NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

NOAA In Your State

Michigan

***NOAA** is an agency that enriches life through science. Our reach goes from the surface of the sun to the depths of the ocean floor as we work to keep citizens informed of the changing environment around them. From daily weather forecasts, severe storm warnings, and climate monitoring to fisheries management, coastal restoration and supporting marine commerce, NOAA's products and services support economic vitality and affect more than one-third of America's gross domestic product. NOAA's dedicated scientists use cutting-edge research and high-tech instrumentation to provide citizens, planners, emergency managers and other decision makers with reliable information they need when they need it.*

The following is a summary of NOAA facilities, staff, programs, or activities based in, or focused on, your state or territory: Starting with highlights, then by congressional districts and cities or towns, Great Lakes programs, and then statewide programs.

Highlights of NOAA in Michigan

Lake Michigan Field Station	Muskegon	MI-3
Marine Instrumentation Laboratory	South Haven	MI-4
Great Lakes Environmental Research Laboratory	Ann Arbor	MI-6
Thunder Bay National Marine Sanctuary	Statewide	MI
Bipartisan Infrastructure Law (BIL) / Inflation Reduction Act (IRA) Projects	Project Specific	MI

The state of Michigan also has one Cooperative Institute, four Weather Forecast Offices, three Labs and Field Offices, four Science on a Sphere® exhibitions, and one Habitat Focus Area.

Weather Forecast Offices

Gaylord	MI-1
Marquette	MI-1
Grand Rapids	MI-3
White Lake/Metro Detroit	MI-10

National Weather Service (NWS) Weather Forecast Offices (WFO) are staffed 24/7/365 and provide weather, water, and climate forecasts and warnings to residents of Michigan. There are 122 WFOs nationwide of which four are in Michigan. Highly trained forecasters issue warnings and forecasts for weather events, including severe thunderstorms, tornadoes, hurricanes, winter storms, floods, and heat waves to the general public, media, emergency management and law enforcement officials, the aviation and marine communities, agricultural interests, businesses, and others. Information is disseminated in many ways, including wireless emergency alerts, social media,weather.gov, and NOAA Weather Radio All Hazards. Each WFO has a Warning Coordination Meteorologist who actively conducts outreach and educational programs that strengthen working relationships with local partners in emergency management, government, the media and academic communities. Forecasters provide Impact-based Decision Support Services (IDSS), both remotely and on-site during critical emergencies such as wildfires, floods, chemical spills, and major recovery efforts. To gather data for forecasting and other purposes, NWS WFO staff monitor, maintain and use Automated Surface Observing Stations and Doppler Weather Radar. In addition to the WFOs, NWS operates specialized national prediction centers and regional headquarters throughout the U.S. for a total of 168 operational units. Over 85% of NWS' workforce is in the field. For current Michigan weather, visit www.weather.gov and, on the national map, click on the relevant county or district.

Science On a Sphere®

Alpena	MI-1
Kalamazoo	MI-4
East Lansing	MI-7
Royal Oak	MI-11

Science On a Sphere (SOS) is a room-sized global display system that uses computers and video projectors to display planetary data onto a six-foot diameter sphere, analogous to a giant animated globe. Researchers at NOAA developed Science On a Sphere® as an educational tool to help illustrate Earth System science to people of all ages. Animated images of atmospheric storms, climate change, and ocean temperature can be shown on the sphere, which is used to explain in a way that is simultaneously intuitive and captivating what are sometimes complex environmental processes. They are located at the Great Lakes Maritime Heritage Center in Alpena, Valley Museum in Kalamazoo, and Detroit Zoo in Royal Oak.

MI-1, 2, 5, 6, 10
Muskegon, Alpena, South Haven, Saginaw

Office of Oceanic and Atmospheric Research (OAR) - Real-time Environmental Coastal Observation Network Stations

The goal of the Great Lakes Environmental Research Laboratory's (GLERL's) Real-time Environmental Coastal Observation Network (RECON) project is to develop a national network of low cost coastal buoys capable of seabed to sea-surface observations. This wireless Internet observation system, with shore stations at coastal locations covering approximately 800 square miles of sea surface, uses commercially available networking equipment allowing straightforward integration into a nationwide network. The seasonal buoys are located offshore of Muskegon, MI in Lake Michigan, and in Saginaw Bay and Thunderbay, in Lake Huron. The buoys collect meteorological data air data (wind direction, barometric pressure, wind speed, maximum wind speed, air temperature; water near-surface data) and provides lake surface and sub surface measurements of chemical, biological, and physical parameters including water temperature, significant wave height, maximum wave height, dissolved oxygen, and conductivity. The system is designed to allow controlled access to multi-institutional users through surface buoys and sub-surface sensor guest ports located on an underwater hub. The observation network currently provides environmental data to state, federal, and university researchers, educators and resource managers.

Alpena

Office of Oceanic and Atmospheric Research (OAR) - Real-Time Meteorological Observation Network

The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of meteorological instrument packages including Alpena, MI. The Alpena station measures/records wind speed, max wind speed, wind direction, and air temperature, and wind chill at two-minute increments updated every ten minutes. In addition there is a webcam with five views, images are updated six times per hour, six hour animation loops of these images are also posted.

NOAA Office of Education – Science On a Sphere® at Great Lakes Maritime Heritage Center. See Page 2 for detail.

Chatham

Office of Oceanic and Atmospheric Research (OAR) - U.S. Climate Reference Network

The US Climate Reference Network (USCRN) is an operationally viable research network of more than 138 climate stations that are deployed nationwide. Data from the USCRN are used in various climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN provides the United States with a reference network that contributes to an International network under the auspices of the Global Climate Observing System (GCOS). ARL/ATDD manage the USCRN in partnership with NOAA's NESDIS/NCEI.

Cheboygan

Office of Oceanic and Atmospheric Research (OAR) - Real-Time Meteorological Observation Network

The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of meteorological instrument packages including one on the Spectacle Reef Light offshore of Cheboygan, Michigan. The Spectacle Reef Light station measures/records wind speed, wind direction, and air temperature, relative humidity, dew point, barometric pressure, incident solar radiation and surface water temperature at 2-minute increments updated twice per hour. In addition there is a webcam with four views, images are updated six times per hour, six hour animation loops of these images are also posted.

Gaylord

Office of Oceanic and Atmospheric Research (OAR) - U.S. Climate Reference Network

The US Climate Reference Network (USCRN) is an operationally viable research network of more than 138 climate stations that are deployed nationwide. Data from the USCRN are used in various climate monitoring activities and for placing current climate anomalies into an historical perspective. The USCRN provides the United States with a reference network that contributes to an International network under the auspices of the Global Climate Observing System (GCOS). ARL/ATDD manage the USCRN in partnership with NOAA's NESDIS/NCEI.

National Weather Service (NWS) - Weather Forecast Office- See Page 2 for detail.

Mackinaw City

Office of Oceanic and Atmospheric Research (OAR) - Real-Time Meteorological Observation Network

The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of meteorological instrument packages including one the White Shoal Light offshore of Mackinaw City, Michigan. The White Shoal Light station measures/records wind speed, wind direction, and air temperature, relative humidity, dew point, barometric pressure, incident solar radiation and surface water temperature at 2-minute increments updated twice per hour. In addition there is a webcam with three views. Images are updated hourly.

Marquette

National Weather Service (NWS) - Weather Forecast Office- See Page 2 for detail.

Sault Ste. Marie

National Ocean Service (NOS) - Soo Locks PORTS®

A Physical Oceanographic Real-Time System (PORTS®) is operated cooperatively with the U.S. Army Corps of Engineers and provides real-time data quality-controlled and disseminated to local users for safe and efficient navigation. Real-time data are available for water levels from seven stations and meteorological data from six locations.

Traverse City

National Ocean Service (NOS) – Office for Coastal Management

The NOAA Office for Coastal Management practices a partner-based, boots on the ground approach to coastal management. The organization currently has staff in the eight regions who provide assistance to local, state, and regional coastal resource management efforts and facilitate customer feedback and assessments. Great Lakes regional staff are located in Chanhassen and Duluth, MN, Chicago, IL,Traverse City, MI, Madison, WI, and Albany, NY. In addition to providing NOAA products and services, these staff represent NOAA on multiple regional governance structures and coordinating bodies, including but not limited to, theGreat Lakes Restoration Initiative and the Great Lakes Regional Collaboration to improve the management of natural resources.

MI-1 through 5

National Ocean Service (NOS) – Climate Resilience Regional Challenge

In July 2024, NOAA announced $575 million in funding for the Climate Resilience Regional Challenge, provided by the Inflation Reduction Act, to invest in holistic, collaborative approaches to coastal resilience at regional scales. This grant program focuses on increasing resilience to extreme weather events, such as hurricanes and storm surge, and longer-term, chronic hazards such as sea level rise, drought, wildfire, extreme heat, and coastal erosion. The program awarded 19 grants that are part of NOAA's larger Climate-Ready Coasts initiative to forge new partnerships, protect

coastal habitats, and close equity gaps. They will help scale up proven best practices across 17 states and territories to take resilience and adaptation plans off paper and into coastal communities across the country.

The Northwest Regional Planning Commission, a cooperative of local governments and tribal communities in Michigan, Minnesota, and Wisconsin (MI-001, MN-008, WI-007) was awarded $1,451,065 to address catastrophic, repetitive flooding affecting local communities and an extensive network of state, local, and tribally managed roads. Road maintenance responsibilities stretch across three states, six counties, five cities, one village, 33 towns, and two tribes. The root causes of flooding and potential restoration opportunities will be investigated using new approaches that integrate spatial and field-based assessments. Funding will be used to 1) identify how the loss of headwater wetland storage and floodplain connectivity is contributing to the flooding problem; and 2) implement high-impact, nature-based solutions to combat this flooding by restoring the natural hydrology.

MI-3

Grand Rapids

National Weather Service - Weather Forecast Office-See Page 2 for detail.

Muskegon

Office of Oceanic and Atmospheric Research (OAR) – GLERL Lake Michigan Field Station

The NOAA Great Lakes Environmental Research Laboratory (GLERL) Lake Michigan Field Station (LMFS) is strategically located on the eastern shore of Lake Michigan in Muskegon, Michigan. The LMFS serves as the home base for field operations, research, and GLERL vessel operations - critical assets in providing physical access to the Great Lakes and advancing NOAA's mission in the region. Located on Lake Michigan's Muskegon Channel, GLERL's field station occupies three buildings. Employees at the facility include research staff, vessel crew, a marine superintendent, and administrative personnel. Additionally, the proximity of the field station to Lake Michigan provides a unique opportunity for engagement with tourists, recreational users, and members of the community.

Office of Oceanic and Atmospheric Research (OAR) - Real Time Meteorological Observation Network

The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of shore-based meteorological instrument packages including locations on Lake Michigan. The meteorological observations obtained from the network are being used in GLERL's Great Lakes Coastal Forecasting System to improve nowcasts and forecasts of wind, waves, water levels, ice cover and circulation. The Muskegon station measures wind speed, max wind speed, wind direction, air temperature, dew point, relative humidity, station pressure, sea level pressure, and PAR at two-minute increments. Additionally there are seven Muskegon webcams, images are updated six times per hour.

Office of Oceanic and Atmospheric Research (OAR), National Marine Fisheries Service (NMFS), National Ocean Service (NOS) - Muskegon Lake Habitat Focus Area

The Muskegon Lake was selected as a NOAA Habitat Focus Area (HFA). HFAs are targeted places where NOAA addresses high priority habitat issues by collaborating with partners and communities. Over the past several years, NOAA, led by the Office of Habitat Conservation, has selected 11 HFAs across the country which have achieved significant results for ecosystems and communities. While each HFA focuses on individual habitat conservation goals, the overarching goal is to leverage collective expertise and demonstrate results in a short time period. The Muskegon Lake watershed has been a center for industrial activity since the late 1800s. To address the impact of this industrial legacy, the Muskegon Lake Habitat Focus Area team has identified a number of objectives they will target over the next five years including addressing loss of fish and wildlife habitat within Muskegon and Bear lakes, rebuilding sport fisheries and populations of aquatic organisms to sustainable levels, and increasing coastal tourism, access and recreation opportunities.

NOAA Commissioned Officer Corps (NOAA Corps) - GLERL Field Station and Vessel Operations Coordinator
The NOAA Commissioned Officer Corps stations an officer at the Great Lakes Environmental Research Laboratory in support of small boat operations and scientific research at the Laboratory. This officer serves as the small boat vessel operations coordinator, managing administrative tasks for the lab's vessels along with other operational duties. They assist with the execution of science projects and facilitate vessel user objectives, becoming an integral link between the scientific and operational sides of the Lab. In addition, the officer is the liaison for the Lab to the co-located USCG Station, ensuring cooperation with all projects and operations undertaken by the Lab. Other duties include assisting in an ongoing effort to catalogue Great Lakes research vessels, their mission capabilities, material condition, and stakeholder requirements; assisting with customer support through development of new tools to communicate the group and vessel capabilities; and managing facility safety, operations, and shared service across multiple GLERL Branches.

MI-4
Kalamazoo
NOAA Office of Education – Science On a Sphere® at Kalamazoo Valley Museum. See Page 2 for detail.

South Haven
Office of Oceanic and Atmospheric Research (OAR) – Real-Time Meteorological Observation Network
The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of shore-based meteorological instrument packages including locations on Lake Michigan. The meteorological observations obtained from the network are being used in GLERL's Great Lakes Coastal Forecasting System to improve nowcasts and forecasts of wind, waves, water levels, ice cover and circulation. The South Haven station measures wind speed, max wind speed, wind direction, air temperature, and wind chill at two-minute increments. Additionally there are four South Haven webcam views, images are updated twice per hour.

MI-6
Ann Arbor
National Ocean Service (NOS) - OR&R Preparedness, Response, and Restoration Coordinators
NOAA's Office of Response and Restoration (OR&R) is a center of expertise in preparing for, evaluating, and responding to threats to coastal environments, including oil and chemical spills, releases from hazardous waste sites, disasters, and marine debris. To fulfill its mission of protecting and restoring NOAA trust resources, OR&R provides scientific and technical support to prepare for and respond to environmental threats that coastal communities face; determines damage to natural resources from those releases; protects and restores marine and coastal ecosystems; and works with coastal communities to address critical local and regional coastal challenges.

Eleven regionally based **Scientific Support Coordinators (SSC)** harness the input of a multi-disciplinary team to address issues such as oil slick trajectory forecasting, environmental tradeoffs, best practices, resources at risk, and chemical hazard assessment to reduce risks to coastal habitats and resources. The SSC for Michigan is based in Ann Arbor, Michigan at the NOAA Great Lakes Environmental Research Laboratory. The SSC is also a NOAA Corps Officer that supports the Agency's response efforts to hazardous materials released into the Great Lakes.
The NOAA Marine Debris Program (MDP) in the Office of Response and Restoration (OR&R) supports national and international efforts to reduce the impacts of marine debris. The MDP Great Lakes Regional Coordinator, based in Ann Arbor, supports coordination efforts with regional stakeholders, provides support to grant-funded projects, tracks progress of projects, and conducts regional marine debris outreach to local audiences. The MDP Bipartisan Infrastructure Law Grants Management Specialist, also based in Ann Arbor, supports the management, administration, and award of Bipartisan Infrastructure Law funding through the MDP.

National Environmental Satellite, Data, and Information Service (NESDIS) - The Center for Satellite Applications and Research (STAR)- CoastWatch Great Lakes Node, collocated with NOAA Research Great Lakes Environmental Research Laboratory, Ann Arbor, Michigan

NOAA CoastWatch exists to help people find, choose, access, and use observations from satellites for ocean, coastal and inland water applications that inform and benefit society. Our primary users include federal, state, and local marine scientists, coastal resource managers, and the public, including commercial users. The CoastWatch Program is managed within the Center for Satellite Applications and Research in the National Environmental Satellite, Data, and Information Service (NESDIS) of NOAA in College Park, MD. The program rests on four legs". Three of the legs, the central operations; training and outreach; and research and applications science teams, are located in College Park, MD. The fourth leg is composed of the seven CoastWatch Regional Nodes, maintained in collaboration with other NOAA Line Offices and located across the US.

The Great Lakes Environmental Research Laboratory (GLERL) of the Office of Oceanic and Atmospheric Research (OAR) hosts the Great Lakes regional node. GLERL obtains, produces, and delivers environmental data and products for near real-time observation of the Great Lakes to support environmental science, decision making, and supporting research. This is achieved by providing access to near real-time and retrospective satellite observations and Great Lakes data. The goals and objectives of the CoastWatch Great Lakes Program directly support NOAA's statutory responsibilities in estuarine and marine science living marine resource protection, and ecosystem monitoring and management.

The CoastWatch node at GLERL provides clients including Federal, state, and local agencies, academic institutions, commercial/industries and the public, both within and outside of the Great Lakes region, with access to near real-time satellite observations and *in-situ* data for the Great Lakes. CoastWatch data are used in a variety of ways, including near real-time observation and tracking of algal blooms, plumes, ice cover, wind, water intake temperatures at fish hatcheries, two and three dimensional modeling of Great Lakes physical parameters such as wave height and currents damage assessment modeling, research, and educational and recreational activities. In addition, through a cooperative project with Michigan Sea Grant, Great Lakes CoastWatch satellite-derived surface temperature imagery is contoured and made available via Michigan State Sea Grant's website. Great Lakes CoastWatch data and products benefit riparians as well as commercial and recreational users in the waters of IL, IN, MI, MN, NY, OH, PA, and WI.

Office of Oceanic and Atmospheric Research (OAR) – Climate Adaptation Partnerships (CAP) Program

The Great Lakes Integrated Sciences and Assessments (GLISA) is a cooperative agreement between NOAA's Climate Program Office (CPO) and the University of Michigan. It is one of several, Climate Adaptation Partnerships (CAP), formerly Regional Integrated Sciences and Assessments (RISA), that contribute to the advancement of equitable climate adaptation through sustained regional research and community engagement.GLISA integrates information from a wide array of scientific fields, develops collaborations between entities with similar goals, and helps inform decision makers throughout the region with sound science. GLISA offers a unique approach to building climate literacy, long-term sustainability, and facilitating smart decision-making across seven Great Lakes states (Minnesota, Wisconsin, Illinois, Indiana, Ohio, Michigan, and New York) and the province of Ontario. GLISA focuses on three critical sectors in the Great Lakes region—agriculture, watershed management, and natural resources-based recreation and tourism—which are interconnected through issues of water quality and quantity. The overarching goal of GLISA is to accelerate and scale-up the impact of climate knowledge in the GL region to inform sustainable and equitable adaptation action.. Core partners of GLISA include the University of Michigan, Michigan State University, the College of Menominee Nation, and the University of Wisconsin-Madison.

Office of Oceanic and Atmospheric Research (OAR) - Cooperative Institute for Great Lakes Research

The Cooperative Institute for Great Lakes Research (CIGLR) was awarded to the University of Michigan. CIGLR serves as a mechanism to promote collaborative research between university scientists and those in NOAA. The mission of CIGLR is to lead exciting new research, train the next generation of scientists, and turn research into action for safe and

healthy Great Lakes communities. The primary NOAA research partner of CIGLR is the Great Lakes Environmental Research Laboratory. CIGLR also collaborates with NOAA's Office of Oceanic and Atmospheric Research, National Ocean Service, National Weather Service, and National Environment Satellite, Data, and Information Service. CIGLR conducts research across four themes: (1) observing systems and advanced technology; (2) invasive species and food-web ecology; (3) hydrometeorological and ecosystem forecasting; and (4) protection and restoration of resources.

Office of Oceanic and Atmospheric Research (OAR) - Great Lakes Environmental Research Laboratory
The Great Lakes Environmental Research Laboratory (GLERL) is a scientific research facility based in Ann Arbor, Michigan, operating as part of the National Oceanic and Atmospheric Administration (NOAA) Office of Oceanic and Atmospheric Research (OAR). GLERL's Ann Arbor facility houses experimental and marine instrumentation laboratories furnished with state-of-the-art equipment and technology to support GLERL's scientific research. GLERL's research capacity is further strengthened by its in-house partnership with NOAA's Cooperative Institute for Great Lakes Research (CIGLR), composed of a consortium of academic institutions in the region. In addition, NOAA's Great Lakes Sea Grant Network serves as a vital in-house partnership that functions to connect NOAA research to the communication and outreach capabilities of NOAA Sea Grant.

Office of Oceanic and Atmospheric Research (OAR) - Great Lakes Center of Expertise for Oil Spill Preparedness and Response
The newly established United States Coast Guard (USCG) Great Lakes Center of Expertise (GLCOE) for Oil Spill Response and Research will reside at the NOAA Great Lakes Environmental Research Laboratory (GLERL) and Lake Superior State University. Five staff members from the USCG sit in the GLERL Ann Arbor facility and work collaboratively with GLERL, the Cooperative Institute for Great Lakes Research (CIGLR), and others. These partners are collaborating to: Monitor and assess freshwater oil spill response technologies and the behavior and effects of oil spills in the Great Lakes; Identify and seek to fill gaps in Great Lakes oil spill research; Conduct research, development, testing, and evaluation for freshwater oil spill response equipment, technologies, and techniques to mitigate and respond to oil spills in the Great Lakes; Educate and train Federal, State, and local first responders; Work with the academic and the private sector to develop and standardize maritime oil spill response training and techniques for use on the Great Lakes.

Office of Oceanic and Atmospheric Research (OAR) -Ocean Acidification Observing Network (NOA-ON)
The NOAA Ocean Acidification Observing Network (NOA-ON) is a sustained investment in ocean chemistry observing networks in U.S. waters and abroad. There are currently 16 buoys sponsored by the NOAA OAR Ocean Acidification Program in coastal, open-ocean and coral reef waters that contribute to this network. The long-term datasets collected from these moorings are key to understanding how ocean chemistry and other ocean conditions are changing over time, and their impacts on marine and coastal ecosystems. These buoys are located in Alaska (Gulf of Alaska, Bering Sea), American Samoa (Fagatele Bay),California (California Current Ecosystem 1 & 2), Chesapeake Bay (MD, VA), Louisiana (Coastal_LA), Florida (Cheeca Rocks), Georgia (Grays Reef), Hawaii (Kāneʻohe Bay and CRIMP-II, both in O'ahu) Oregon (Coos Bay), Maine (Gulf of Maine), Puerto Rico (La Parguera), Washington (Cha'ba), and Lake Huron (Thunder Bay).

Office of Oceanic and Atmospheric Research (OAR) - CoastWatch
The NOAA CoastWatch Great Lakes regional node obtains, produces, and delivers environmental data and products for near real-time observation of the Great Lakes to support environmental science, decision making, and supporting research. This is achieved by providing Internet access to near real-time and retrospective satellite data and products, as well as in-situ Great Lakes data. The CoastWatch node at Great Lake Environmental Research Laboratory provides clients including Federal, state, and local agencies, academic institutions, commercial/industries, and the public, both within and outside of the Great Lakes region. CoastWatch data are used in a variety of ways, including near real-time observation and tracking of algal blooms, plumes, ice cover, ice type, wind speed/direction, water levels, surface water

intake temperatures at fish hatcheries, two and three dimensional modeling of Great Lakes physical parameters, such as wave height and currents, damage assessment modeling, research, and educational and recreational activities. In addition, through a cooperative project with Michigan Sea Grant, Great Lakes CoastWatch satellite-derived surface water temperature imagery is contoured and made available on the Great Lakes node. Great Lakes CoastWatch data and products benefit riparians as well as research, operational, and recreational users.

Washtenaw

NOAA Office of Education - Environmental Literacy Program

The Environmental Literacy Program (ELP), administered by NOAA's Office of Education, provides grants and support for formal (K-12) and informal education to advance the agency's mission. In Ypsilanti, Michigan, ELP funded a project by Eastern Michigan University in Washtenaw County. The project aims to increase resilience in Detroit and southeast Michigan by partnering high school students and teachers with place-based educators, climate scientists, adaptation professionals, municipalities, and community organizations. Using a Place-Based Education (PBE) process and the Climate Resilience from the Youth Up curriculum, students and teachers will explore local climate impacts and develop resilience strategies that protect vulnerable school campuses, households, and neighborhoods from the increased occurrence and intensity of heat waves, storm events, and flooding. Through their involvement in this project, students will increase their climate and civic literacy, actively contribute to broader sustainability initiatives, increase their awareness of and interest in climate adaptation careers, and engage in solution-focused work that inspires hope in their communities.

MI-7

East Lansing

NOAA Office of Education - Science On a Sphere® at Michigan State University Museum. See Page 2 for detail.

MI-8

Genesee

NOAA Office of Education - Environmental Literacy Program

The Environmental Literacy Program (ELP), administered by NOAA's Office of Education, provides grants and support for formal (K-12) and informal education to advance the agency's mission. In Flint, Michigan, ELP funded a project by Kettering University in Genesee County. The project aims to build the environmental literacy of children, youth, and adults so that they can become knowledgeable about ways to increase their community's resilience to extreme weather, climate change, and other environmental hazards, and be involved in achieving that resilience. To achieve this goal, the project integrates relevant state and local resilience plans and collaborates with stakeholders who are actively implementing these plans. The Kettering University project employs NOAA resources and educational methods to promote community-level environmental literacy, enabling participants to better comprehend threats and implement solutions that build resilience to extreme weather, climate change, and other environmental hazards. Environmental literacy includes the knowledge, skills, and confidence to 1) reason about the ways that human and natural systems interact globally and locally; 2) participate in civic processes; and 3) incorporate scientific information, cultural knowledge, and diverse community values when taking action to anticipate, prepare for, respond to, and recover from environmental hazards, including mitigating and adapting to climate change.

MI-10

Thunder Bay Island

Office of Oceanic and Atmospheric Research (OAR) - Real-Time Meteorological Observation Network

The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of meteorological instrument packages including on Thunder Bay Island, offshore of Alpena, MI. The Thunder Bay Island station measures/records wind speed, max wind speed, wind direction, and air

temperature at two-minute increments updated twice per hour. In addition there is a webcam with five views. Images are updated hourly. Twenty-four hour animation loops of these images are also posted.

White Lake/Metro Detroit

National Weather Service (NWS) - Weather Forecast Office- See Page 2 for detail.

National Ocean Service (NOS) - Navigation Manager

The Office of Coast Survey navigation managers are strategically located in U.S. coastal areas to provide regional support to federal and state agencies in order to assist with navigational challenges. NOAA's navigation managers work directly with pilots, port authorities, and recreational boating organizations in Michigan. They help identify the navigational challenges facing marine transportation in Michigan and provide NOAA's resources and services that promote safe and efficient navigation. Navigation managers are on call to provide expertise and NOAA navigation response coordination in case of severe coastal weather events or other marine emergencies. The Great Lakes Navigation Manager position is located in Cleveland, Ohio.

National Ocean Service (NOS) - Navigation Response Team

The Office of Coast Survey (OCS) maintains the nation's nautical charts and publications for U.S. coasts and the Great Lakes. The Office of Coast Survey's Navigation Response Branch (NRB) conducts routine and emergency hydrographic surveys; and working with the regional Navigation Managers, navigation response teams (NRT) work around-the-clock after storms to speed the reopening of ports and waterways. During emergency response, the NRTs provide time-sensitive information to the U.S. Coast Guard or port officials, and transmit data to NOAA cartographers for updating the Coast Survey's suite of navigational charts. The mobile integrated survey team (MIST) can be applied to a vessel of opportunity to provide response capability in the Great Lakes.

MI-11

Royal Oak

NOAA Office of Education - Science On a Sphere® at Detroit Zoological Society. See Page 2 for detail.

Science On a Sphere (SOS) is a room-sized global display system that uses computers and video projectors to display planetary data onto a six foot diameter sphere, analogous to a giant animated globe. Researchers at NOAA developed Science On a Sphere® as an educational tool to help illustrate Earth System science to people of all ages. Animated images of atmospheric storms, climate change, and ocean temperature can be shown on the sphere which is used to explain complex environmental processes in a way that is simultaneously intuitive and captivating.

MI-13

Washtenaw

NOAA Office of Education - Environmental Literacy Program

The Environmental Literacy Program (ELP), administered by NOAA's Office of Education, provides grants and support for formal (K-12) and informal education to advance the agency's mission. In Ypsilanti, Michigan, ELP funded a project by Eastern Michigan University in Washtenaw County. The project aims to address the urgent need to increase resilience by working with high school students and teachers in Detroit and southeast Michigan to increase their awareness of climate change and develop local projects that help their schools and neighborhoods become resilient to increased occurrence and intensity of heat waves, storm events, and flooding. Using NOAA assets, including localized climate data and Sea Grant outreach and education expertise, and the support of climate adaptation professionals and grassroots community organizations, high school students and teachers explore local climate impacts firsthand and develop resilience strategies and projects that protect vulnerable school campuses, households, and neighborhoods. In this process, students will actively contribute to broader sustainability initiatives, increase their awareness of and interest in climate adaptation careers, and engage in solution-focused work that inspires hope in their communities.

The Michigan Sea Grant project employs NOAA resources and educational methods to promote community-level environmental literacy, enabling participants to better comprehend threats and implement solutions that build resilience to extreme weather, climate change, and other environmental hazards. Environmental literacy includes the knowledge, skills, and confidence to 1) reason about the ways that human and natural systems interact globally and locally; 2) participate in civic processes; and 3) incorporate scientific information, cultural knowledge, and diverse community values when taking action to anticipate, prepare for, respond to, and recover from environmental hazards, including mitigating and adapting to climate change.

Great Lakes

Multiple NOAA Programs - Lake Erie Harmful Algal Bloom Forecast

A Harmful Algal Bloom Program (HAB) bulletin has been developed to provide a weekly forecast for *Microcystis* blooms in western Lake Erie to local health officials, water treatment managers, natural resource managers and several research scientists in the area. HABs produce toxins that may pose a significant risk to human and animal health through water recreation and may form scum that are unsightly and odorous to beach visitors, impacting the coastal economy. Forecasts depicting current and future locations of blooms, as well as intensity, will alert scientists and managers to possible threats to the Great Lakes beaches and assist in mitigation efforts. Lake Erie HAB Forecasting Products include:

- The **Western Lake Erie Harmful Algal Bloom Early Season Projections**, issued weekly by the National Centers for Coastal Ocean Science (NCCOS/NOS) beginning in May, estimate bloom severity based on measurements of phosphorus loading from the Maumee River combined with long-range forecasts and historical records. Projections are issued until NCCOS and Ohio Sea Grant issue the Seasonal Lake Erie HAB Forecast in late June.
- **Lake Erie HAB Seasonal Forecast:** NCCOS and Ohio Sea Grant issue a seasonal forecast in late June. The Seasonal Lake Erie HAB Forecast gives coastal managers and drinking water facility operators a general sense of how “bad” the upcoming bloom season has the potential to be. The seasonal forecast is an ensemble of models based largely upon phosphorus discharge from the Maumee River.
- The **Lake Erie HAB forecast (nowcast and 5 day forecast)** provides the current bloom extent and 5-day outlooks of where the bloom will travel and what the concentrations are likely to be seen, allowing managers to determine whether to take preventative actions. It is issued by the National Centers for Coastal Ocean Science (NCCOS/NOS) twice a week during bloom season (July - Oct) to the Lake Erie HAB Alert subscribers list and posted to the NCCOS Lake Erie HAB Forecast page.

Statewide

National Marine Fisheries Service (NMFS) - Restoration Center

The NOAA Restoration Center, within the Office of Habitat Conservation, works with partners across the nation to restore habitat to sustain fisheries, recover protected species, and maintain resilient coastal ecosystems and communities. We have over 30 years conducting habitat restoration through competitive funding opportunities and technical assistance. We also work to reverse habitat damage from disasters like oil spills, ship groundings, and severe storms. In the Great Lakes, the NOAA Restoration Center focuses on restoring the most degraded environments--designated Areas of Concern. Our projects address loss of habitat and diminished fish and wildlife populations. NOAA is also working with the Great Lakes Restoration Initiative to implement habitat restoration projects that will help improve Areas of Concern. See the interactive Restoration Atlas to find habitat restoration projects near you. Site visits to see habitat projects may be available in your state, please inquire if interested.

In addition, the Office of Habitat Conservation is responsible for executing an unprecedented $1.4 billion in funding under Bipartisan Infrastructure Law and Inflation Reduction Act for habitat restoration and fish passage. We are working with our partners to do this through our expert technical assistance and four funding competitions: Fish Passage, Tribal Fish Passage, Transformational Habitat Restoration, and Habitat Restoration for Tribes and Underserved Communities. We have funded 214 awards totaling $985M in rounds one and two with more to come in round 3. We are funding work all over the country, explore them on our interactive map.

National Weather Service - **NEXRAD (WSR-88D) Systems**
NEXRAD is used to warn the people of the United States about dangerous weather and its location. This radar technology allows meteorologists to warn the public to take shelter with more notice than ever before. The NEXRAD network provides significant improvements in severe weather and flash flood warnings, air traffic safety, flow control for air traffic, resource protection at military bases, and management of water, agriculture, forest, and snow removal. NEXRAD radar has a range of up to 250 nautical miles, and can provide information about wind speed and direction, as well as the location, size, and shape of precipitation. There are 159 operational NEXRAD radar systems deployed throughout the United States and overseas, of which four are in Michigan.

National Weather Service (NWS) - Automated Surface Observing Systems Stations
The Automated Surface Observing Systems (ASOS) program is a joint effort of the National Weather Service (NWS), the Federal Aviation Administration (FAA), and the Department of Defense (DOD). ASOS serves as the Nation's primary surface weather observing network. ASOS is designed to support weather forecast activities and aviation operations and, at the same time, support the needs of the meteorological, hydrological, and climatological research communities. ASOS works non-stop, updating observations every minute, 24 hours a day, every day of the year observing basic weather elements, such as cloud cover, precipitation, wind, sea level pressure, and conditions, such as rain, snow, freezing rain, thunderstorms, and fog. There are 27 ASOS stations in Michigan.

National Weather Service (NWS) - Cooperative Observer Program Sites
The National Weather Service (NWS) Cooperative Observer Program (COOP) is the Nation's weather and climate observing network of, by and for the people. More than 10,000 volunteers take observations on farms, in urban and suburban areas, National Parks, seashores, and mountaintops. The data are representative of where people live, work and play. The COOP was created to provide observational meteorological data required to define the climate of the United States and to help measure long-term climate changes, and to provide observational meteorological data in near real-time to support forecast, warning and other public service programs of the NWS. The data are also used by other federal, state and local entities, as well as private companies. In some cases, the data are used to make billions of dollars' worth of decisions. For example, the energy sector uses COOP data to calculate the Heating and Cooling Degree Days which are used to determine individuals' energy bills monthly. There are 201 COOP sites in Michigan.

National Weather Service (NWS) - NOAA Weather Radio All Hazards Transmitters
NOAA Weather Radio All Hazards (NWR) is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest National Weather Service (NWS) forecast office. NWR broadcasts official NWS warnings, watches, forecasts and other hazard information 24 hours a day, 7 days a week. Working with the Federal Communication Commission's (FCC) Emergency Alert System, NWR is an "All Hazards" radio network, making it the single source for comprehensive weather and emergency information. In conjunction with federal, state, and local emergency managers and other public officials, NWR also broadcasts warning and post-event information for all types of hazards – including natural (such as earthquakes or avalanches), environmental (such as chemical releases or oil spills), and public safety (such as AMBER alerts or 911 Telephone outages). Known as the "Voice of NOAA's National Weather Service," NWR is provided as a public service by the NWS. NWR includes 1,100 transmitters covering all 50 states,

adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific Territories. There are 28 NWR transmitters in Michigan.

National Ocean Service (NOS) – Bipartisan Infrastructure Law
The Bipartisan Infrastructure Law is helping coastal communities build the future they want to see. The legislation provides a historic investment in coastal protection and restoration that will increase community resilience to climate change and extreme weather events, and improve how we manage our ocean resources. Projects funded under this law protect and restore ecologically significant habitats, including conserving lands that play a critical role in helping communities become more resilient to natural hazards. Michigan received funding in FY22 and FY23 to build the state's capacity to protect its coastal communities and resources.

National Ocean Service (NOS) - National Water Level Observation Network
NOS operates 28 long-term continuously operating water level stations in the state of Michigan which provide data and information on Great Lakes and interconnecting waterways data and lake level regulation and are capable of producing real-time data for storm surge warning. These stations are located at Menominee, Port Inland, Port Iroquois, Marquette, Ontonagon, Algonac, St Clair St Police, Dry Dock, Mouth of the Black River, Dunn Paper, Fort Gratiot, St Clair Shores, Gibraltar, Wyandotte, Fort Wayne, Windmill Point, Fermi Power Plant, Lakeport, Harbor Beach, Essexville, Alpena, Mackinaw City, De Tour Village, Rock Cut, West Neebish Island, Little Rapids, Ludington and Holland. Station data feeds into many CO-OPS products that are used to support safe navigation, mitigate coastal hazards, and protect communities. Such products include:

- Coastal Inundation Dashboard - view water levels in real-time and during storms
- High Tide Flooding Outlooks
- Sea level trends and maps
- Real-time current measurements
- Hydrodynamic models
- Tidal and water level datums

National Ocean Service (NOS) - Great Lakes Bay Watershed Education Training Program
The NOAA Bay Watershed Education and Training (B-WET) program is a competitive grants program that provides funding for locally relevant environmental education projects for K-12 audiences. The Great Lakes B-WET program is managed by NOAA's Thunder Bay National Marine Sanctuary on behalf of NOAA's Office of Education. The Great Lakes B-WET program recognizes that knowledge and commitment built from firsthand experience, especially in the context of one's community and culture, is essential for achieving environmental stewardship. Great Lakes B-WET regional grant competitions are responsive to local education and environmental priorities. Please see the funding opportunities for specifics.

National Ocean Service (NOS) - NOAA Ocean Guardian School Program
A NOAA Ocean Guardian School makes a commitment to the protection and conservation of its local watersheds, the world's ocean, and special ocean areas, like national marine sanctuaries. Funds are provided to schools at $4,000 per year if the school makes this commitment by proposing and then implementing a school- or community-based conservation project. Once the school has completed its project, the school receives official recognition as a NOAA Ocean Guardian School. To date, the Ocean Guardian School Program has reached more than 88,797 students and 3,599 teachers.

National Ocean Service (NOS) - NOAA Ocean Guardian Youth Ambassador Program
Youth aged 13-18 from across the United States and its territories that are committed to ocean conservation and stewardship of our blue planet can apply to become a NOAA Ocean Guardian Youth Ambassador. This year-long program

looks for enthusiastic youth with new ideas and a unique perspective who want to learn more about America's underwater treasures and share their passion with others. Youth learn how to become a leader at their school or in their local community to make a difference in the conservation of the ocean through marine protected areas.

National Ocean Service (NOS) - Thunder Bay National Marine Sanctuary
Located in northwestern Lake Huron, Thunder Bay is adjacent to one of the most treacherous stretches of water within the Great Lakes system. Unpredictable weather and rocky shoals earned the area the name, "Shipwreck Alley." Today, the 4,300 square mile Thunder Bay National Marine Sanctuary protects one of America's best preserved and nationally significant collections of shipwrecks. Fire, ice, collisions, and storms have claimed ships in and around Thunder Bay. To date, 99 historic shipwrecks have been discovered in the waters adjacent to Alpena, Alcona, and Presque Isle counties, and five shipwrecks off Mackinaw and Cheboygan counties. Protection and management of the sanctuary is entirely focused on this extraordinary collection of underwater cultural resources and historic research indicates that as many as 100 additional shipwrecks may yet be found within the sanctuary's waters. Thunder Bay National Marine Sanctuary in Lake Huron encompasses 4,300 square miles, protecting 99 known historic shipwrecks in Alpena, Alcona and Presque Isle counties, and five shipwrecks from Mackinaw and Cheboygan counties. Protection and management of the sanctuary is entirely focused on Thunder Bay's extraordinary collection of underwater cultural resources (primarily shipwrecks). Dubbed "Shipwreck Alley," historic research indicates that as many as 100 additional shipwrecks may be found in the treacherous waters around Thunder Bay. Intense weather patterns, islands, and rocky shoals, and heavy vessel traffic, and converging shipping lanes all contributed to the area's vast collection of shipwrecks. These submerged archaeological sites are nearly a complete collection of Great Lakes vessel types from small schooners and pioneer steamboats of the 1830s, to enormous industrial bulk carriers that supported the Midwest's heavy industries during the twentieth century. Well preserved by Lake Huron's cold, fresh water of the Great Lakes, the shipwreck sites are a haven for historians, archaeologists, and the public. The sanctuary's waters are important to the local economy as a destination for snorkeling, diving, boating, and paddling kayaking. Additionally, NOAA's 20,000 square foot visitor center for the sanctuary, the Great Lake Marine Heritage Center in Alpena, brings nearly 100,000 visitors to the region annually. Through research, education and community involvement the sanctuary seeks to protect these unique and non-renewable historic sites for future generations.

National Ocean Service (NOS) – National Coastal Zone Management Program
Through a unique federal-state partnership, NOAA's Office for Coastal Management works with the Michigan Department of Environmental, Great Lakes, and Energy to implement the National Coastal Zone Management Program in Michigan. NOAA provides the state coastal management program with financial and technical assistance to further the goals of the Coastal Zone Management Act and ensure coastal waters and lands are used in a balanced way to support jobs, reduce use conflicts, and sustain natural resources.

National Ocean Service (NOS) – Digital Coast
The Digital Coast is a focused information resource developed to meet the unique needs of coastal communities. Developed and maintained by NOAA's Office for Coastal Management, content comes from hundreds of organizations, including federal, state, and local agencies, plus private sector and non-profit contributors. The Digital Coast website provides not only site-specific coastal data, but also related tools, training, and information needed to make these data useful for coastal decision makers. The Digital Coast Act authorizes the Digital Coast as a standing national program and supports NOAA's efforts to increase access to authoritative data, tools, and training that enable coastal communities to plan for long-term resilience, manage water resources, and respond to emergencies.

National Ocean Service (NOS) - National Estuarine Research Reserve Science Collaborative
The National Estuarine Research Reserve Science Collaborative is a partnership between NOAA and the University of Michigan Water Center. The Science Collaborative supports user-driven collaborative research that addresses coastal

management issues important to the National Estuarine Research Reserve System and coastal decision-makers. Research focus areas include climate change, water quality, habitat restoration, ecosystem service valuation, and synthesis of monitoring data.

National Ocean Service (NOS) - Coastal and Estuarine Land Conservation Program
The Coastal and Estuarine Land Conservation Program (CELCP) brings conservation partners together to protect coastal and estuarine lands considered important for their ecological, conservation, recreational, historical, or aesthetic values. Subject to availability of funding, the program provides state and local governments with matching funds to purchase coastal and estuarine lands or obtain conservation easements for important lands threatened by development. Since 2002, the program has protected more than 110,000 acres of coastal land nationally, including over 16,000 acres protected as in-kind matching contributions. Seven projects have been successfully completed in Michigan, four with CELCP funding, and another three with funds from EPA's Great Lakes Restoration Initiative.

National Ocean Service (NOS) – National Coastal Resilience Fund
The National Coastal Resilience Fund restores, increases, and strengthens natural infrastructure to protect coastal communities while also enhancing habitats for fish and wildlife. The National Fish and Wildlife Foundation (NFWF) executes this program in partnership with NOAA to invest in conservation projects that restore or expand natural features, such as coastal marshes and wetlands, dune and beach systems, oyster and coral reefs, forests, coastal rivers and floodplains, and barrier islands, which minimize the impacts of storms and other naturally occurring events on nearby communities. In Michigan, 13 projects have been funded, one in FY18, two in FY19, one in FY20, three in FY21, one in FY22, and five in FY23.

National Ocean Service (NOS) - OR&R and U.S. Coast Guard Great Lakes Oil Spill Center of Expertise
NOAA's Office of Response and Restoration (OR&R) has engaged in a number of projects with the Great Lakes Oil Spill National Center of Expertise (GLCOE) related to protecting the Great Lakes from spills in recent years, including highlights such as: updates to Environmental Sensitivity Index (ESI) maps and data pursuant to the Great Lakes ESI Act of 2020, funding from the U.S. Coast Guard and Great Lakes Restoration Initiative (GLRI) allowing for refreshed data for the St. Marys and St. Lawrence Rivers in 2021, updates to Lake Erie in 2022, and new data for Lake Ontario in 2024. Efforts are underway for updates to Lake Michigan in 2025 and Lakes Superior and Huron are expected to be completed in 2026. Under new agreements with the GLCOE, OR&R will be working on a series of projects to help protect the Great Lakes, including enhancing data management, advancing capabilities to detect oil in ice environments, improving use of Uncrewed Systems for response, and transitioning research into applications. We will also be developing a Federal On-Scene Coordinator user guide for oil spill response in oil under ice conditions. The GLCOE is located at NOAA's Great Lakes Environmental Research Laboratory (GLERL) in Ann Arbor and Lake Superior State University in Sault Ste. Marie.

National Ocean Service (NOS) - OR&R Regional Resource Coordinators
NOAA's Office of Response and Restoration (OR&R) is a center of expertise in preparing for, evaluating, and responding to threats to coastal environments, including oil and chemical spills, releases from hazardous waste sites, disasters, and marine debris. To fulfill its mission of protecting and restoring NOAA trust resources, OR&R provides scientific and technical support to prepare for and respond to environmental threats that coastal communities face; determines damage to natural resources from those releases; protects and restores marine and coastal ecosystems; and works with coastal communities to address critical local and regional coastal challenges.

OR&R identifies and quantifies environmental injury caused by releases of oil and hazardous materials. Our network of **Regional Resource Coordinators** work with multidisciplinary scientific, economic, and legal teams with the goal of securing the appropriate amount and type of restoration required to restore injured NOAA trust resources and compensate the public for their lost use. We collaborate with NMFS Restoration Center and NOAA General Council

through the Damage Assessment, Remediation, and Restoration Program (DARRP) to ensure the process is efficient, legally defensible and restoration focused. The RRC serving the Great Lakes is based in New York, New York.

National Ocean Service (NOS) – OR&R Environmental Response Management Application and Response Tools for Oil and Chemical Spills, Preparedness Training for Responders
Assessing important spatial information and designing successful restoration projects rely upon interpreting and mapping geographic information, including the location, duration, and impacts from oil spills, other hazardous materials, or debris released into the environment. Great Lakes Environmental Response Management Application (ERMA®) is an online mapping tool that integrates both static and real-time data, such as ship locations, weather, and ocean currents, providing an easy-to-use common operating picture for environmental responders and decision makers. In addition to ERMA, the Office of Response and Restoration (OR&R) offers a suite of tools to support emergency responders dealing with oil and chemical spills. From Environmental Sensitivity Index (ESI) maps and data which provide concise summaries of coastal resources including biological resources and sensitive shorelines to GNOME, a trajectory and fate model that predicts the route and weathering of pollutants spilled on water, and so much more, these tools provide easy-access to critical data that support a wide range of needs for emergency responders, ultimately supporting our coastal communities. In addition, OR&R offers training to help spill responders increase their understanding of oil spill science when analyzing spills and making risk-based decisions. The training classes include the Science of Oil Spills (SOS), the Science of Chemical Releases (SOCR), Shoreline Cleanup Assessment Technique (SCAT), among others. Each year, OR&R teaches these classes around the country, see our calendar for upcoming training.

National Ocean Service (NOS) - NOAA Marine Debris Program (MDP) in Michigan
The NOAA Marine Debris Program (MDP) in the Office of Response and Restoration (OR&R) leads national and international efforts to reduce the impacts of marine debris. The program supports marine debris removal, prevention, and research projects in partnership with state and local agencies, tribes, non-governmental organizations, academia, and industry. The MDP Great Lakes Regional Coordinator supports coordination efforts with regional stakeholders, provides support to grant-funded projects, tracks progress of projects, and conducts regional marine debris outreach to local audiences. In Michigan, MDP is working with the City of Benton Harbor, using funds provided under the Bipartisan Infrastructure Law, to remove large marine debris in Ox Creek, which feeds into Lake Michigan. The City is also contributing to ongoing revitalization efforts, and engaging with community members to develop creative solutions to prevent littering and illegal dumping. Further, through the National Marine Sanctuary Foundation's Ocean Odyssey Marine Debris Awards for Diversity, Equity, Inclusion, Justice, and Accessibility (DEIJA), MDP provided funding to Friends of Thunder Bay National Marine Sanctuary to support local youth in researching and monitoring Lake Huron shorelines for marine debris using NOAA's Marine Debris Monitoring and Assessment Project. These funds were provided to support initiatives that investigate and prevent the adverse impacts of marine debris in communities that are underserved, underrepresented, or overburdened by marine debris.In Michigan, the MDP worked with the National Park Service to develop and install an outreach and educational exhibit on marine debris in Isle Royale National Park using debris sourced from Lake Superior. An additional educational exhibit is being developed by Sleeping Bear Dunes National Lakeshore. The MDP also works with local communities and organizations to prevent and remove marine debris. The Superior Watershed Partnership is partnering with Upper Peninsula tribes and partners to implement community clean-up along Lake Superior's southern shoreline and educational outreach throughout Michigan's Upper Peninsula. The Great Lakes Marine Debris Action Plan was published in 2020. This plan, which is facilitated by the MDP and supported by local stakeholders, provides a road map for strategic progress in making the Great Lakes, its coasts, people, and wildlife free from the impacts of marine debris.

National Ocean Service (NOS) - Phytoplankton Monitoring Network
The Phytoplankton Monitoring Network (PMN) is a nationwide community-based volunteer program of citizen scientists monitoring for the presence of organisms that can lead to Harmful Algal Bloom (HAB) formation. Volunteers serve as

data collectors for marine and freshwater blooms at more than 200 coastal and inland sites in the U.S. and Caribbean. Monitoring is conducted year-round and volunteers are trained to measure salinity, air and water temperatures, and how to collect phytoplankton samples using a plankton net. Samples are then analyzed for any HAB organisms via microscopy. Data collected by PMN volunteers enhances the Nation's ability to respond to and manage the growing threat posed by HABs by collecting important data for species composition and distribution in coastal and freshwater environments and creating working relationships between volunteers and professional marine biotoxin researchers. Event monitoring can assist state and federal agencies to issue timely warnings about shellfish consumption and other public health concerns.

National Ocean Service (NOS) - Mussel Watch Program
The National Oceanic and Atmospheric Administration (NOAA) Mussel Watch Program (MWP) monitors the status and trends of chemical contaminants and biological stressors in the nation's coastal waters. MWP began in 1986, and is based on the periodic collection and analysis of bivalves (oysters and mussels) and sediment from a network of more than 300 monitoring sites nationwide. Contaminants monitored at each site include the EPA's Priority Pollutant List of toxic substances and a suite of chemicals of emerging concern such as flame retardants, PFAS, pharmaceuticals, and current use pesticides.

National Ocean Service (NOS) - U.S. Integrated Ocean Observing System (Great Lakes Observing System)
The U.S. Integrated Ocean Observing System, or IOOS®, is a federally and regionally coordinated observing system with 17 interagency and 11 regional partners. The System addresses regional and national needs for coastal, ocean, and Great Lakes data and information. This includes gathering and disseminating regional observations; data management; modeling and analysis; education and outreach; and research and development.Working with government agencies, academic researchers, tribes, first nations and the private sector, the Great Lakes Observing System (GLOS) provides end-to-end services that support science, policy, management and industry in the U.S. and Canada.GLOS provides public access to critical, real-time and historical data and information about the Great Lakes, St. Lawrence River and interconnecting waterways for use in managing, safeguarding and understanding these immensely valuable freshwater resources.

National Ocean Service (NOS) - Regional Geodetic Advisor
The Regional Geodetic Advisor is a National Ocean Service (NOS) employee that resides in a region and serves as a liaison between the National Geodetic Survey (NGS) and its public, academic and private sector constituents within their assigned region. NGS has a Regional Geodetic Advisor stationed in Ann Arbor, MI serving the great lakes region – Illinois, Indiana, Michigan, and Wisconsin The Geodetic Advisor provides training, guidance and assistance to constituents managing geospatial activities that are tied to the National Spatial Reference System (NSRS), the framework and coordinate system for all positioning activities in the Nation. The Geodetic Advisor serves as a subject matter expert in geodesy and regional geodetic issues, collaborating internally across NOS and NOAA to ensure that all regional geospatial activities are properly referenced to the NSRS.

National Marine Fisheries Service (NMFS), National Ocean Service (NOS), and NOAA General Counsel - Damage Assessment, Remediation, and Restoration Program
NOAA's Damage Assessment, Remediation, and Restoration Program (DARRP) assesses and restores habitat, fisheries, protected species and recreational uses that have been harmed by oil spills, chemical releases, and ship groundings. Working with federal, state, and tribal entities, and responsible parties, we have recovered funding from responsible parties for restoration of critical habitats, fisheries, protected species and recreational uses nationwide. These projects promote recovery of the ecosystem and provide economic benefits from tourism, recreation, green jobs, coastal resiliency, property values and quality of life. Michigan is a co-trustee with NOAA for assessment and restoration after pollution incidents in Michigan. For more information about our work in Michigan, visit: DARRP in Your State (and use the top menu to navigate to "Michigan") and this interactive map.

National Marine Fisheries Service (NMFS) - Office of Law Enforcement
NOAA's Office of Law Enforcement is the only conservation enforcement program (Federal or State) that is exclusively dedicated to Federal fisheries and marine resource enforcement. Its mission is to protect global marine resources by enforcing domestic laws and international treaties and obligations dedicated to protecting wildlife and their natural habitat. Our special agents and enforcement officers ensure compliance with these laws and take enforcement action if there are violations. Additionally, the Cooperative Enforcement Program allows NOAA the ability to leverage the resources and assistance of 27 coastal states and U.S. territorial marine conservation law enforcement agencies in direct support of the Federal enforcement mission. Effective fisheries law enforcement is critical to creating a level playing field for U.S. fishermen and enabling sustainable fisheries to support vibrant coastal communities. The Office of Law Enforcement's Northeast Division is headquartered in Gloucester, Massachusetts, with a Michigan field office in Ann Arbor.

Office of Oceanic and Atmospheric Research (OAR) – Michigan Sea Grant
The National Sea Grant College Program (Sea Grant) is a federal-university partnership administered by NOAA that integrates research, extension outreach, and education. Sea Grant forms a national network of 34 programs in all U.S. coastal and Great Lakes states, Puerto Rico, and Guam. Michigan Sea Grant College Program promotes better understanding, conservation and use of Michigan's coastal resources. The program supports research, education and outreach efforts designed to foster science-based decisions about the use and conservation of Great Lakes resources. Michigan Sea Grant is in the heart of one of the most biologically diverse freshwater ecosystems in the world. With more than 3,288 miles of Great Lakes shoreline, 11,000 inland lakes and 36,000 miles of rivers — water is what makes Michigan a special place. The Great Lakes are not just a "local" issue, housing about one-fifth of the world's fresh surface water supply, and nine-tenths of the U.S. supply. A collaborative effort of University of Michigan and Michigan State University, Michigan Sea Grant supports efforts in coastal regions throughout the state. The program was established in 1969 at the University of Michigan. Administrative offices are located in Ann Arbor and East Lansing. Get involved with Sea Grant through state and national opportunities like the John A. Knauss Marine Policy Fellowship program at seagrant.noaa.gov.

NOAA Office of Education - Science On a Sphere® - See Page 2 for detail.

Office of Oceanic and Atmospheric Research (OAR) - Real-Time Meteorological Observation Network
The Marine Instrumentation Laboratory at the Great Lakes Environmental Research Laboratory (GLERL) has deployed and is maintaining a real-time network of meteorological instrument packages including Alpena, MI. The Alpena station measures/records wind speed, max wind speed, wind direction, and air temperature, and wind chill at 2-minute increments updated twice per hour. In addition there is a webcam with four views, images are updated six times per hour, six hour animation loops of these images are also posted.

National Ocean Service (NOS) - Students for Zero Waste Week
Students are inviting their local communities to "Go Green and Think Blue" by joining them in the annual *Students for Zero Waste Week campaign*. During this campaign led by the Office of National Marine Sanctuaries, students focus on reducing land-based waste in order to protect the health of local marine environments. These young leaders are raising awareness of how single-use plastic and other types of litter affect the health of local watersheds, national marine sanctuaries, and the ocean. In addition, some schools are looking at ways to reduce their energy use on campus with hopes of raising awareness of how the burning of fossil fuels also impacts the health of the ocean.

Bipartisan Infrastructure Law (BIL) / Inflation Reduction Act (IRA) Projects

The National Oceanic and Atmospheric Administration (NOAA) was entrusted with billions of supplemental federal funding dollars with passage of the Bipartisan Infrastructure Law on November 15, 2021 and the Inflation Reduction Act on August 16, 2022. This historic infrastructure funding has been invested in communities across the nation to build resilience in the face of climate change. NOAA distributed funding to communities, tribal, state and local governments, higher education programs, businesses, non-profit organizations, and facilities in need. NOAA funded billions of dollars in grants and cooperative agreements across the country to fund projects that enhance climate resilience, restore coastal and marine habitats, improve safety, and create jobs. For an interactive map of NOAA BIL and IRA investments in your state, visit https://www.noaa.gov/bil-ira-awards-explorer.

BIL

Coastal and Inland Flood and Inundation Mapping, $516,946

To improve predictions of future flood events, Cooperative Institute for Great Lakes Research (CIGLR) will expand on an existing forecast framework and develop improved flood forecasting for the Great Lakes by coupling the lake forecast hydrodynamic model of the lake with the National Water Model (NWM) distributed hydrologic model, and the WAVEWATCH III wind wave model. The team will begin implementing Great Lakes Coastal Forecasting System (GLCFS) improvements starting with Lake Ontario, including developing and testing FVCOM-NWM and FVCOM-WAVEWATCH III coupling and support for real-time inundation mapping, which is needed for public safety. *This award supports work in MI, WI, IL, IN, OH, PA, NY, MN.*

Infrastructure Investment and Jobs Acts (IIJA): Development of Next Generation Prediction System for Great Lakes Water Levels and Lake Management Decisions, $1,444,946

This project aims to develop the next-generation prediction system for determining the mean and extreme net basin supply and water levels to provide the foundation for defining risks of coastal inundation impacts and lake management decisions across subseasonal to annual time scales for the Great Lakes. *This award supports work in MI, WI, IL, IN, OH, PA, NY, MN.*

Near-Real-Time Flood Observing by Synthetic Aperture Radar Satellites, $479,981

This project will develop a flood mapping system driven by Synthetic Aperture Radar (SAR) data. The project also includes the initial testing of new algorithms to tackle challenging flood types, including urban flood, sparsely vegetated, and desert floods. The project outcome includes an operational flood mapping system covering submerged floods of the Continental U.S. in near real time based on radar statistics and machine learning, and an experimental product based on deep learning for unsubmerged floods.

Reconnecting Stream Habitat in Shared Priority Waters in the Lake Michigan and Lake Superior Basins and Building Local Capacity to Improve Future Fish Passage, Michigan and Wisconsin, $4,784,222

The project will remove or replace eight fish passage barriers to open 55 miles of spawning, rearing, and refuge habitat on high-quality cold water streams in the Great Lakes region. The projects are expected to benefit native Great Lakes species like brook trout and sturgeon. They are also expected to improve climate resilience by reducing flooding and improving threatened infrastructure. *This award supports work in MI and WI.*

Restoring Tribal Priority Fish Passage through Barrier Removal, $3,600,000

The project is replacing 12 road stream crossings with fish passage infrastructure. They will also investigate fish passage alternatives for two hydropower dams: Tower Dam and Kleber Dam. Funding will support hiring of an additional position to help with conservation planning, implementation, and partner engagement.

Lower Lake St. Clair Habitat Restoration Project, $7,000,000
The project is developing design plans to restore habitat along Lake St. Clair, in an area where nearly all of the lake's shoreline has been hardened. Restoration will benefit several native Great Lakes species. It will also reduce impacts from waves and flooding, reduce polluted runoff, increase recreational fishing opportunities, and increase public access to the water.

Infrastructure Investments in the Great Lakes Observing System, $1,836,000
The Great Lakes Observing System will support improving and enhancing observing systems in the Great Lakes. The funding will be used to recapitalize and modernize systems to address sustained monitoring of coastal conditions. Project work will address critical assets and services, including repairs, replacements, and spares to enhance resilience of the observing system and product delivery services to prevent failures. As the IOOS RA in the Great Lakes and ROP equivalent, GLOS will support the sharing and integration of Federal and non-Federal data. The funding will be used to sustain and enhance data accessibility in the regions through data product development, portal management, and outreach and engagement with stakeholders. *This award supports work in MI, MN, NY, WI, IN, IL, PA, and OH.*

MI CZM IIJA Work Plan 12/1/2022-11/30/2025, $450,000
This funding will build the capacity of the state's federally-approved coastal management program within MI's Department of Environment, Great Lakes, and Energy (EGLE) to plan for and implement habitat restoration and conservation projects proposed through funding opportunities connected to the Bipartisan Infrastructure Law. Specifically, EGLE will use these funds to identify and apply for high-priority projects through an equitable, competitive process and manage any awards that should be made to the state. Further, EGLE will engage with communities to understand their needs and formulate projects and provide technical assistance, including engineering expertise. Underpinning all of these efforts, EGLE will lead an inclusive process to develop a Coastal Ecosystem Conservation Strategy.

Advancing Coastal Inundation Science and Resilience Solutions Through an Inclusive, Multimodal Community of Practice, $424,200
The American Society of Adaptation Professionals (ASAP) will collaborate with NOAA Office for Coastal Management (OCM) and National Sea Grant Office (NSGO) to build and facilitate a Coastal Resilience to Inundation Community of Practice (CoP) over the course of four years. The project will contribute to outcomes such as increasing and improving the use of regionally-relevant, publicly available climate data and information for coastal inundation science and resilience solutions; enhancing connections, peer learning, and information transfer across regions; strengthening the national network of individuals and organizations from all sectors working on coastal inundation science and resilience solutions, and informing future coastal inundation research, modeling, tool development, training, and technical assistance.

Development of Next Generation Prediction System for Great Lakes Water Levels and Lake Management Decisions, $1,745,237
The project aims to develop the next-generation prediction system for determining mean and extreme net basin supply and water levels to provide the foundation for defining risks of coastal inundation impacts and lake management decisions across subseasonal to annual time scales for the Great Lakes. *This award supports work in MI, WI, IL, IN, OH, PA, NY, and MN.*

NOAA WI Shipwreck Coast NMS Observing System Support and Enhancement, $55,455
The Wisconsin Shipwreck Coast National Marine Sanctuary (WSCNMS) received funding to install three Sofar Ocean Technologies smartmoorings within the sanctuary, which transmit via satellite real-time wave, wind and water column temperature information that directly benefits a variety of lake users including charter and commercial fishers, recreational boaters, NWS marine forecasters, and researchers. The project substantially expanded the Great Lakes observing network by deploying new assets in areas that were previously poorly observed and where data was needed to serve

stakeholder and lake research needs. This award provides continuing engineering data management, and operational support for the existing smart mooring systems and enhances the original project with additional physical science sensors. *This award supports work in MI, MN, WI, IL, IN, OH, PA, and NY.*

Coastal and Inland Flood and Inundation Mapping, $487,892
To improve predictions of future flood events, we will expand on an existing forecast framework and develop improved flood forecasting for the Great Lakes by coupling the lake forecast hydrodynamic model of the lake with the National Water Model (NWM) distributed hydrologic model, and the WAVEWATCH III wind wave model. We will begin implementing hydrodynamic modeling improvements starting with Lake Ontario. *This award supports work in MI, WI, IL, IN, OH, PA, NY, and MN.*

Coast to Coast: Using Scenario Planning to Build Resilience to Compound Flooding in the Southeast and Great Lakes Regions, $474,554
The overarching goal of this proposal is to build capacity for resilience to flooding and inundation across two different coastal environments: the Great Lakes (GL) and the Southeast (SE). To accomplish this, the project team will do a comparative study that assesses a stakeholder engagement model (scenario planning, SP) across different community demographics and compound flooding environments. *This award supports work in MI and GA.*

Restoration, Engagement, and Traditional Ecological Knowledge: An Indigenous Approach to Climate and Cultural Resiliency, $11,900,000
This project will preserve and restore coastal habitat on Mashkiigaki, a parcel of sacred ancestral land along West Grand Traverse Bay. They will also support an innovative fish passage project, Giigook man-jowang (FishPass), to fully re-connect the Boardman-Ottaway River to Lake Michigan. This project emphasizes traditional ecological knowledge and tribal-led multi-generational community engagement.

Ox Creek Debris Removal and Education Project, $1,032,500
The City of Benton Harbor is engaging and supporting the local community to remove illegally-dumped large debris from Ox Creek and its adjacent floodplains in the Lake Michigan watershed.

Building an Equity-oriented Engagement Framework for the FloodWise Communities Process in the Great Lakes & South Central Regions, $139,905
This project will directly engage with four frontline communities in the Great Lakes and South Central regions to co-produce a community-centered stormwater vulnerability assessment (VA) framework to address understanding with and from frontline communities, co-developing and piloting a community-driven VA, and identifying best practices for justice- and equity-oriented research and engagement to scale up the pilot framework(s). The project will organize and facilitate a series of co-production workshops in each community and use pre- and post-surveys, participant observation, and key informant interviews for evaluation.

IRA

Ox Creek Corridor Ecosystem Restoration, $1,000,000
This project is coordinating with the City of Benton Harbor, Michigan, to hire an administrator to manage an effort to revitalize the area surrounding Ox Creek. The new project administrator will help build a coalition of residents and local organizations, conduct community outreach and engagement, develop a habitat restoration plan that incorporates public input, and implement two pilot habitat restoration projects.

River Raisin Dam #4 Removal and Restoration, $3,029,980
This project will reroute a sewer line and remove a dam that are currently preventing fish passage in the River Raisin. This work is part of a larger long-term effort to restore River Raisin fish habitat connectivity to Lake Erie, increase resilience to flooding, and open 23 miles of habitat for Great Lakes fish species.

Dynamics of Biodiversity Across Lakescapes in North Americas Inland Seas, $1,728,550
This award will fill a critical gap in the science and management of the Great Lakes by creating a biodiversity observation network that uses complementary technological approaches to understand different facets of biodiversity. The proposed Great Lakes Marine Biodiversity Observation Network (GLMBON) will address interconnections among (i) dynamic pelagic habitats known as lakescapes, (ii) biodiversity across the tree of life, (iii) movement of fisheries species, and (iv) important ecosystem functions. A key innovation of the proposed work is the degree of integration across multiple technological approaches featured by NOAA, which extend from high-throughput sequencing and bioinformatics to telemetry for fish populations to mapping large-scale biogeographic patterns measured by satellites. This integration will allow us to examine impacts of multiple stressors and test hypotheses about biodiversity and ecosystem function, which are emerging areas in marine biodiversity but remain understudied phenomena in the Great Lakes.

GLOS IRA Topic Area 1 - Coastal and Community Resilience in the Laurentian Great Lakes, $5,000,000
GLOS will use this funding to support projects aimed at increasing equitable service delivery through the expansion of year-round observations and analysis. They will also expand Seagull information technology platform capabilities and coordinate with networks connected to Indigenous communities to provide workshops on Seagull. Additionally, GLOS will develop a lightweight application focused on Great Lakes Beach safety, expand the Great Lakes Acoustic Telemetry Observation System and collect ice thickness measurements from ice anglers to help ice modeling efforts.

Building Capacity to Measure and Assess Offshore, Full-frequency Water Level Fluctuations to Support Coastal Hazard Observation and Prediction, $1,199,427
The overarching goal of the proposed project is to develop a low-cost observing network capable of gathering offshore full-frequency water level fluctuations, and the methodology to relate that data with the most pressing water level-related coastal hazards. *This award supports work in MI, WI, and IL.*

Fiscal Year 2023 - 2028 Inflation Reduction Act (IRA) Capacity Building Funding, $875,000
This funding will build the ability of the state's federally-approved coastal management program within the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to implement projects, initiatives, and programs that increase the climate resilience of coastal communities within coastal counties. Specifically, EGLE will use these funds to collaborate with Michigan State University (MSU) to conduct a Nearshore Sediment Transport Study in six initial sites, engage in community science to expand the scope, and provide technical assistance and outreach about the research and how to use it to enhance coastal resilience.

Accelerating Natural Flood Management in the Lake Superior Basin, $1,451,065
The project site is an area hit hard by catastrophic, repetitive flooding (six federal disaster declarations between 2012 and 2022) affecting local communities and an extensive network of state, local, and tribally managed roads. Funding will be used to 1) identify how the loss of headwater wetland storage and floodplain connectivity is contributing to the flooding problem; and 2) implement high-impact, nature-based solutions to combat this flooding by restoring the natural hydrology. The project is led by the Northwest Regional Planning Commission, a cooperative of local governments and tribal communities. Road maintenance responsibilities stretch across three states, six counties, five cities, one village, 33 towns, and two tribes. The root causes of flooding and potential restoration opportunities will be investigated using new approaches that integrate spatial and field-based assessments. *This project was funded through the Climate Resilience Regional Challenge and supports work in MI, MN, and WI.*

Modular Ocean Model (MOM6) Development for the Great Lakes, $224,730
The proposed work is a new task of NOAA Climate Ecosystem and Fisheries Initiative (CEFI) for regional application: Great Lakes. This project provides a rare opportunity for GLERL and the Cooperative Institute for Great Lakes Research (CIGLR) to develop an ensemble modeling framework (i.e., GLESM + MOM6) to inform and support ecosystem and fisheries management in the Great Lakes. While GLESM is a strong Earth system model, additional guidance provided by MOM6 and the broader NOAA-GFDL suite can only serve to improve our Earth system forecasts. *This award supports work in MI, MN, WI, IL, IN, OH, PA, and NY.*

Alaska Customized Algorithm Development for Flood Detection from SAR Imagery, $79,881
The project enhances our current Decision Support Tools - Harmful Algal Blooms (DST-HABs) project through addressing specific questions regarding the cyanobacteria harmful algal bloom initiation and bloom maintenance. Specifically 7 sub-projects are addressed; 1. Assist with assessment and transition of a toxin forecast; 2. improve our understanding of the impact of high-intensity, short term events (such as storms) on HAB development ; 3. Characterization of phosphorus from the Maumee River into the western basin; 4. Identify changes in nutrient balances and their influence on bloom dynamics; 5. Impact of zooplankton feeding on the cyanobacteria harmful algal bloom; 6. Exploring toxin gene expression through RNA analysis throughout the bloom, 7. Continued development of a Lake Erie Ecosystem model.