



YOUR WETLANDS AND A CHANGING CLIMATE

INDIANA



Many landowners have noticed visible impacts to their land with recent changes in our climate^{1,3,4}. Changes in land use and cover have made the functions and values of wetlands and riparian areas even more critical to store and filter water. The USDA's Northern Forests Climate Hub and Northern Institute of Applied Climate Science have identified tools and approaches² to help landowners adapt to climate change and restore desired hydrologic function on their land. The conservation programs offered by the USDA Natural Resources Conservation Service (NRCS) in Indiana can help private landowners achieve these goals through technical and financial assistance. Below are some examples of how adaptation strategies and NRCS programs can help you steward your wetland resources and prepare for climate change impacts.

HOW IS CLIMATE CHANGE IMPACTING WETLANDS?

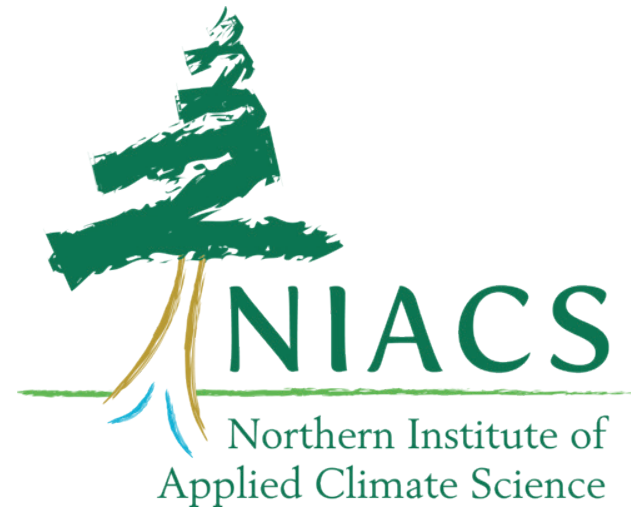
For a full description of climate change impacts on Indiana wetlands, view the Climate Explorer Tool at: <https://adaptationworkbook.org/explore-impacts>.



Helping People Help the Land

NRCS provides America's farmers and ranchers with financial and technical assistance to voluntarily put conservation on the ground, not only helping the environment but agricultural operations, too.

www.in.nrcs.usda.gov



The Northern Institute of Applied Climate Science (NIACS) has been designed as a collaborative effort among the Forest Service, universities, conservation organizations, and forest industry to provide information on managing forests for climate change adaptation and enhanced carbon sequestration.

www.niacs.org



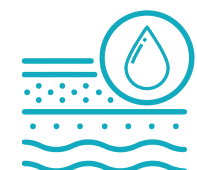
TEMPERATURE INCREASES

Temperatures in Indiana have risen 1.2° F since 1895, and are projected to increase by 6-10° F by late century. The frost-free season has already increased by 9 days, a trend which is expected to accelerate. Snow cover and soil frost will likely decrease in the future. Increasing temperatures can affect rates of evaporation and evapotranspiration, length of growing season, and drought stress. This means a shorter period of time for conducting management operations in forested wetlands, as well as changes in groundwater recharge and soil infiltration rates.



PRECIPITATION CHANGES

Average annual precipitation in Indiana has increased by 5.6 inches; winters and springs are projected to be much wetter by mid-century. By late century, summer precipitation is projected to decline by nearly 8%. Extreme rainfall events are becoming more common across the Midwest, and are expected to continue to intensify throughout the century. Heavy rainfall has significant impacts on soil moisture, frozen ground duration, flooding, and surface runoff.



CHANGING HYDROLOGY

Intense rainstorms are happening much more frequently in recent decades. Flooding and erosion from heavy rainfall have severe consequences for ecosystems, infrastructure, and local communities. These heavy rain events negatively impact water quality, through increased sedimentation and nutrient deposition, while warming temperatures can lead to increases in harmful algae and bacteria. Increases in winter and spring precipitation are expected to contribute to increased runoff and stream flow during those seasons. Soil infiltration and erosion rates could change as the duration and timing of ground thaw and precipitation changes. All these things could mean either less water on your land or more, depending on where you live and how climate change impacts continue to unfold.

WHAT CAN I DO?

Whether you are concerned about climate change impacts or are just interested in what you can do to keep your wetlands healthy and productive, NRCS has programs that can provide the technical and financial assistance to help you achieve your goals and objectives .

AGRICULTURAL CONSERVATION EASEMENT PROGRAM (ACEP)

Provides financial and technical assistance to help conserve agricultural lands, wetlands, and their related benefits.

CONSERVATION STEWARDSHIP PROGRAM (CSP)

Helps landowners, land trusts, tribes, and other entities protect, restore, and enhance wetlands, grasslands, and working farms and ranches through conservation easements.

ENVIRONMENTAL QUALITY INCENTIVES PROGRAM (EQIP)

Provides technical and financial help to landowners for conservation practices that protect soil and water quality.

WHERE DO I START?

After applying for a specific program, you'll start with a **CONSERVATION PLAN**, which will help you:

- Identify your **GOALS** and **OBJECTIVES**,
- consider how climate change will affect your land, and
- select adaptation strategies and conservation practices.

EXAMPLES:



OBJECTIVE: CREATE OR RESTORE ADAPTED PLANT COMMUNITIES

ADAPTATION APPROACHES: Enhance and maintain species diversity; favor and restore native species and genotypes adapted to future conditions.

CONSERVATION PRACTICES: Riparian Forest Buffer, Wetland Restoration

Wetlands and riparian areas can be critical habitat for many wildlife species and provide beneficial ecosystem services when they are functioning properly. These practices can help you provide habitat while maintaining beneficial riparian or wetland ecological processes and hydrological functions, which will increase your land's resiliency to climate change impacts. Increasing the diversity and cover of native woody and herbaceous species within a buffer zone along a river, stream, pond, lake, or wetland can help control invasive species, improve water quality, and improve habitat for fish and waterbirds. Amphibians and reptiles have small home ranges and depend on a diversity of wetland habitats and hydrologic periods available in relatively close proximity. Finding a way to maintain tree cover in forested lowland areas after losing ash trees to Emerald ash borer (EAB) will be of special importance to many landowners.



OBJECTIVE: IMPROVE HYDROLOGIC FUNCTION

ADAPTATION APPROACHES: Maintain and enhance infiltration and water storage; restore stream channel form and function.

CONSERVATION PRACTICES: Wetland Creation, Wetland Enhancement, Stream Habitat Improvement and Management

Hydrologic function can range from intercepting precipitation and surface runoff to filtering pollutants and excess nutrients out of the water. Maintaining appropriate temperature and oxygen levels for fish and providing appropriate ponded water for waterbirds, amphibians, and reptiles to feed and nest are important parts to those functions. The work involved to either create or restore these functions on your land can include creating appropriate micro-topography and vegetation, installing water control structures, or controlling erosion with structural treatments. The goal is to minimize land that offers little to no opportunities for rainwater infiltration or that accelerates the movement of water across the land. Removing legacy sediments, amending compacted soils, or providing structures that stabilize stream-banks and reconnect the floodplain to incised channels can decrease soil erosion and increase water quality.



OBJECTIVE: FACILITATE WILDLIFE USAGE

ADAPTATION APPROACHES: Maintain and restore wetland structure; design and manage wetlands to accommodate hydrologic variability

CONSERVATION PRACTICES: Tree and Shrub Establishment, Wetland Wildlife Management, Wetland Creation

Critical functions of wetlands and riparian areas include providing food, nesting, brood rearing, and water sources for terrestrial and aquatic organisms. By creating topographic variation on the site and encouraging an appropriate diversity of plant species, you can increase the likelihood of your wetland being utilized by wildlife. Topographic variation (micro and macro) creates a diversity of water depths, from short-term ponding to seasonal and semi-permanent water conditions; this diversity allows for the germination, establishment and dispersal of a wider array of wetland plants, which provide food and cover for wildlife. Future changes in precipitation patterns are likely to impact water levels, which may cause plant communities to shift. When designing a new wetland, it may be useful to consider increasing the capacity for extreme precipitation events. Creating topographic variation is one way to make your wetland more resilient to water level fluctuations, while maintaining its usefulness to wildlife.

OTHER RESOURCES AVAILABLE

Conservation programs, practices, and easements are available through the NRCS. Visit your local USDA Service Center or www.in.nrcs.usda.gov. More adaptation strategies and approaches are available for forestry and other topics. Visit the Climate Change Response Framework website at: www.forestadaptation.org/adapt.

CITATIONS

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2. Swanston et al, 2016. Forest Adaptation Resources: climate change tools and approaches for land managers, 2nd edition. <http://www.treesearch.fs.fed.us/pubs/52760>.
3. Widhalm, M. et al., 2018. Indiana's Past & Future Climate: A Report from the Indiana Climate Change Impacts Assessment. Purdue Climate Change Research Center, Purdue University. West Lafayette, IN. <https://purdue.ag/climate-report>
4. Phillips, R.P. et al. 2018. Indiana's Future Forests: A Report from the Indiana Climate Change Impacts Assessment. Purdue Climate Change Research Center. West Lafayette, Indiana. DOI: 10.5703/1288284316652