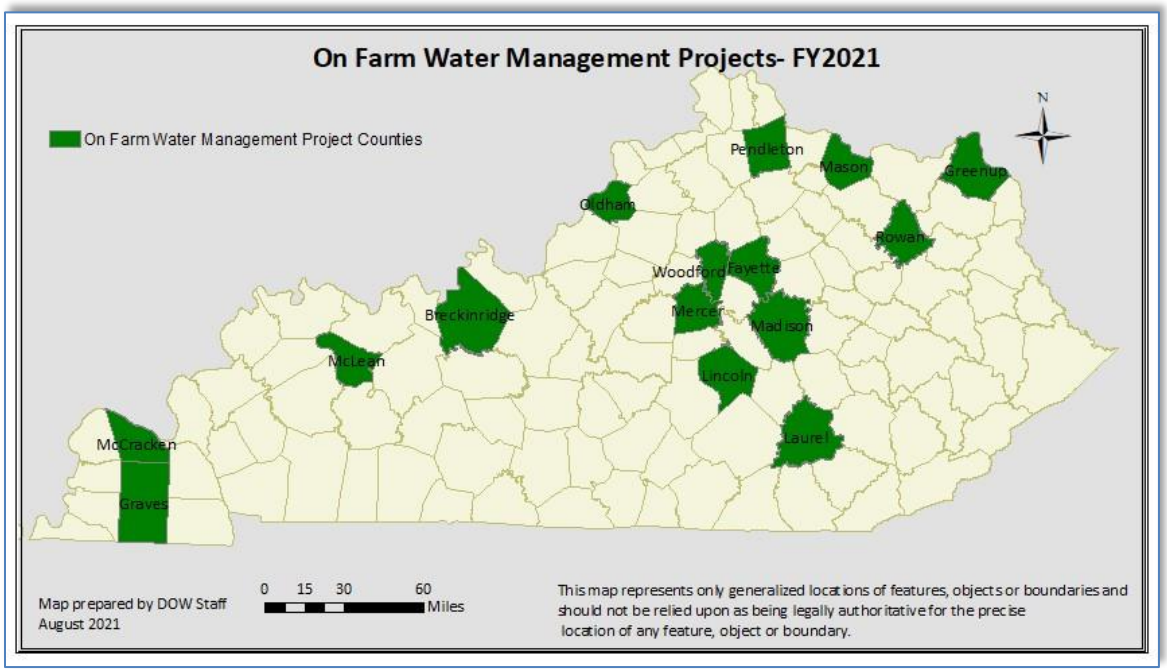
Virtual farm tour at the Somerset Drive-in.

## On-Farm Water Management Program

The Division began supporting collaborative efforts in 2018 to implement a program that promotes practices that maximize the capture, storage, and use of on-farm water resources. The On-Farm Water Management Program is a joint effort between the Division, the Kentucky Office of Agricultural Policy (KOAP), the Kentucky Water Resources Board, and the Kentucky Agricultural Development Board (KADB). The program recruits farmers, agribusinesses, non-profits, and universities to share the implementation costs of projects that promote efficient use of on-farm water resources. These practices include rainwater harvesting and storage, developing on-farm water resources (springs, wells, or ponds), improving soil health and available water storage, and new technologies that increase the efficiency of on-farm water uses.

Projects that have received funding represent a wide variety of animal, agronomic, and horticultural operations – from greenhouses and drip-irrigated vegetables, to precision-irrigated tree nurseries and grain crops. Animal operations including poultry, hogs, sheep, cattle, and even aquaculture are implementing projects that reduce dependency on public water supplies and provide additional resiliency during times of water shortages.

Seventeen projects in fifteen counties have received approval and funding from the KADB with current allocations of over $680,000 and an additional nearly $750,000 remaining for new projects. Division and KOAP staff continue to solicit new project ideas with the goal of allocating the remaining funds over the next two years.




**On-Farm Water Management Case Study: Center pivot irrigation in central Kentucky**

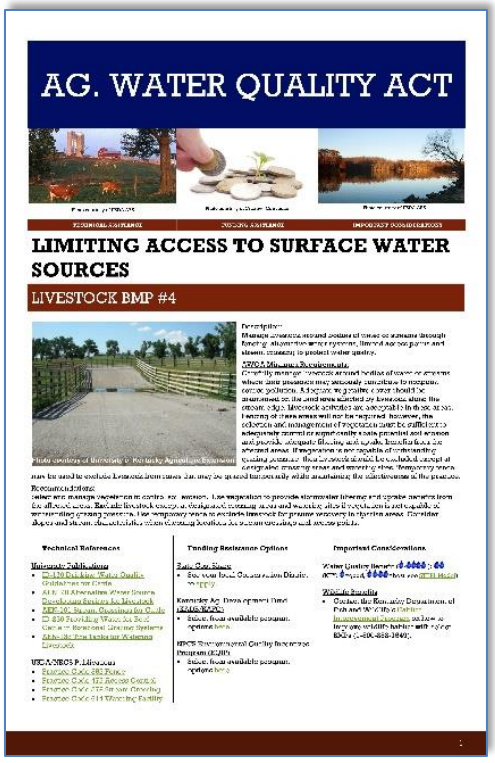
One of the more ambitious projects funded by the KADB involves the use of on-farm water resources to irrigate several hundred acres of corn and soybeans. When no obvious source of water is available for large-scale irrigation, the farmer captures a spring to create a large storage reservoir for irrigation water, and uses a precision irrigation system with soil moisture monitors and variable rate pivots to water crops. The goal of this project is to demonstrate practices that mitigate the effects of rainfall deficits on crop yield, while using water in the most efficient manner possible.

**Nutrient Reduction Strategy**

The Division is in the final stages of updating the Kentucky Nutrient Reduction Strategy available at: https://eec.ky.gov/Environmental-Protection/Water/Protection/Documents/Nutrient Reduction Strategy draft 5-12.pdf.

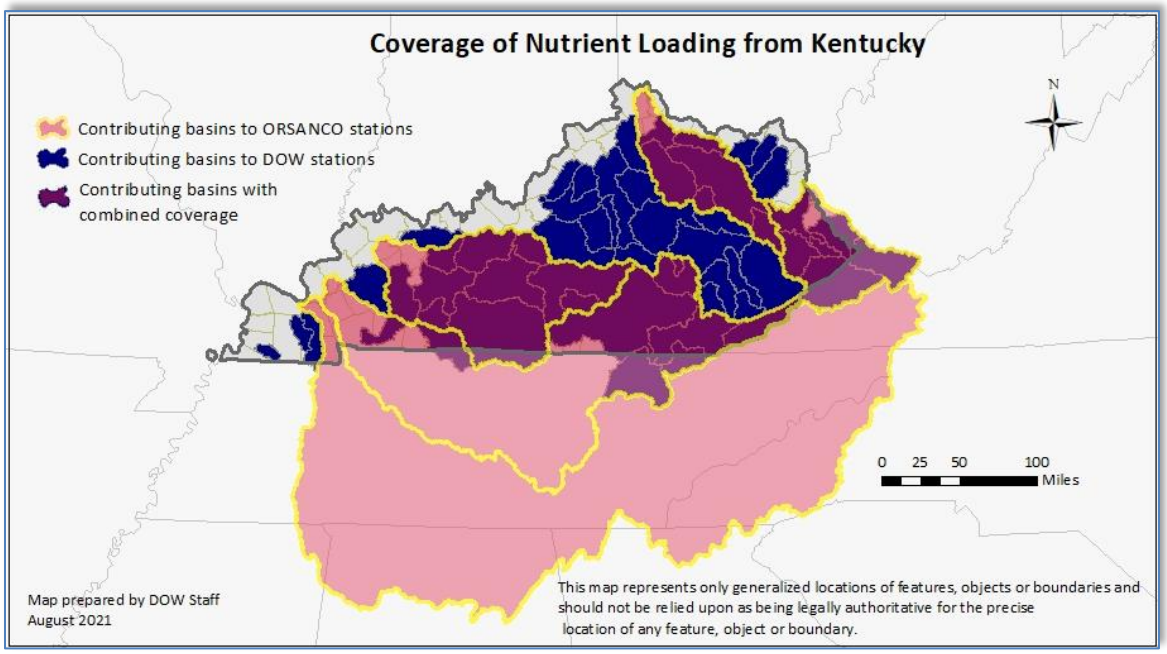
To improve estimates of Kentucky's nutrient contribution to the Gulf of Mexico, the Division published an *Update to the 2019 Nutrient Loads and Yields in Kentucky Study* (https://eec.ky.gov/Environmental-Protection/Water/Reports/Reports/2021-NutrientLoadsYieldsUpdate.pdf). This update included two additional years of Division data (2018, 2019), new monitoring data and coverage from partners such as the Ohio River Sanitation Commission (ORSANCO), and an analysis of the relationship between precipitation and nutrient loading. To improve stakeholder engagement in nutrient planning, the Division also updated the Nutrient Reduction in Kentucky interactive story map: https://watermaps.ky.gov/nutrients.

In June 2021, the Division completed a user-friendly Agriculture Water Quality Planning Tool (https://dep.gateway.ky.gov/eForms/Main/Forms.aspx?FormId=168), which is the result of a nearly two-year coordinated effort with the Division of Conservation (https://eec.ky.gov/Natural-Resources/Conservation/Pages/Agriculture-Water-Quality-Act.aspx). The Kentucky Agriculture Water Quality Authority has long sought improvements to existing agricultural water quality planning tools, and took advantage of a recent grant from the EPA to support developing updated, enhanced Agricultural Water Quality Plans for active farms 10 acres or more in size. This new tool streamlines agriculture Best Management Planning while connecting producers to helpful graphics, funding, technical resources, and water quality metrics (see example below). The Division remains engaged with the Kentucky farming community to improve water quality through Agriculture Water Quality Act planning.




This year, the Division collaborated with other state and federal partners on the Gulf of Mexico Hypoxia Task Force (HTF) to advance nutrient reduction awareness and monitoring. The Division worked with EPA Region 4 to develop success stories

(https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=e4652cf9284c406b9f3483896fccd85f) on clean water treatment optimization, monitoring, and watershed planning (https://www.epa.gov/sites/default/files/2020-12/documents/ky_floyds_fork_1918_508.pdf). Additionally, Kentucky and other agencies on the HTF Monitoring Committee identified resources needed to improve nutrient tracking. The Division of Water and the Division of Conservation remain engaged on multiple HTF committees to collaborate on nutrient loss solutions, improve progress tracking, and communicate state engagement.



# TESTING & TRAINING

## Municipal Separate Stormwater System (MS4) Training

After evaluating MS4s across the state, the Division determined that a trend of permit noncompliance was largely due to permittees not understanding the requirements of MS4 permits, or how best to comply with them. To address this gap, the Division developed two trainings that addressed specific minimum control measures to help municipalities comply with requirements.

The Division also developed training to familiarize new staff and elected officials with the MS4 program. Due to the frequency of staff turnover and lack of general public knowledge about MS4s, this training has been effective by establishing the knowledge required to administer their programs, and making elected officials and municipal administrators aware of the resources necessary to maintain permit compliance.

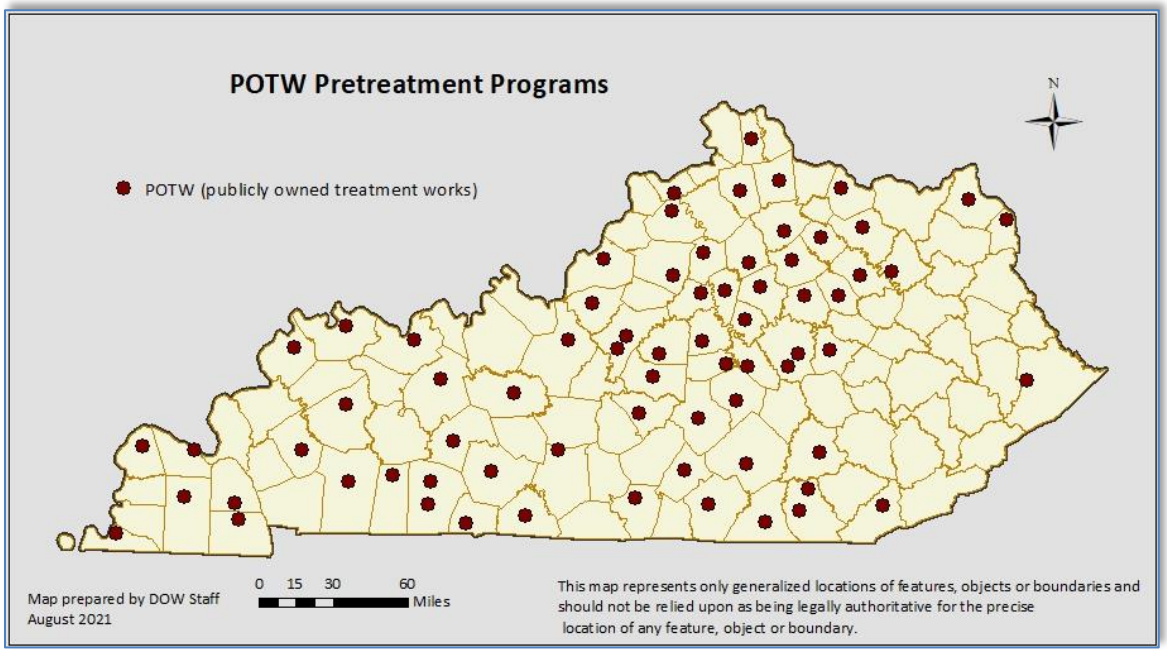
In partnership with the UK Cooperative Extension Service (UKCES), a fourth MS4 training was developed specifically for extension agents to emphasize the benefits of partnerships between the two. The UKCES disseminates helpful, trustworthy educational materials to Kentucky citizens, and has public education expertise and access to a wealth of stormwater-related materials. Several MS4 permittees are already working closely with the UKCES towards these objectives, and anticipate the development of more mutually beneficial partnerships in the future.

## Pretreatment Training

The federal Clean Water Act requires many Publicly Owned Treatment Works (POTWs) that receive wastewater from industrial sources to implement a pretreatment program to regulate incoming, non-domestic wastewater. The Division oversees and regulates POTW pretreatment programs across the Commonwealth, and conducts inspections and audits regularly to determine compliance with federal and state pretreatment regulations. In FY2021, the Division conducted nearly 60 audits and inspections of 70 current POTW pretreatment programs.

In the past few years, POTWs have seen a significant increase in the number of new pretreatment coordinators, many of whom received little, if any, training before stepping into the role. Due to the ongoing pandemic, online videoconferencing options provided the perfect platform to easily reach out

and provide virtual training to pretreatment staff across the entire state. The Division developed a webinar series of four courses to provide key pretreatment knowledge, and the Division offered continuing education hours to help wastewater operators maintain required licenses.




## Remote Water Well Driller Certification Examinations

The COVID 19 pandemic health and safety measures prohibited in-person examinations for Kentucky Water Well Driller certification that are required for a water well driller license in Kentucky. In response to the need to continue an examination process during the pandemic, the Division collaborated with the Division of Compliance Assistance to develop remote, monitored testing for drinking water and wastewater plant operators.

This new remote testing procedure makes it possible to safely conduct driller examinations and for new well drillers to complete licensing requirements. Drillers located across the Commonwealth, or out of state, will be able to save the considerable costs associated with travel to Frankfort to complete the exam. The Division believes remote testing offers a valuable option that will continue to benefit both the agency and drilling community in the future.

## Commonwealth of Kentucky

**Andy Beshear, Governor**

## Energy and Environment Cabinet

**Rebecca Goodman, Secretary**

## Kentucky Department for Environmental Protection

**Anthony R. Hatton, P.G., Commissioner**

## Kentucky Division of Water

**Carey Johnson, CFM, Director**

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| | |
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| **Field Operations Branch** | **Connie Coy** |
| **Planning and Program Support Branch** | **Carey Johnson, acting** |
| **Surface Water Permits Branch** | **Jason Hurt** |
| **Water Infrastructure Branch** | **Jory Becker** |
| **Water Quality Branch** | **Melanie Arnold** |
| **Water Resources Branch** | **Shawn Hokanson** |
| **Watershed Management Branch** | **John Webb** |
| **Environmental Scientist Consultant Senior** | **Sarah Gaddis** |