

Climate Resilient Land Management



Land Management for Our Future

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Climate Resilient Land Management (CRLM) Origins

The Origins of CRLM

Managing its land to support a healthy environment has been a top priority since Pierce Cedar Creek Institute was established on 550 acres in Barry County in 2001. Removing and controlling invasive species, planting native plants, and protecting sensitive areas are some of its standard land management techniques. These land management efforts have evolved over the years in response to data collected on-site, new research, and new threats. The growing scientific evidence of climate change has become an undeniable threat to the Institute's ability to maintain and enhance the biodiversity and health of its property, which now has grown to 850 acres. In early 2023, the owners of a local business came to the Institute. They asked if there was a way to reduce their businesses' carbon footprint by supporting the Institute's land management efforts. With this question, Institute staff saw an opportunity to define their land management efforts in a way that brought light to the challenging effects of climate change on our natural environment while also providing the knowledge and tools for others to protect their piece of nature, big or small. Climate Resilient Land Management, or CRLM, began as a pilot project and overarching term encompassing a variety of strategies and goals.



What is CRLM

CRLM is a work plan for the long-term health and resiliency of the Institute's natural areas in response to the threats posed by climate change. There is ample research linking carbon preservation in trees, plant matter, and soil to ecosystem health, but that is only one aspect of a healthy ecosystem. Building biodiversity, along with carbon sequestration, is critical for the long-term health and resiliency of our natural areas that, in turn, provide a healthy home for all inhabitants. Through specific management efforts backed by years of research, the Institute will employ land-management techniques to enhance climate resiliency and maintain biodiversity. Finally, these efforts will be documented, monitored, and evaluated for effectiveness and success. Equally important, the Institute will provide educational programming to allow others to implement similar measures on their property. All of this will take time, but it is a focus the Institute is committed to.



Research

Researchers completed two monitoring projects at the Institute in 2023. These projects have helped establish essential baseline data that Institute staff will use to monitor the impacts of the CRLM techniques applied, thus shaping future activities. The projects for 2023 included soil organic carbon content and storage capacity and eastern box turtle population dynamics.

Soil Organic Carbon Content and Storage Capacity

A research team from Calvin University, led by Dr. David Dornbos, completed a project measuring soil carbon content on several different soil types with multiple land-use histories at the Institute. The project aimed to compare the amount of soil carbon between different soil types and land-use history. Additionally, they calculated the future capacity to sequester carbon in the soil. Carbon sequestration should increase as organic matter is added to the upper soil layers. This project provides a baseline to identify and measure how land management techniques impact soil carbon levels in the long term.

“Research showed that previously tilled soils, now managed as prairies or successional forests, can store large amounts of additional soil carbon.”



Eastern Box Turtles

A Grand Valley State University research team led by graduate student Faith Kuzma and faculty members Dr. Jen Moore and Dr. Paul Keenlance have spent the past five summers headstarting eastern box turtles. Headstarting is a conservation tool that involves collecting eggs in the field, incubating, hatching, and rearing turtles in captivity, and releasing them when they are bigger and less susceptible to predation. The team is using this practice to increase the eastern box turtle population at the Institute. This state-threatened species has significantly declined at the Institute and across Michigan due to habitat loss and predation. Institute researchers have successfully released

“Without headstarting, current estimates are that less than 1% of the eggs laid by eastern box turtles would survive to adulthood.”

dozens of turtles over the past few years, considerably increasing their numbers. With the headstarting process, survivorship of hatchlings increases to 40% after one year and continues to aid in survival several years after release - juvenile survivorship rises to approximately 66%. Several future questions remain regarding the headstarted turtles, including whether this headstarting process affects the turtles' behavior after they reach sexual maturity. Future work will determine if the headstarting process impacts the ratio of male to female turtles and their ability to reproduce successfully.



Land Management

CRLM land-management efforts for 2023 focused on a specific portion of the Institute's property. The focus was defining the land-management stewardship needs and collecting baseline information to develop management plans and long-term goals for that parcel.

Site Selection

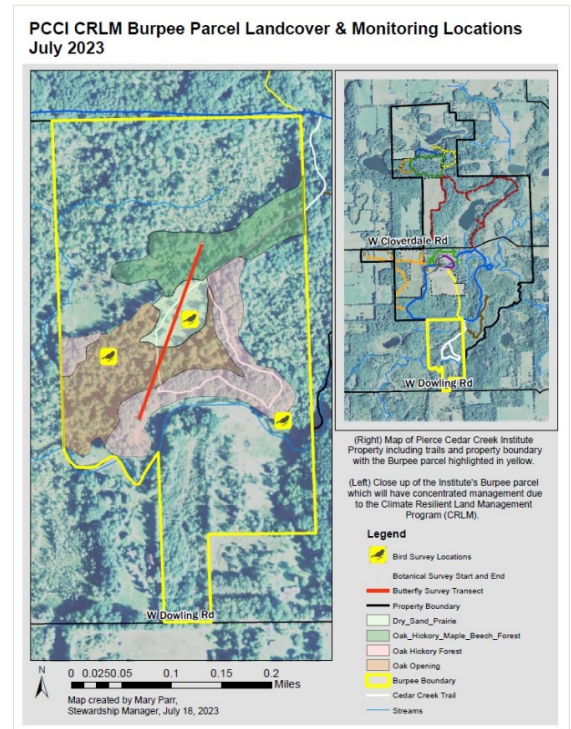
The first parcel chosen for the CRLM study is the Burpee parcel, located in the southern part of the Institute. This site provides several advantages. It is home to two of the Institute's flagship species for research and management: the eastern box turtle, which Michigan also identifies as a species of special concern, and the federally threatened eastern massasauga rattlesnake. Additionally, it encompasses a newly acquired property from Mary Pierce that includes a degraded upland and high-quality hardwood-Conifer swamp. Finally, this site does not have a conservation easement placed on it. A conservation easement is a legally binding document that outlines acceptable management practices for a property through perpetuity. Without this agreement, the Institute has more flexibility in conducting climate-progressive management practices that may apply to other sites on the Institute property.

Biodiversity Information

This summer, Institute staff and students from the Biological Field Station program collected baseline data about the site's biodiversity and completed preliminary invasive species management. We tested several protocols to evaluate the site's biodiversity and identify changes in response to management. The first protocol completed was a vegetation monitoring project, recording plant species diversity throughout the parcel. Currently, native species are present on approximately 57% of the ground cover along the transect, with another 24% covered in leaf litter or other non-vegetative cover. The remaining 19% is covered by invasive species, with spotted knapweed being the most common. Resampling in the future following management efforts will help identify the effectiveness of the management practices. Hopefully, we will document an increase in native plant species richness and diversity, along with a decrease in the frequency of invasive species, signifying a healthy ecosystem.

The Steeby Land Management Fellows conducted a bird and butterfly diversity project to monitor the site's health with the assistance of local birding experts Doug and Anne Klein of the Barry County Bird Club. Another collaboration included Bill Westrate of the Michigan Department of Natural Resources for butterfly and moth sampling and identification. The Institute also partnered with the Kellogg Bird Sanctuary and Michigan State University Extension on

“All plant species along the transect were recorded. Of the 120 species identified, 97 are native, while the remaining 23 are non-native.”



Land Management

the Michigan Conservation Stewards Program. This program helps participants gain the skills needed to contribute to land and water stewardship and educational efforts in their local communities. Each student was required to select and work on a capstone project to advance on-the-ground conservation efforts, public awareness, and educational efforts regarding natural resource management. Three students from the program worked on CRLM-related projects at the Institute. Two students conducted a baseline tree survey, mapping and identifying individual trees. The other student worked on passive camera trapping protocols to monitor small mammals, reptiles, and amphibians in the CRLM study area. All three students enjoyed their experiences with the Institute and plan to continue volunteering for their respective projects.



Management Goals

Through the surveying and baseline data collected, we created a management strategy for this region of the property that considers the changing climate and its effects on the habitat. The primary goals of the upland areas are to 1) reduce invasive species, 2) selectively thin the canopy of the oak woodlands, and 3) promote greater plant and wildflower ground cover. Additional work will be needed to remove invasive shrubs with stump treatments, girdle trees in dense areas and adjacent to open areas, use prescribed fire to further thin woody plants and stimulate the existing plant community, and add Institute native plant plugs and seeds harvested from the property in the newly open areas to expand plant diversity.



Management Activity

Work began on the management goals in 2023, such as removing invasive species, evaluating prescribed fire opportunities, and collecting seeds for use in the project area. Field Station students and volunteers aided in invasive species management during scheduled weekly and monthly workdays. Additionally, John Ball Zoo staff and Grand Valley State University faculty have provided insight on eastern box turtle management and fire. This has sparked conversations regarding future research opportunities to assess how the Institute's turtle population will respond to management and habitat improvements.

“Three acres have been managed for preliminary invasive species removal, which included 50.25 hours of volunteer stewardship work.”



Education and Outreach

PreK-12 Learning Programs

During late summer and fall, we provided 16 programs for 305 young people related to climate change and land management. These included programs on erosion prevention engineering, engineering for extreme weather events, conservation careers, and forest ecology. While most of these programs were for elementary students, we provided three programs to middle and high school students.



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PreK-12 Teacher Professional Development

On November 3 and 4, the Institute partnered with Western Michigan University to offer a Kid Wind Teacher Training. At the end, teachers received kits of supplies to take back into their classrooms.

Sixteen teachers from thirteen different schools participated in the training, learning about renewable energy, climate change, and technology.

Plans for 2024

Land Management and Research

This coming year, Institute staff and volunteers will continue to focus on the CRLM land management goals. Work has already begun on native seed processing. In the spring, work will focus on woody invasive plant control, selective tree thinning, and planning for prescribed burns. From May through August, the Institute will host our researchers and Steeby Land Management Fellows, who will be working on a variety of CRLM-related projects. In June, stewardship staff and Biological Field Station students and volunteers will plant native plant plugs in open areas. The birds, small mammals, reptiles, and amphibians will also be monitored and recorded. In the fall, work will continue on woody plant management and seed processing.



Education and Outreach

Conservation in a Changing World Lecture Series: In 2024, the Institute is hosting a new lecture series focused on conservation stories, biodiversity, climate change, and other phenomena affecting our changing world. Ten talks will be offered both in-person and virtually.

Solar Summit: The Institute is planning a solar energy educational event on Saturday, April 27, 2024. The event will address the following: basics of solar/renewable energy and how it relates to climate change, the use of solar energy to diversify landowners' income and habitat usage, fears and misinformation surrounding solar energy, and personal solar energy stories. The goal is to provide the public with a program where people can feel comfortable and invited to ask and get answers to questions about solar energy.

Traveling Talks: Institute staff will have a new 15-minute talk available to church groups, garden clubs, libraries, service organizations (e.g., Rotary, Kiwanis), and Institute facility rental groups in 2024. This talk will focus on local case studies related to climate change and actionable items that citizens, land owners, and everyday individuals can incorporate into their lives to combat climate change.



Looking Forward

The Institute's staff and Board of Directors are committed to the CRLM effort as a critical aspect of the Institute's newly created long-range plan. Through data collection, research, and the testing of management efforts, the community will learn how they can help combat climate change. The Institute will be able to model these best practices to help ensure it remains and grows resilient and healthy.