Environmental Stewardship

PHOTO: USDA

Mitigating the impacts of climate change

Farmers and communities across the United States are already experiencing the effects of climate change. Shifts in temperature, precipitation and pest and pathogen populations impede crop and livestock production, and rising sea levels and "superstorms" threaten coastal communities. The severity and frequency of these effects could continue to increase. To sustain agricultural productivity, food security and community well-being, researchers at land-grant universities across the United States are gathering nuanced data on the causes and consequences of climate change and developing science-based tools and strategies to mitigate the impacts.

Successful examples:

- Communities need to understand science-based environmental limits, or "tipping points," so they can make informed land use decisions. A team in **Indiana** developed Tipping Point Planner, an interactive web-based tool that helps communities calculate tipping points, explore what-if scenarios, and estimate the costs and benefits of taking certain actions. Through workshops, communities across Indiana, Illinois, Wisconsin, Michigan and Ohio learned how to use the Tipping Point Planner to organize objectives, data, models and planning tools to implement and maintain natural resource and land management plans that protect critical ecosystem services.
- **Connecticut** researchers and Extension educators are helping prepare for and mitigate the damage strong storms cause to power lines, homes and other structures in Connecticut's coastal and forested areas. As part of the Climate Adaption Academy and Climate Corps, students, municipalities and professionals learn about climate change and practical, low-cost next steps to improve resilience. In particular, workshops and educational materials have increased the use of "living shores," which use natural materials like sand, plants, or rock to stabilize shoreline, dampen the impact of waves and reduce coastal erosion. Through Stormwise, scientists collected data on the effects of wind on tree movement and worked with arborists, tree crews and woodland owners to thin trees along utility lines to reduce storm damage. Extension educators have also helped Connecticut residents participate in a federal incentive program that offers discounted flood insurance premium rates in return for specific floodplain management activities.

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Prepared by the National Impacts Database Communications Subcommittee, supported by ESCOP, ECOP and USDA/NIFA.

02/2021

USDA National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE

- The Rio Grande Basin is the most climate-stressed river system in the United States. Frequent droughts and floods affect the water supply, which six million people depend on for urban uses, agriculture, hydropower and ecosystem services. **New Mexico** researchers developed a method that predicts major shifts in the hydrologic system and identifies locations of disconnection between surface and groundwater. They also created a model to analyze and predict the economic costs of new policies that would protect the aquifers given various scenarios. These tools help policymakers, water managers, and residents make informed decisions about sustainable water use, such as irrigation for important crops like the world-famous Hatch green chile, which is critical for the New Mexico economy.
- With traditional water sources under stress from climate variability, non-traditional irrigation water sources, such as recycled water, are becoming more and more crucial. Many farmers have concerns about these sources, however. A **New Mexico** team created two virtual labs to help farmers and others see how nontraditional water is tested and monitored. These accessible, high-quality digital educational tools have been used nearly 5,000 times since December 2019 and have supported a shift within both agricultural and nonagricultural communities toward the use of non-traditional irrigation sources.
- Cover crops planted in the summer can improve the water use and nutrient use efficiency of the following fall crop. **New Mexico** researchers identified cover crops that can be grown with little to no water, providing farmers in semi-arid regions with a sustainable, cost-effective way to improve crop yields, increase income, and maintain food and forage security even as droughts become more frequent and intense.
- Researchers in **Illinois** looked at fish responses to climate-related stressors, including changes in gene expression patterns, swimming performance, feeding habits and reproduction. This project is generating tools, datasets and guidelines that can be used to detect, predict and mitigate the effects of climate change on fish communities and aquatic ecosystems that provide valuable ecosystem services, such as recreation, food and habitat.
- Gardeners, homeowners and commercial landscapers have become more interested in planting drought-tolerant plants in California, but many are unknowingly planting harmful or poisonous plants that can injure people, pets and wild animals. **California** Extension developed brochures, presentations, a website and other materials that provide information on toxic plants and show gardeners and landscapers how to enjoy these plants safely.