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Collaborate to Protect Vital Source Waters and Mitigate Climate Change

Dave White and Adam T. Carpenter

Key Takeaways

Climate-friendly agricultural conservation practices can protect and restore drinking water sources.

As US water utilities consider how to better protect their source waters, working with the US Department of Agriculture (USDA) and agricultural producers offers great promise.

Collaboration between water utilities and USDA can also strike a blow against climate change effects—and maybe even save some money in the process.

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From the environment to our forests, to agriculture, and the water we drink, climate change continues to adversely affect many sectors of our lives. Once rare and extreme weather events are becoming commonplace. The National Oceanic and Atmospheric Administration (NOAA) tracks natural disasters, and since 1980 the United States has experienced 291 weather and climate disasters that each exceeded \$1 billion (NOAA NCEI 2021). The cumulative cost is staggering: more than 14,000 lives lost and in excess of \$1.9 trillion to pay for disaster relief. Between 2016 and 2020, there were 81 severe disasters that caused nearly 4,000 deaths and whose total cost was more than \$600 billion. Figure 1 shows the billion-dollar disasters that occurred just in 2020.

Climate Change and Source Waters

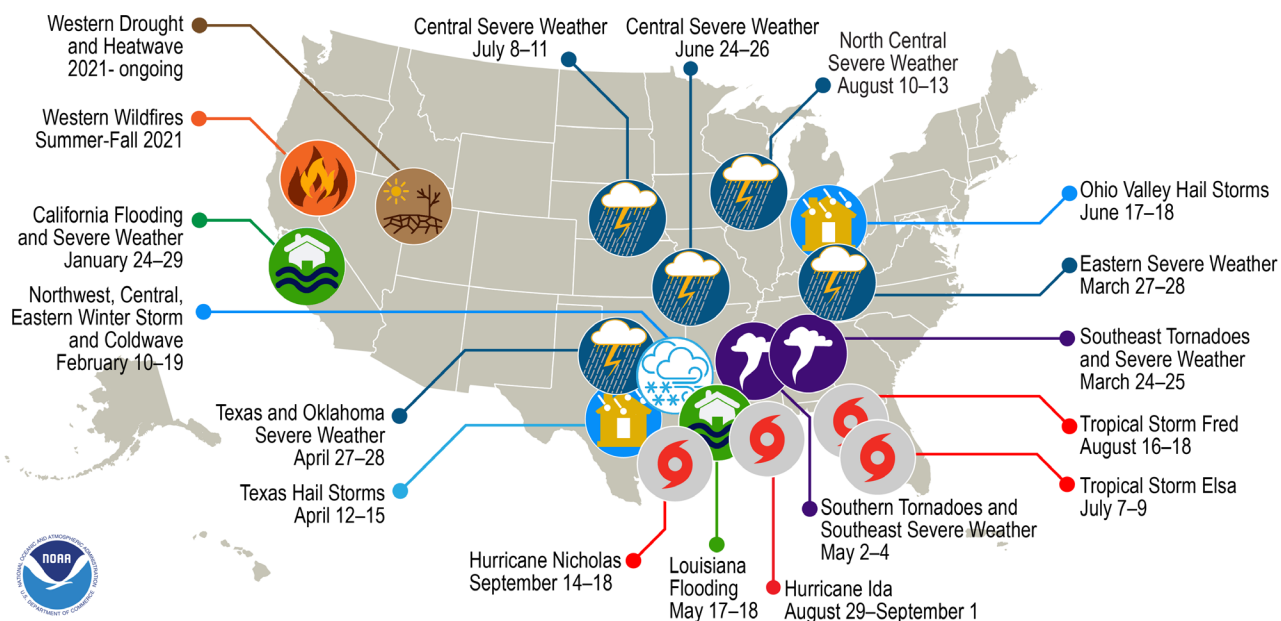
In the western United States, wildfires are happening with increasing frequency and severity as well (Photo 1). The National Association of State Foresters documents that the fire season today is 78 days longer than it was in



Wildfires have caused considerable destruction to source water areas and water infrastructure alike.
Photo credit: n.d. US Department of Agriculture Natural Resources Conservation Service

Photo 1

Billion-Dollar Weather and Climate Disasters in 2020



Source: Smith 2021, National Oceanic and Atmospheric Administration

Figure 1



Sheet and rill erosion in a field in Iowa (A) and cumulative, severe loss of topsoil in a Virginia crop field (B) illustrate issues faced in many US croplands. Photo credit: (left) n.d. US Department of Agriculture Natural Resources Conservation Service, (right) © 2021 Ray Archuleta

Photo 2

the 1970s and projects that fire seasons will become hotter, more unpredictable, and more expensive (NASF n.d.). The amount dedicated to fire suppression in the Forest Service budget has grown from 20% of the total to more than 50%, and in 2018 the US government spent more than \$3 billion fighting wildfires.

Agriculture and Water

In addition to these many challenges is the uneven increase in world population. The United Nations projects that there will be 9.7 billion humans on Earth by 2050, many of whom will be in water-poor areas (UN DESA 2019). To feed this many people, worldwide food production will need to substantially increase. In 2012, the World Wildlife Fund's *2050 Criteria* report stated that in the next 40 years, humanity would have to produce more food than we have in the last 8,000 years combined (WWF 2012).

At the same time, agricultural issues increasingly affect drinking water. A 2021 study published in *Proceedings of the National Academy of Sciences* (Thaler et al. 2021) found that over the years, some one-third of the cropland in the US Corn Belt has lost its carbon-rich topsoil to erosion (Photo 2, parts A and B). While farm production has kept up with the loss of topsoil through advanced genetics and additional fertilizer, agricultural runoff has accelerated water quality problems in many US lakes and waterways.

For example, the City of Toledo had to issue a “do not drink” order for three days in 2014 because of a harmful algal bloom in Lake Erie caused by

phosphorus runoff, primarily from agricultural lands. Today, harmful algal blooms commonly occur around the world, and excessive nutrients and chemicals often increase costs to water utilities to ensure safe drinking water for their customers.

The challenge is clear—the world must find a way to work together to increase food production to meet all human needs while also safeguarding our environment, addressing climate change, and ensuring overall economic vitality. And we must do that in the face of increasingly erratic weather patterns.

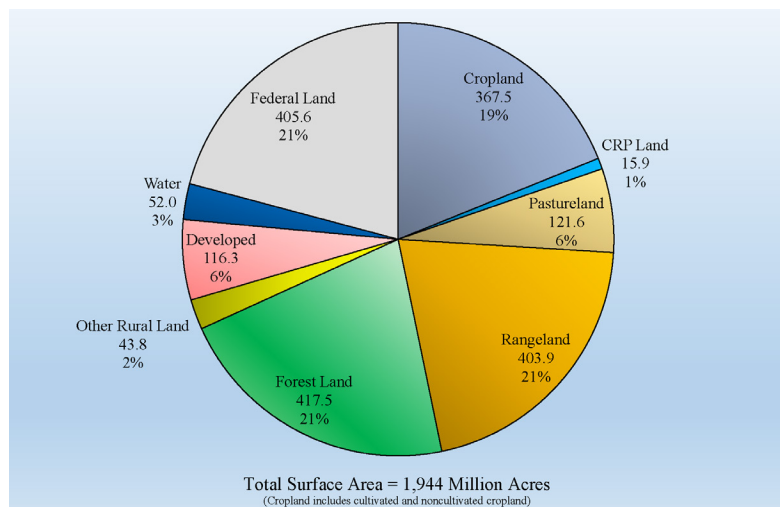
Agriculture in the United States

As shown in Figure 2, there are 1.9 billion acres of land in the United States (excluding Alaska), and some 1.4 billion acres of those are classified as nonfederal rural land. In the lower 48 states, approximately 70% of the land is privately owned, and about 88% of all surface water falls on private lands before reaching lakes, streams, and groundwater aquifers.

Agriculture accounts for the vast majority of private lands in the United States, and because of this mammoth footprint, it's clear that the quality of our environment is determined by the countless decisions that farmers make every day. It's equally clear that working with agriculture is an effective way for utilities to help address climate change and ensure the protection and viability of their surface water and groundwater sources.

It's estimated that agriculture contributes approximately 10.5% of the US emission of greenhouse gases (GHGs; Figure 3).

Land Cover and Use in Millions of Acres as Percent of Total Surface Area, 2017



Source: 2020 US Department of Agriculture Natural Resources Conservation Service

Figure 2

Primary GHGs associated with agriculture are carbon dioxide (CO₂), nitrous oxide (N₂O), and methane (CH₄).

In 2018, US agriculture emitted an estimated 698 million metric tons of carbon dioxide equivalent: 12.3% as CO₂, 36.2% as CH₄, and 51.4% as N₂O. The US Environmental Protection Agency estimates that N₂O contributes 6% of the total US load of GHGs, and the vast bulk comes from agriculture. It's worth noting that nitrous oxide and methane are much more powerful GHGs than carbon dioxide—nitrous oxide is 298 times and methane 84 times more potent than CO₂. In other words, every pound of N₂O kept out of the environment is the equivalent of 298 pounds of carbon dioxide reduction; every pound of methane reduced equals 84 pounds of CO₂.

Climate change is widely acknowledged to adversely affect agriculture, and there is keen interest to ensure everyone has a reliable food supply. As far back as 2015, the US Department of Agriculture (USDA) projected that climate change would negatively affect many of the nation's primary crops, including corn, soybeans, rice, and cotton. However, agriculture can also be a carbon sink, and by using regenerative practices that sequester carbon in the soil, trees, or grasslands, agriculture has the unique ability not only to offset its own carbon

footprint but also to help mitigate the worst effects of climate change.

The USDA Natural Resources Conservation Service (NRCS) has more than 150 different science-based conservation practices, and many of them protect source waters and are also climate friendly. Ranging from contour buffer strips to no-till farming, to cover crops, to windbreaks, and shelterbelts, these conservation practices solve resource issues while they also sequester carbon. Additionally, edge-of-field structural practices such as drainage water management, saturated buffers, and denitrifying bioreactors help reduce nutrient loss to waterways (and the subsequent conversion of nitrogen into N₂O), which reduces costs to produce potable water. Other livestock-related practices

such as using digesters reduce methane emissions while keeping manure out of water bodies.

Taken together and working as conservation systems, these relatively inexpensive practices not only help utilities protect their source waters—they can also mitigate climate change and help agricultural producers become more resilient to maintain their long-term economic viability. The bottom line is, working with agriculture can provide water utilities with some of the most cost-effective and reliable conservation practices to reduce GHG emissions, build resilience and sustainability on farms and in communities, and protect drinking water sources.

Regional Conservation Partnerships

Working with local and regional partners is a frugal way to leverage limited finances to fund source water protection. In the United States, USDA operates several voluntary, incentive-based conservation programs for agricultural producers—farmers, ranchers, and woodland owners—and most of them are managed by NRCS.

When it comes to stretching money, of key interest to US water utilities is the Regional Conservation Partnership Program (RCPP). Under this program, NRCS co-invests with both public and private partners to implement environmentally beneficial projects. NRCS will pay 50% of a project,

with project partners making up the balance, and noncash, in-kind contributions are allowed.

There is no question that utilities in the United States can participate. AWWA worked with Congress to ensure water utilities are specifically mentioned in law as being eligible partners. Further, Congress has directed NRCS to spend at least 10% of its conservation funding on source water protection projects.

The RCPP is unique in that the local partners get to

- select the geographic area they want to work in,
- choose the natural resource problem they want to focus on, and
- select and prioritize the practices they want to use.

This means that if a utility knows the issues affecting its source waters—whether it's from cropland, grassland, or forestland—they can work to design a project that will address that need. While all land uses are eligible, the carbon sequestration potential of sound forest management and reforestation is particularly clear.

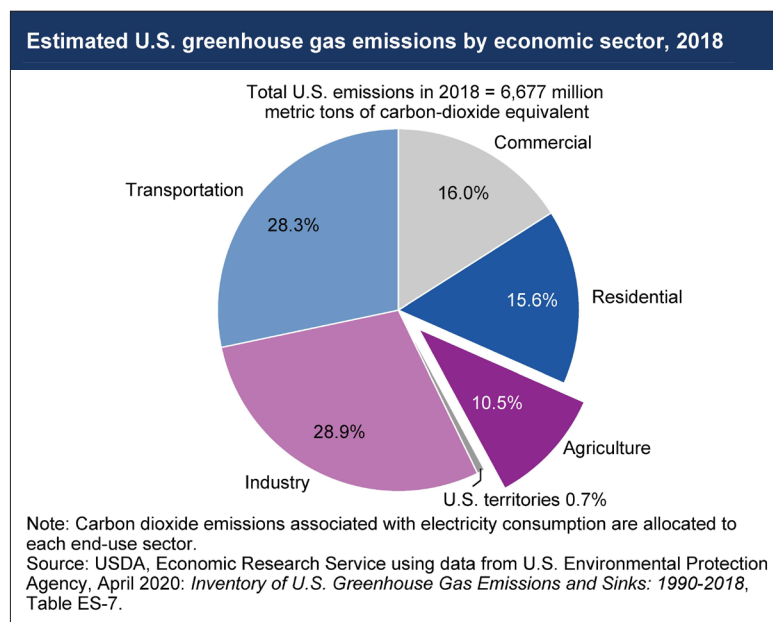
NRCS has about \$300 million annually to invest in RCPP projects and publicly announces its funding opportunities. NRCS is focused on agriculture, so water utilities interested in the program need to work with local agricultural and conservation partners to develop and submit applications tailored to their specific issues.

Relationships Are Everything

AWWA worked with the House and Senate Agriculture Committees and USDA during the development of the 2018 Farm Bill to secure the ability of water utilities to participate in USDA conservation programs and to ensure at least 10% of the funding goes to source water funding. But the legislative achievements didn't just happen; they were the result of a deliberate relationship-building effort on the part of AWWA that began in 2016.

When the effort first started, neither the Agriculture Committees nor USDA had any idea who AWWA

Total US Greenhouse Gas Emissions in 2018 by Economic Sector



Source: 2020 US Department of Agriculture Economic Research Service

Figure 3

was, so AWWA spent two years developing relationships on Capitol Hill and within USDA. Those relationship-building efforts paid off, and AWWA became viewed as a new—and welcome—nontraditional voice in the development of the agricultural act. AWWA became a trusted source that added greatly to informing the final outcome of the Farm Bill.

For water utilities, the principle is the same: the first task is to establish local and state relationships with USDA (particularly NRCS) and with local agricultural and conservation groups. Put bluntly, they need to know and trust you and your utility's aims before they will collaborate with your team. Start by contacting your local NRCS field office—there is generally one in every county or parish across the country, and a complete listing of all the USDA offices can be found at <https://offices.usda.gov>. The goal is to get to know the people who work there on a first-name basis.

At the state level, the NRCS state conservationist represents the first stop. The state conservationist is

ADDITIONAL AWWA RESOURCES ON THE FARM BILL, ITS PROGRAMS, AND WORKING WITH NRCS

Farm Bill Key in Protecting Drinking Water (YouTube)
www.youtube.com/watch?v=kPEdoWgc4Gg

Working Together to Solve Source Water Nutrient
Issues
<https://doi.org/10.5942/jawwa.2017.109.0145>

Collaboration With Farmers Key to Source Water
Protection
<https://doi.org/10.5942/jawwa.2018.110.0026>

USDA Tools to Support Source Water Protection
<https://news.awwa.org/USDASWPrep>

Working With the NRCS for Source Water Protection
<https://news.awwa.org/2019WorkWithNRCS>

Bringing Agriculture and Drinking Water Utilities
Together for Source Water Protection
<https://doi.org/10.1002/awwa.1340>

The Farm Bill and Source Water Protection:
One Year Later
<https://doi.org/10.1002/awwa.1425>

A Call to Action: How to Use \$4 Billion for Source Water
Protection
<https://doi.org/10.1002/awwa.1264>

USDA Source Water Protection Funding: Successes
and Opportunities
<https://doi.org/10.1002/awwa.1481>

Protecting Drinking Water at the Source: Information for
Our Agricultural Partners
<https://news.awwa.org/ProtectSource>

NRCS—Natural Resources Conservation Service,
USDA—US Department of Agriculture

responsible for all the agency's statewide operations; a complete list can be found at www.nrcs.usda.gov/wps/portal/nrcs/main/national/contact/states. In many states, someone is dedicated to working with potential and current partners to help them navigate the various programs and funding opportunities.

AWWA published *Working With the NRCS for Source Water Protection*, which serves as a handy guide on whom and how to contact. Find this and many other current and valuable resources listed in the accompanying sidebar, "Additional AWWA Resources on the Farm Bill, Its Programs, and Working With NRCS."

As utilities survey their source water protection efforts, they are encouraged to reach out to their local NRCS office—let them know who you are, whom you

represent, and that you are interested in opportunities to work with NRCS to protect source water in your service area. Inquire about the RCPP and offer to meet with NRCS staff.

It takes time to build relationships and trust, but the payoff can be significant. By taking the approach described here, utilities can work with their communities to develop effective collaborations that protect source waters while working against further climate change. 🌱

About the Authors



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<https://doi.org/10.1002/awwa.1865>

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