

Mississippi River Basin / Gulf of Mexico Nutrient Runoff Network Info Bulletin

Sharing information and making connections from the headwaters to the gulf.

January 18, 2022

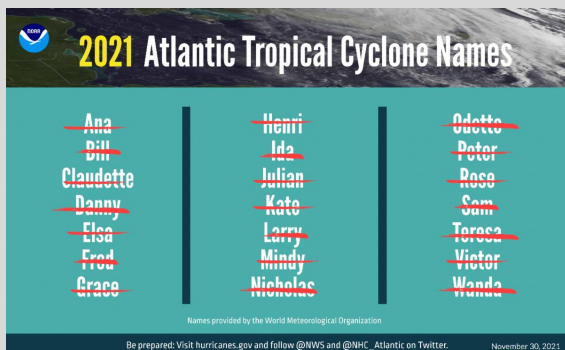
Welcome!

This bulletin is designed as a way to share information with those interested in nutrient runoff issues and impacts. **We hope you find this a valuable resource and encourage you to be a part of the exchange!** You can share resources or information for inclusion in future bulletins, or join the distribution list, by sending an email to noaa.centralregion@noaa.gov.

2021: Auld Lang Syne

An Atlantic Hurricane Season to Remember

The active [2021 Atlantic hurricane season](#) officially concluded November 30th having produced 21 named storms, including seven hurricanes - of which four were major hurricanes. This above-average hurricane season was accurately predicted by the NWS Climate Prediction Center in their May and August outlooks. In terms of named storms, the 2021 season was the sixth consecutive above-normal Atlantic hurricane season, the third most active on record, and the first time the list of 21 storm names was exhausted in back-to-back seasons.



The list of 21 named storms which occurred during the 2021 Atlantic Hurricane Season. (NOAA)

The connection between hurricane seasons and hypoxic zones may be two-fold. On one hand, hurricanes can at least temporarily **directly affect** the hypoxic zone by churning up the water column



An ice jam on the Mississippi River. (National Weather Service)

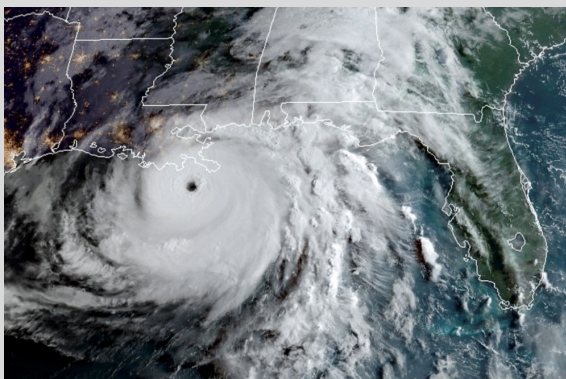
Spotlight: River Forecast Centers

Water Services for the Nation

In the early 1940s, the National Weather Service (NWS) had a vision to modernize river and flood forecasting services by establishing centers focused on hydrology. Cincinnati and Kansas City were chosen to be the homes of the first two [River Forecast Centers \(RFCs\)](#). The Ohio RFC opened on September 23, 1946, and was followed by the Missouri Basin RFC one week later on October 1, 1946 (check out Missouri Basin's excellent [75th Birthday storymap!](#)). Since then, an additional 11 RFCs have been added in order to provide water services to all 50 states and most U.S. territories.

Over the past 75 years RFCs have gone through large transitions relating to technology, science, and data. The RFCs transitioned from hand calculations to using complex computer models, and from using remote, centralized mainframes to local computer systems. There was also an explosive growth in the availability of data. Originally, cooperative observers provided weather and stream data by telegrams, postcards, teletypewriters, and telephone. Today, RFCs utilize vast data networks which provide weather and stream data via observers, telemetry, satellite and radar in near real-time – comprised of more than 5,000 sites.

and delivering oxygen to the bottom layer. On the other hand, they could have longer-term [indirect effects](#) as some research has indicated hurricane seasons may influence how much nutrients make their way downstream to the Gulf of Mexico. Potential links between the 2021 hurricane season and hypoxia have yet to be assessed.

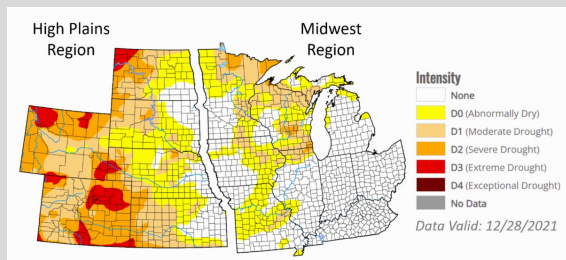


Hurricane Ida moves through the Gulf of Mexico, Aug 2021 (NOAA)

Drought in the Upper Mississippi Basin

For parts of the Upper Mississippi River basin, 2021 was characterized by historic drought conditions. Both the [Midwest](#) and the [High Plains](#) regions ended the year with significant areas of drought. The Midwest began 2021 with approximately 44% of the region dealing with drought conditions, and closed out the year with 40% in drought. The High Plains went from 96% to 88% drought coverage over the same period. Throughout the year, certain areas were hit harder than others; [Minnesota in particular](#) saw 99% of the state dealing with drought conditions in August 2021.

Drought is not only concerning for the way it can impact agricultural production, but also important to monitor for its potential impacts on water quality. One of the ways drought can affect water quality is by allowing the buildup of nutrients in soils which are then flushed out in subsequent rainfall events. These higher levels of nutrients can then contribute to algal blooms and hypoxia.



U.S. Drought Monitor maps from December 30th, 2021 for the High Plains and Midwest regions. (National Drought Mitigation Center)

Increased focus on Midwestern drought in 2021 brought a [new collaboration](#) between NASA and



National Weather Service River Forecast Centers provide the public with hydrologic forecasts and information. (NWS)

River Forecast Centers and Nutrient Runoff

Although a primary function of RFCs is to provide timely and accurate river forecasts for the protection of life and property, these centers also work with partner agencies to address water quality concerns such as nutrient runoff and resulting impacts on aquatic systems. Here are just a few examples of how RFCs can help make a difference on these critical issues:

- The North Central River Forecast Center leads efforts to incorporate forecast precipitation, temperature, snowmelt and soil conditions up to ten days into the future. The resulting information is used by state groups to develop guidance for farmers on nutrient application timing. State working groups then create maps with this important information, and develop [websites](#) for farmers and other land managers in their states.
- The Ohio River Forecast Center (OHRFC) contributes to [long-range forecasts](#) for harmful algal blooms in Lake Erie by providing 60-day Climate Forecasting System flow forecasts for the Maumee River. These forecasts are used to predict phosphorus loading into the lake's western basin - a critical component for predicting bloom intensity.
- The Middle Atlantic River Forecast Center has worked to support USDA Agricultural Research Service [efforts](#) to forecast nutrient runoff associated with fertilizer application and rain events. These efforts included providing retrospective hydrologic simulations and real-time forecasts for driving decision-support tools for land managers in Pennsylvania.
- The Northeast River Forecast Center provides supporting materials for HAB monitoring and research work in the Gulf of Maine, in partnership with NOAA's National Ocean Service and Woods Hole Oceanographic Institution. These consist of a year-round [Decision Support webpage](#).

the National Integrated Drought Information System (NIDIS) through the NASA Develop program. [NASA Develop](#) allows students and recent graduates opportunities to address environmental and public policy issues through research projects which apply the lens of NASA Earth observations to community concerns. The NASA - NIDIS work aims to create evapotranspiration and water balance climatologies for the Midwestern United States. These climatologies will help the region better determine the seasonal availability of water and monitor the evolution of drought conditions. The Midwest is the world's most expansive region of corn and soybean production, and understanding the seasonal water variability of the region is vital for determining irrigation schedules, growing seasons, and general ecosystem health.



NASA Earth Observations satellite imagery utilized in a Summer 2021 NASA Develop project. (NASA)

2022: A Look Ahead

Coming Soon - Spring Flood Outlooks

To help communities prepare for flood season and give information about expected drought conditions, NOAA provides regional Spring Flood and Water Resources Outlooks in late winter and early spring, followed by a National Hydrologic Assessment and Spring Flood Outlook. For NOAA's Central Region, the National Weather Service's River Forecast Centers (RFCs), Weather Forecast Offices (WFOs), and National Water Center have set the dates for the upcoming release of public products:

1. Thursday, February 10th, 2022 - Outlook #1
2. Thursday, February 24th, 2022 - Outlook #2
3. Thursday, March 10th, 2022 - Outlook #3

On each of these dates, - Central Region RFCs will post probability graphics by 10AM central time, and Central Region WFOs will issue public products by 5PM central time.

Drought Outlook for the North Central U.S.

In part due to La Niña conditions being in place for the second winter in a row, [drought is expected to improve](#) in the North Central U.S. over the first few

and a seasonal weekly outlook with a discussion and graphics on hydrology and meteorology.

- The Lower Mississippi River Forecast Center has worked in the past to support various groups/universities on efforts to predict harmful algal blooms in the Gulf of Mexico by providing long-range river forecasts.



Fertilizer being applied to a field. (NWS)

Spotlight: North Central Region Water Network

Multi-state Water Outreach and Research

The [North Central Region Water Network](#) is a 12-state collaboration designed to enhance connectivity across regional and state water projects, develop and carry out integrated outreach and education efforts, and coordinate projects with measurable short and long-term environmental and social impacts. The Network's priority areas include:

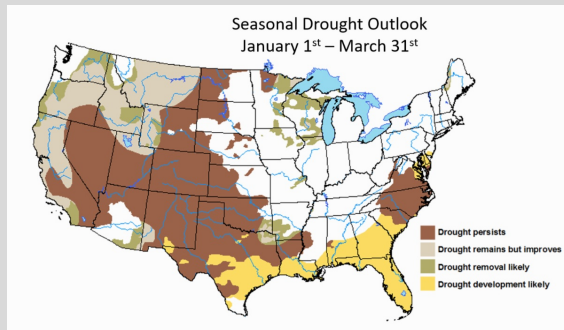
- [Flooding, Drought and Insufficient Water Supply](#)
- [Sediment and Nutrient Pollution](#)
- [Unsafe Drinking Water Supplies](#)
- [Vulnerability to Climate change](#)

Tap Your Potential: A Training to Grow Farmer Leadership in Watershed Management

Developed by a team of Extension professionals from universities in the Mississippi River basin, [this exciting training](#) is a curriculum for watershed coordinators, outreach professionals, and educators from nonprofits, and government agencies who want to recruit the involvement of farmers in watershed-based efforts.



months of 2022. There are higher chances for a wetter-than-average January and February for states in the Great Lakes Region, extending westward to eastern portions of Minnesota and Iowa. However, existing drought in the northern Great Plains states could continue or even worsen.



The U.S. Seasonal Drought Outlook from December 31st, 2021 (valid January 1st, 2021 through March 31, 2022) shows most of the areas of MN, WI, and IL currently in drought either improving or being removed from drought status altogether. (Adam Allgood / NOAA Climate Prediction Center)

Fifth National Climate Assessment

The Global Change Research Act of 1990 mandates the U.S. Global Change Research Program (comprised of [13 federal agencies](#)) deliver a report every four years analyzing the effects and trends of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity. Work on the [5th National Climate Assessment](#) (NCA5) began in 2020, and will conclude with a final publication released in 2023. 2022 is a critical year for NCA5, and will include several milestones:

- **Early 2022:** Public engagement; public call for Review Editor nominations
- **Spring 2022:** First NCA5 draft developed
- **Summer 2022:** Agency review; Review Editors selected
- **Fall 2022:** Public and National Academies of Sciences, Engineering, and Medicine reviews of draft

Earth's climate is now changing faster than at any point in the history of modern civilization, primarily as a result of human activities. Global climate change has already resulted in a wide range of impacts across every region of the country and many sectors of the economy which are expected to grow in the coming decades. The National Climate Assessments synthesize climate knowledge, impacts, and trends across U.S. regions and sectors to inform decision making and resilience-building activities across the country.

Bringing people together to create and implement a shared watershed plan requires significant investment in people, especially in local stakeholders. (North Central Region Water Network / Joe Bonnell)

With a “plug and play” format, the customizable curriculum creates a space for farmers to explore what it means to be a leader in watershed management and to discover pathways to exercise their leadership. While farmers are the primary target audience, it is also appropriate for farm advisors, who also play an important role in influencing farmers’ decisions to adopt conservation practices.

New Virtual Platform Allows Farmers to Learn and Share Ideas

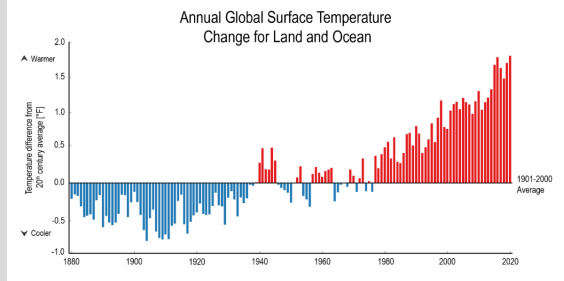
[One Good Idea](#) is a new online platform and campaign to help farmers get started and have success with soil health and regenerative practices. Created by a multi-state team of university Extension professionals and farmers, One Good Idea was designed to facilitate farmer-to-farmer learning about practices which can improve soil, land, and bottom lines, such as cover crops, conservation tillage, rotational grazing, and nutrient management.

As a clearinghouse of videos and podcasts featuring farmers’ ideas and experiences with these practices, One Good Idea creates a centralized location for farmers to learn from their peers about what has worked or hasn’t, the benefits and precautions, and other nuts and bolts of using conservation practices on their operations. This content is crowdsourced and has been provided by university Extension, nonprofits, government agencies, farmer-led groups and individual farmers from across the Midwest and Mid-south.

Network Newsletters

The North Central Region Water Network monthly newsletter features educators, specialists, research, and extension programs from each state, relays important news and events involving water, and promotes funding opportunities. You can catch up on all previous issues of the newsletter [here](#), and be sure to [sign up](#) for future issues!

Education and Outreach



The bars on the graph show the number of degrees by which the average global temperature for each year differs from the average global temperature during the last century. (NOAA / Derek S. Arndt)

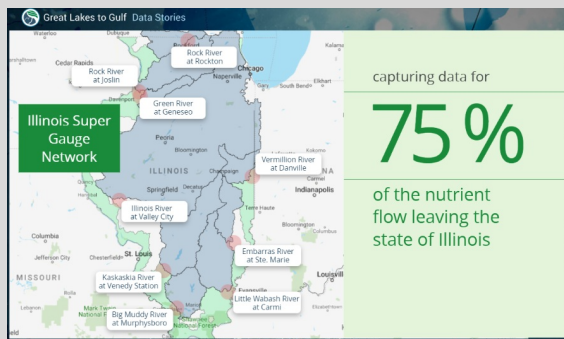


A nitrogen-deficient corn field. For reasons challenging to predict, the same rate of nitrogen fertilizer on the same field can be far less than what a corn crop needs to maximize its production in one year, only to be more than it needs the next. (University of Minnesota Extension / Gregory Klingler)

Water Quality Updates

Great Lakes to Gulf Virtual Observatory

In the Mississippi River watershed, water quality remains a primary and ongoing concern which requires monitoring conducted by multiple state and federal agencies and academic institutions. The [Great Lakes to Gulf Virtual Observatory](#) (GLTG) is an interactive geospatial application which connects users with tools designed to help visually map, explore and compare referenced water quality monitoring data aggregated from multiple sources. It was developed by National Great Rivers Research and Education Center, Lewis & Clark Community College, University of Illinois National Center for Supercomputing Applications and the University of Illinois at Urbana-Champaign. The application facilitates ready access to water resource information from the Mississippi River and its tributaries, enabling users to identify and select sites, graph specific parameters and download data in compatible formats.



The Great Lakes to Gulf Virtual Observatory provides [Data Stories](#) to show large-scale water quality issues and trends using data and mapping, as seen in this image from the story, "Illinois Nutrient Loss Reduction Strategy."

Currently, GLTG includes sites with five or more years of discreet nutrient data in the main stem of the Mississippi River. It also includes continuous water quality monitoring sites in the Mississippi River watershed, and even shows some sites in

The Story of Nitrogen: A New Audio Series

Nitrogen, a nutrient essential for life, impacts us all but might not be something you think about unless it relates to your job. Farmers constantly think about how their nitrogen fertilizer decisions can impact their crop yields, an agricultural scientist might think about the importance of nitrogen to the global food supply, an ecologist might think about the impact of nitrogen on the life which exists in forests or bodies of water like the Gulf of Mexico. Often, nitrogen is framed as a cause-and-effect, for example, how fertilizer added to a corn field or suburban lawn can impact a nearby lake or drinking well. Another way to look at these issues, though, is through a lens of curiosity. *Why* does extra nitrogen change life in a field, stream, lake, forest, or the ocean? *Why* is fine-tuning fertilizer rates so challenging in agriculture, and why do crop demands for nitrogen change so much from year to year? *Why* do some trees grow faster with more nitrogen while others decline (and what key differences are there between crop fields and forests which explain these outcomes)? Can knowing more about these effects make us better scientists, agronomists, conservationists, and farmers?

Gregory Klingler, an Extension Educator with the University of Minnesota, has created a new audio series, "[The Story of Nitrogen](#)," to answer these questions and more.

selected smaller watersheds.

First Update to EPA's Nutrient Criteria in 20 Years

The Environmental Protection Agency (EPA) has published [revised recommended ambient water quality criteria](#) under the Clean Water Act to help address nutrient pollution in lakes and reservoirs. As the first update to EPA's nutrient criteria in 20 years, these recommendations represent a significant advancement in the scientific understanding of the impacts of nitrogen and phosphorus in U.S. waters. Based on statistical stressor-response relationships developed from data collected in approximately 1,800 lakes nationwide and incorporated into national models, these new criteria will help protect drinking water sources, recreational uses, and aquatic life in the nation's lakes and reservoirs. The national models are designed so states, territories, and Tribes can also incorporate local data into the models to account for unique local conditions.

Storymap: Tracking CyanoHABs

EPA has published an [ArcGIS StoryMap](#) which will allow the public to learn about and track reported cyanobacterial harmful algal blooms (cyanoHABs) in freshwaters across the country. CyanoHABs can harm ecosystems and contaminate freshwaters with toxins which can lead to serious human health impacts. There is scientific consensus the incidence of cyanoHABs has increased in the nation's freshwater systems in recent years, in part due to climate change.



HABs may be distinguished by blue, green, or white streaks on the water surface (left image). By contrast, green algae which do not produce harmful toxins may be distinguished by stringy or hairy green mats on the water surface (right image). (NY Dept. of Environmental Conservation)

The StoryMap creates a single online resource for information about cyanoHAB events across the U.S. by consolidating freshwater advisory and closure information from state environmental and health agencies into user-friendly, interactive maps. In addition, the story map includes links to information on freshwater harmful algal blooms (HABs) causes and effects; several EPA tools on



Northern pine forests are among those most likely to be negatively impacted by an increase in their nitrogen supply. (University of Minnesota Extension / Gregory Klinger)

This series offers an opportunity to dig deeper into how nitrogen behaves across diverse environments, behaviors which may explain things you witness every day. Whether you're observing how the species of trees change while on a walk through the forest, fishing for bass among the lily pads, watching the plants in your yard or garden grow or die, or trying to diagnose an issue in a corn field, nitrogen can help explain a fundamental question we're all curious about: Why am I seeing what I'm seeing?

This Drain Leads Directly to the River



Last year, [hundreds of volunteers](#) with Friends of the Mississippi River (FMR) stenciled 1,615 storm drains in the Twin Cities.

Volunteers used stencils with the words "Keep 'em Clean," and "Drains to River" and cans of spray paint to apply the message near storm drains around Minneapolis and St. Paul. They also shared 2,529 flyers with community members to spread the word about why it's so important to keep our storm drains clean.



Scholars from 21st Century Academy stenciled storm drains in North Minneapolis in partnership with the City of Minneapolis Public Works. (Friends of the Mississippi River / Tamar Patterson)

Unlike household water systems, storm sewers flow

HABs preparedness and response; and state and local HAB resources such as the laboratories which perform analysis of water samples for cyanotoxins. These maps can help the public better understand the occurrence of cyanoHAB events and further explore the causes of cyanoHAB formation.

Saltier Lakes in Minnesota?

EPA has given a green light to [changes to Minnesota's water quality rules](#) which advocates say will weaken protections for lakes and rivers. The Minnesota Pollution Control Agency (MPCA) proposed amending the standards, intended to protect water for use by industry, agriculture, livestock and wildlife. "What we were really trying to do was to build in some flexibility to look at Minnesota-specific conditions, and to make sure we had water quality standards that were really tailored to the conditions that we have in Minnesota," said Catherine Neuschler, who manages the MPCA's water assessment work.



Paddlers in Minnesota have access to 35 state water trails comprising over 4,500 miles. (MN Department of Natural Resources)

These changes eliminated some numeric limits on certain pollutants, including those affecting salinity, and replaced them with narrative statements describing what the water quality should be.

Water advocates are concerned the changes could lead to more chloride, bicarbonates and other salts being discharged into lakes and rivers, where they can harm aquatic life. "There is research showing that our lakes are becoming saltier in Minnesota, and that the impacts of that pollution is really long term." Melissa Lorentz, staff attorney with the Minnesota Center for Environmental Advocacy, said. Several of Minnesota's Tribal Nation's also opposed the changes, arguing they would lead to degraded water quality in lakes and rivers which support fish and wild rice.

An Unknown Benefit of Roadside Ditches: Nitrogen Removal

The ubiquitous ditch - this common feature along roadways, mainly serves to provide a path for stormwater to escape. However, roadside

directly into waterbodies, depositing whatever they pick up along the way (pesticides, motor oil, fertilizer, pet waste) directly into the nearest lake or river — unfiltered and untreated. Many residents are unaware activities like raking their leaves into the street may contribute to the algae blooms and fish kills which have impacted their favorite outdoor spaces. Stenciling volunteers learn about their effects on water quality as they spray paint awareness messages like "Keep 'em clean, drains to river" next to drains.

Along with stenciling, FMR works with community partners to create and install a water quality-themed mural near a storm drain at a park in St. Paul. [This mural](#) serves as a reminder that the city landscape connects to the river through storm drains and that it takes everyone working together to ensure clean water.

Funding Opportunities

Gulf of Mexico Underserved Farmer to Farmer Grants Program RFA

The EPA Gulf of Mexico Division (GMD) is announcing a [Request for Applications \(RFA\)](#) from eligible applicants for the Gulf of Mexico Historically Underserved Farmer to Farmer Grants Program. This RFA is for an applicant who would receive a direct award from EPA and would provide competitive subawards to eligible entities to directly collaborate with underserved farmers on projects within the Gulf of Mexico watershed to support Gulf of Mexico Farmer to Farmer objectives. The total estimated amount available under this announcement is approximately \$12 million. It is expected grant awards may be issued for up to a five-year project period beginning May 2022. EPA plans to award four cooperative agreements of up to \$3,000,000 of funding per cooperative agreement. EPA plans to fund one cooperative agreement in each of the following geographic categories:

1. Missouri - Arkansas – White - Red Region (HUCs 10 and 11)
2. Ohio-Tennessee Region (HUCs 05 and 06)
3. Non-Mississippi River Drainage (HUCs 12, 13 and a portion of 03)
4. Mississippi River Region (HUCs 07 and 08)

Farmer-Led Conservation & Watershed Protection Mini-Grant Program

[This mini-grant program](#) promotes conservation delivery, adoption, and technologies to improve water quality in local watersheds across the Mississippi River Basin, encourages partnerships in conservation, and promotes farmer-led watershed leadership. Awardees will be equipped with educational materials and evaluations to ensure delivery and evaluation meet grant requirements.



ditches may have an unexpected benefit: the removal of excess nitrogen which could otherwise contribute to harmful algal blooms and dead zones in coastal waters. Dr. Corianne Tatariw, a researcher at the

University of Alabama, recently published a study ([read the summary here](#)) comparing the nitrogen removal ability by microbes in ditches from three distinct landscapes surrounding Mobile. Tatariw and her team spent four weeks gathering samples from 96 ditches along paved two-lane roads in each of those three areas. What they discovered was these ditches were as effective at removing nitrogen as natural ecosystems, such as wetlands and streams. Knowing these ditches can serve as bonus filters from excess nutrients could help managers make smarter development choices in the future.

Winners of the Next Gen Fertilizer Innovations Challenge Announced

The U.S. Environmental Protection Agency (EPA) [announced the winners](#) of the Next Gen Fertilizer Innovations Challenge, the second of a two-part, joint EPA-US Department of Agriculture (USDA) Partnership and Competition on Enhanced Efficiency Fertilizers (EEFs) to Advance Agricultural Sustainability in the United States. The goal of the competition is to improve the efficiency of fertilizers to increase crop yields while reducing the impacts of fertilizers on the environment.

The [winning solutions](#) use nanoparticles which require less fertilizer and release nutrients on demand to growing plants, and then biodegrade into harmless substances or even nutrients; support greater plant growth from the same or less fertilizer application; and other approaches.

Four local farmer-led demonstration activities will be funded annually.

Qualified organizations will compete for grants in the amount of up to \$4,000. The 2021-2022 mini-grant submission deadline is Feb 15th, 2022.

Upcoming Meetings

12th International Conference on Toxic Cyanobacteria

The City of Toledo and the local organizing committee invite you to [ICTC 12](#) to be held at University of Toledo! Online registration available until July 2022.

11th U.S. Symposium on Harmful Algae

The [11th U.S. Symposium on Harmful Algae](#) will be held on October 23-28, 2022, in Albany, New York, at the Hilton Albany. The theme for the upcoming symposium is "Science to Support Solutions from Shore to Shore". From freshwater to marine systems, the prevalence of harmful algal blooms (HABs) is a national environmental challenge, and solutions are needed. Celebrating this event in New York – the only state with Great Lake shorelines, marine coasts, and the diverse range of ecosystems between these extremes – creates an ideal setting to discuss progress in understanding algal bloom ecology and the solutions necessary to prevent and reduce HABs.

Abstract deadline is May 6th, 2022; poster abstract deadline is July 15th, 2022; registration deadline is September 16th, 2022.

National Climate Assessment: Midwest Chapter Engagement Workshop

The National Climate Assessment is a Congressionally mandated quadrennial report led by the U.S. Global Change Research Program (USGCRP). The report evaluates how climate change affects people and places in the United States. To inform development of the fifth National Climate Assessment, USGCRP and the author teams will be hosting a series of virtual public engagement workshops in January and February 2022. [The workshop for the Midwest](#) will take place on January 24, 2022 from 9am-1:30pm Central Time.



NOAA Regional Collaboration NETWORK

This bulletin is compiled by the NOAA Central Region Collaboration Team and Gulf of Mexico Regional Collaboration Teams nutrient runoff working group.

Members represent Minnesota, Louisiana, and Mississippi-Alabama Sea Grant Programs, National Water Extension Program, Northern Gulf Institute, Mississippi State University, University of Minnesota Water Resources Center, North Central Region Water Network, NOAA National Center for Coastal Ocean Science, NOAA National Weather Service Forecast Offices and River Forecast Centers.

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NOAA Regional Collaboration: Improving NOAA's service to the Nation