



Environmental Stewardship

PHOTO: PIXABAY

Protecting Habitats and Biodiversity

Natural ecosystems provide clean air and water, food and shelter for wildlife and recreation opportunities. Agriculture, urbanization, climate change, pests and other stressors put America's landscapes and native species, including essential pollinators, at risk. U.S. Land-grant universities are working to restore and protect ecosystems and biodiversity.

Here are a few examples of that work:

- Per- and polyfluoroalkyl substances (PFAS) molecules are “forever chemicals” that linger in the environment and can be highly toxic to humans even at extremely low amounts. Researchers in **Connecticut** worked with Yale University and the University of **Minnesota** to develop nanomaterials that attach to PFAS molecules so they can be easily extracted from soil by plant roots and shoots. Soil amendments with these engineered nanomaterials could help remediate land.
- Working with USDA's Agricultural Research Service, **Iowa** researchers developed the Financial and Nutrient Reduction Tool to help farmers and landowners estimate direct and opportunity costs of conservation objectives. The tool's tailored, localized data can reduce critical uncertainties, encouraging landowners to adopt conservation practices.
- In **Pennsylvania**, researchers generated annual county-level estimates of lethal doses of insecticides honeybees received from chemicals applied to cropland, or the “toxic load.” This new indicator can be a more accurate alternative to the commonly used “pounds of insecticide applied” scale. The research showed an increased total “toxic load” of over 120-fold in some Midwestern states due largely to increased neonicotinoid seed treatments in corn and soybean fields. This is the first study to identify geographic patterns of insecticide toxicity in bees and reveal specific geographic areas where mitigation and conservation efforts could be focused.

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- Restoring wetlands has many benefits, but re-emerging wetlands can produce higher levels of greenhouse gases. Researchers in **New York** found that alder trees can help wetland soils recover while also mitigating greenhouse gas production by taking up the nitrogen produced by soil microbes before it enters the atmosphere.
- Living shorelines can be a cost-effective and desirable way to protect coastal land from erosion, provide habitat and improve water quality. **Florida** Extension developed a course to help contractors increase skills need to design, permit, install and maintain living shorelines for property owners. In 2019, the program helped 36 companies diversify their businesses to include living shorelines. In addition to environmental benefits, counties benefit from increased tax revenue from hosting successful businesses with high-paying jobs and from reduced erosion control costs.
- **Wyoming** Extension helped remove almost 20 acres of invasive Russian Olive trees from the Popo Agie watershed. Tree removal helps reestablish native species and create open space, which encourages wildlife migration, improved stream flows, healthier riparian habitats and more area recreation opportunities.
- **Arkansas** researchers determined that even nonlethal levels of pesticides have serious effects on wild bee health. The researchers are now working to identify gut bacteria that help wild bees survive pesticide exposure so they can develop diet supplements that will boost pesticide tolerances of managed bees.
- In 2021, **Alabama** Extension helped volunteer gardeners grow 60,000 oysters to be used to help restore nearly three acres of reef sites in Mobile Bay. In addition to their potential economic value, oysters filter water and support estuarine ecosystems.
- **Florida** Extension educators are working to restore endangered and threatened native orchid species where they once thrived. As part of a 2022 Master Gardener training, volunteers installed 129 native orchids in 43 park and residential landscapes.
- **Virginia** Tech researchers are investigating how salt leaching from surface coal mining in Appalachia impacts the region's streams and biodiversity. This vital research is a first step in preventing cascading failures of crucial aquatic habitats and food webs.
- After a camp led by **West Virginia** Extension, 28 youths increased their sense of environmental stewardship and improved natural resource conservation skills. The number of campers interested in studying environmental sciences in college and pursuing a related career doubled. Encouraging youth interest in conservation and environmental advocacy is foundational to safeguarding the environment in the future.
- Hurricane Irma in 2017 and a spill of nutrient-rich wastewater in 2021 put southwest **Florida** water bodies at risk of macroalgae blooms. These blooms are unsightly and can impact native seagrasses and fish habitats. The Eyes of Seagrass program led by Florida Extension has been vital to collecting data on macroalgae abundance, species composition, and more. Trained citizens can cover more sites in less time than state agencies, filling data gaps and providing information to protect area aquatic ecosystems.

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- Research in **New Mexico** showed that burrowing owls — a species of conservation concern that's increasingly threatened by urban and commercial development — should be translocated in the non-breeding season and restricted to single individuals or male-female pairs, which has improved survival and productivity for owls in the Phoenix area.
- In **Louisiana**, researchers are working to stop the die-off of the world's largest continuous stand of roseau cane, which plays a crucial role in coastal stability. Surveys, soil cores, and plant and insect analyses shed light on possible management plans.
- **Oregon** researchers and Extension educators showed that cattle grazing on invasive grasses during the dormant season could be effective for mitigating wildfire damage and helping rangelands recuperate. So far, cattle grazing in the trial area has removed 2,500 tons of biomass fuels that would otherwise burn in a rangeland wildfire. Extension experts also helped about 300 landowners affected by fires, who need millions of trees to reforest their properties, prepare their sites and find available seedlings. Many forest owners found it almost impossible to find supplies until Extension stepped in.
- In **Indiana**, Extension programs about hellbender salamander conservation reached 60 state park naturalists and over 300 visitors, increasing their knowledge of ways to protect this endangered species.