

SUPPLEMENTAL INFORMATION

NOAA Great Lakes Environmental Research Laboratory

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Congressional Mandates

Legal Authorities for NOAA OAR Great Lakes Environmental Research Laboratory

14 U.S.C. Coast Guard

§ 313: Centers of expertise for Coast Guard prevention and response

- Establishes a Center of Expertise for Great Lakes Oils Spill Preparedness and Response in accordance with Public Law 115-282, title VIII, § 807, Dec. 4 2018, 132 Stat. 4310, provided that:
 - (a) *IN GENERAL.*—Not later than 1 year after the date of enactment of this Act, the Commandant of the Coast Guard shall establish a Center of Expertise for Great Lakes Oil Spill Preparedness and Response (referred to in this section as the “Center of Expertise”) in accordance with section 313 of title 14, United States Code, as amended by this Act.
 - (b) *LOCATION.*—The Center of Expertise shall be located in close proximity to—
 - (1) critical crude oil transportation infrastructure on and connecting the Great Lakes, such as submerged pipelines and high-traffic navigation locks; and
 - (2) an institution of higher education with adequate aquatic research laboratory facilities and capabilities and expertise in Great Lakes aquatic ecology, environmental chemistry, fish and wildlife, and water resources.
 - (c) *FUNCTIONS.*—The Center of Expertise shall—
 - (1) monitor and assess, on an ongoing basis, the current state of knowledge regarding freshwater oil spill response technologies and the behavior and effects of oil spills in the Great Lakes;
 - (2) identify any significant gaps in Great Lakes oil spill research, including an assessment of major scientific or technological deficiencies in responses to past spills in the Great Lakes and other freshwater bodies, and seek to fill those gaps;
 - (3) 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;
 - (4) educate and train Federal, State, and local first responders located in Coast Guard District 9 in—
 - (A) the incident command system structure;
 - (B) Great Lakes oil spill response techniques and strategies; and
 - (C) public affairs; and
 - (1) work with academic and private sector response training centers to develop and standardize maritime oil spill response training and techniques for use on the Great Lakes.

(d) *DEFINITION.—In this section, the term “Great Lakes” means Lake Superior, Lake Michigan, Lake Huron, Lake Erie, and Lake Ontario.*

15 U.S.C. Commerce and Trade

§ 313c: Authorized activities of the National Oceanic and Atmospheric Administration

- 1) *Improve the capability to accurately forecast inland flooding (including inland flooding influenced by coastal and ocean storms) through research and modeling [and]*
- 5) *Assess, through research and analysis of previous trends, among other activities—*
 - (A) *the long-term trends in frequency and severity of inland flooding; and*
 - (B) *how shifts in climate, development, and erosion patterns might make certain regions vulnerable to more continual or escalating flood damage in the future.*

§ 1511: Bureaus in Department

- Reorganization of the Department of Commerce (1970), establishing and authorizing NOAA for the conception, planning, and conduct of basic research and development in the fields of water motion, water characteristics, water quantity, and ice and snow

§ 1525: Special studies; special compilations, lists, bulletins, or reports

- Authorizes Secretary of Commerce to make special studies on matters within authority of Department of Commerce
- Authorizes Secretary of Commerce to engage in equitable cost-sharing with research organizations for joint projects or services of mutual interest

§ 1540: Cooperative Agreements

The Secretary of Commerce, acting through the Under Secretary of Commerce for Oceans and Atmosphere, may enter into cooperative agreements and other financial agreements with any nonprofit organization to-

- (1) *aid and promote scientific and educational activities to foster public understanding of the National Oceanic and Atmospheric Administration or its programs; and*
- (2) *solicit private donations for the support of such activities.*

§ 2901: National Climate Program - Findings

- Declares the relevance of weather and climate change to national security, human welfare, and sound policy decisions

- Declares the need for a well-defined, coordinated national program in climate-related research, monitoring, assessment of effects, and information utilization

§ 2904: National Climate Program

- Establishes National Climate Program
- Includes assessments of the effect of climate on the natural environment, land and water resources, and basic and applied research to improve understanding of climate processes
- Includes basic and applied research to improve the understanding of climate processes, natural and man induced
- Includes methods for improving climate forecasts on a monthly, seasonal, yearly, and longer basis

§ 8531: NOAA satellite and data management

- Integrate additional coastal and ocean observations, and other data and research, from the Integrated Ocean Observing System (IOOS) into regional weather forecasts to improve weather forecasts and forecasting decision support systems;
- Support the development of real-time data sharing products and forecast products
- Support increasing use of autonomous, mobile surface, sub-surface, and submarine vehicle ocean and freshwater sensor systems and the infrastructure necessary to share and analyze these data in real-time and feed them into predictive early warning systems.

16 U.S.C. Conservation

§ 760e: Study of migratory game fish; waters; research purpose

- *The Secretary of Commerce is directed to undertake a comprehensive continuing study of the migratory marine fish of interest to recreational fishermen of the United States, including species inhabiting the offshore waters of the United States and species which migrate through or spend a part of their lives in the inshore waters of the United States.*
- *The study shall include, but not be limited to, research on migrations, identity of stocks, growth rates, mortality rates, variations in survival, environmental influences, both natural and artificial, including pollution, and effects of fishing on the species, for the purpose of developing wise conservation policies and constructive management activities.*

§ 1447b. Regional Marine Research Boards

- Establishes regional boards for 10 national regions
- Considers the Great Lakes Research Office authorized under U.S.C. 33 §1268d as responsible for research in the Great Lakes region under U.S.C. 16 §1447b

§ 4721: Establishment of Task Force

- Establishes the Aquatic Nuisance Species Task Force.
- Designates NOAA as a co-chair agency of the Task Force

§ 4722: Aquatic Nuisance Species Program

- Directs Aquatic Nuisance Species Task Force to establish program for monitoring, control, and study of Aquatic Nuisance Species
- Specifies components of the Aquatic Nuisance Species Program to include prevention of introduction and dispersal, monitoring, control, research, technical assistance, education, a Zebra mussel demonstration program for the Great Lakes and other affected US waters, implementation, and reporting.

§ 4730: Great Lakes and Lake Champlain Invasive Species Program

(2) Establishment of program

(A) In general

The Administrator shall establish within the Great Lakes National Program Office a program, to be known as the “Great Lakes and Lake Champlain Invasive Species Program”

(i) in collaboration with-

- (I) the Director of the United States Fish and Wildlife Service;*
- (II) the Administrator of the National Oceanic and Atmospheric Administration;*
- (III) the Director of the United States Geological Survey; and*
- (IV) the Secretary of the department in which the Coast Guard is operating; and*

(ii) in consultation with-

- (I) the head of Great Lakes Aquatic Nonindigenous Species Information System of the National Oceanic and Atmospheric Administration; and*
- (II) the head of Great Lakes Environmental Research Laboratory of the National Oceanic and Atmospheric Administration.*

(B) Purposes

The purposes of the Program shall be-

- (i) to monitor for the introduction and spread of aquatic nuisance species into or within the Great Lakes and Lake Champlain Systems;*
- (ii) to detect newly introduced aquatic nuisance species prior to the establishment of the aquatic nuisance species in the Great Lakes and Lake Champlain Systems;*
- (iii) to inform, and assist with, management and response actions to prevent or stop the establishment or spread of an aquatic nuisance species;*

(iv) to establish a watch list of candidate aquatic nuisance species that may be introduced or spread, and that may survive and establish, within the Great Lakes and Lake Champlain Systems;

(v) to monitor vectors likely to be contributing to the introduction or spread of aquatic nuisance species, including ballast water operations;

(vi) to work collaboratively with the Federal, State, local, and Tribal agencies to develop criteria for prioritizing and distributing monitoring efforts;

(vii) to develop, achieve type approval for, and pilot shipboard or land-based ballast water management systems installed on, or available for use by, commercial vessels operating solely within the Great Lakes and Lake Champlain Systems to prevent the spread of aquatic nuisance species populations within the Great Lakes and Lake Champlain Systems; and

(viii) to facilitate meaningful Federal and State implementation of the regulatory framework in this subsection, including monitoring, shipboard education, inspection, and compliance conducted by States.

22 U.S.C. Foreign Relations and Intercourse

§ 267b: International Joint Commission; invitation to establish; personnel; duties

- *The President of the United States is requested to invite the Government of Great Britain to join in the formation of an international commission, to be composed of three members from the United States and three who shall represent the interests of the Dominion of Canada, whose duty it shall be to investigate and report upon the conditions and uses of the waters adjacent to the boundary lines between the United States and Canada, including all of the waters of the lakes and rivers whose natural outlet is by the River Saint Lawrence to the Atlantic Ocean; also upon the maintenance and regulation of suitable levels; and also upon the effect upon the shores of these waters and the structures thereon, and upon the interests of navigation, by reason of the diversion of these waters from or change in their natural flow; and, further, to report upon the necessary measures to regulate such diversion, and to make such recommendations for improvements and regulations as shall best subserve the interests of navigation in said waters.*

§ 268: International Joint Commission; salaries; powers

- *The salaries of the members on the part of the United States, of the International Joint Commission, established under the treaty of January 11, 1909, between the United States and Great Britain, relating to boundary waters between the United States and Canada, shall be fixed by the President.*

33 U.S.C. Navigation and Navigable Waters

§ 891b: Fleet replacement and modernization plan

- Proposed acquisition of modern vessels and scientific instrumentation for the NOAA fleet, including acoustic systems, data transmission positioning and communication systems, physical, chemical, and meteorological oceanographic systems, and data acquisition and processing systems

§893: Ocean and Atmospheric Research and Development Program

- Identify emerging and innovative Research and Development supporting U.S. competitiveness and new economic opportunities based on NOAA research, observations, monitoring, modeling, and predictions that sustain economic services.
- Advance ocean, coastal, Great Lakes, and atmospheric research and development, including potentially transformational research, in collaboration with other relevant Federal agencies, academic institutions, the private sector, and nongovernmental programs, consistent with NOAA's mission to understand, observe, and model the Earth's atmosphere and biosphere, including the oceans, in an integrated manner.

§ 1121: Congressional declaration of policy

- Declares national strategic need for understanding and wise use of Great Lakes resources
- Declares the National Oceanic and Atmospheric Administration, through the national sea grant college program, offers the most suitable locus and means for such commitment and engagement through the promotion of activities that will result in greater such understanding, assessment, development, management, management, utilization, and conservation of ocean, coastal, and Great Lakes resources. The most cost-effective way to promote such activities is through continued and increased Federal support of the establishment, development, management, and operation of programs and projects by sea grant colleges, sea grant institutes, and other institutions, including strong collaborations between Administration scientists and research and outreach personnel at academic institutions.

§1268: Great Lakes

- Declares Great Lakes as a valuable national resource
- Declares the United States should seek to achieve the goals of the Great Lakes Water Quality Agreement (1978, 1987)
- Establish within NOAA a Great Lakes research office to conduct, through the Great Lakes Environmental Research Laboratory, National Sea Grant College program, other Federal

laboratories, and the private sector, appropriate research and monitoring activities which address priority issues and current needs relating to the Great Lakes

(c)(7) Great Lakes Restoration Initiative

(A) Establishment

There is established in the Agency a Great Lakes Restoration Initiative (referred to in this paragraph as the "Initiative") to carry out programs and projects for Great Lakes protection and restoration.

(B) Focus areas

In carrying out the Initiative, the Administrator shall prioritize programs and projects, to be carried out in coordination with non-Federal partners, that address the priority areas described in the Initiative Action Plan, including—

- (i) the remediation of toxic substances and areas of concern;*
- (ii) the prevention and control of invasive species and the impacts of invasive species;*
- (iii) the protection and restoration of nearshore health and the prevention and mitigation of nonpoint source pollution;*
- (iv) habitat and wildlife protection and restoration, including wetlands restoration and preservation; and*
- (v) accountability, monitoring, evaluation, communication, and partnership activities.*

(C) Projects

(i) In general

In carrying out the Initiative, the Administrator shall collaborate with other Federal partners, including the Great Lakes Interagency Task Force established by Executive Order No. 13340 (69 Fed. Reg. 29043), to select the best combination of programs and projects for Great Lakes protection and restoration using appropriate principles and criteria, including whether a program or project provides—

- (I) the ability to achieve strategic and measurable environmental outcomes that implement the Initiative Action Plan and the Great Lakes Water Quality Agreement;*
- (II) the feasibility of-*
 - (aa) prompt implementation;*
 - (bb) timely achievement of results; and*
 - (cc) resource leveraging; and*
- (III) the opportunity to improve interagency, intergovernmental, and interorganizational coordination and collaboration to reduce duplication and streamline efforts.*

(D) Implementation of projects

(i) In general

Subject to subparagraph (J)(ii), funds made available to carry out the Initiative shall be used to strategically implement-

- (I) Federal projects;*

(II) projects carried out in coordination with States, Indian tribes, municipalities, institutions of higher education, and other organizations; and

(III) operations and activities of the Program Office, including remediation of sediment contamination in areas of concern.

(ii) Transfer of funds

With amounts made available for the Initiative each fiscal year, the Administrator may-

(I) transfer not more than the total amount appropriated under subparagraph (J)(i) for the fiscal year to the head of any Federal department or agency, with the concurrence of the department or agency head, to carry out activities to support the Initiative and the Great Lakes Water Quality Agreement; and

(II) enter into an interagency agreement with the head of any Federal department or agency to carry out activities described in subclause (I).

(E) Scope

(i) In general

Projects may be carried out under the Initiative on multiple levels, including-

(I) locally;

(II) Great Lakes-wide; or

(III) Great Lakes basin-wide.

(F) Activities by other Federal agencies

Each relevant Federal department or agency shall, to the maximum extent practicable-

(i) maintain the base level of funding for the Great Lakes activities of that department or agency without regard to funding under the Initiative; and

(ii) identify new activities and projects to support the environmental goals of the Initiative.

(G) Revision of Initiative Action Plan

(i) In general

Not less often than once every 5 years, the Administrator, in conjunction with the Great Lakes Interagency Task Force, shall review, and revise as appropriate, the Initiative Action Plan to guide the activities of the Initiative in addressing the restoration and protection of the Great Lakes system.

(d) Great Lakes Research

o Establishment of Research Office

There is established within the National Oceanic and Atmospheric Administration the Great Lakes Research Office.

o Identification of issues

The Research Office shall identify issues relating to the Great Lakes resources on which research is needed. The Research Office shall submit a report to Congress on such issues before the end of each fiscal year which shall identify any changes in the Great Lakes system with respect to such issues.

o Inventory

The Research Office shall identify and inventory Federal, State, university, and tribal environmental research programs (and, to the extent feasible, those of private organizations and other nations) relating to the Great Lakes system,³ and shall update that inventory every four years.

○ *Research exchange*

The Research Office shall establish a Great Lakes research exchange for the purpose of facilitating the rapid identification, acquisition, retrieval, dissemination, and use of information concerning research projects which are ongoing or completed and which affect the Great Lakes System.

○ *Research Program*

The Research Office shall develop, in cooperation with the Coordination Office, a comprehensive environmental research program and data base for the Great Lakes system. The database shall include, but not be limited to, data relating to water quality, fisheries, and biota.

Monitoring

- *The Research Office shall conduct, through the Great Lakes Environmental Research Laboratory, the National Sea Grant College program, other Federal laboratories, and the private sector, appropriate research and monitoring activities which address priority issues and current needs relating to the Great Lakes.*

(7) Location

The Research Office shall be located in a Great Lakes State.

§2326b: Sediment management

(a) In general

The Secretary may enter into cooperation agreements with non-Federal interests with respect to navigation projects, or other appropriate non-Federal entities, for the development of long-term management strategies for controlling sediments at such projects.

(b) Contents of strategies

Each strategy developed under subsection (a) shall:

- (1) include assessments of sediment rates and composition, sediment reduction options, dredging practices, long-term management of any dredged material disposal facilities, remediation of such facilities, and alternative disposal and reuse options;*
- (2) include a timetable for implementation of the strategy; and*
- (3) incorporate relevant ongoing planning efforts, including remedial action planning, dredged material management planning, harbor and waterfront development planning, and watershed management planning.*

(c) Consultation

In developing strategies under subsection (a), the Secretary shall consult with interested Federal agencies, States, and Indian tribes and provide an opportunity for public comment.

§ 3424: Research, exploration, education, and technology programs

- Directs development, testing, and transition of advanced undersea technology associated with ocean observatories, submersibles, advanced diving technologies, remotely operated vehicles, autonomous underwater vehicles, and new sampling and sensing technologies.

§ 3601: Integrated Coastal and Ocean Observation System

- Establishes purposes of a national integrated system for ocean, coastal, and Great Lakes observing systems to address regional and national needs, including:
 - Promoting public awareness and stewardship of ocean, coastal, and Great Lakes resources
 - Enabling advances in scientific understanding to support the sustainable use, conservation, management, and understanding of healthy ocean, coastal, and Great Lakes resources
 - Improving the Nation's capability to measure, track, explain, and predict events related directly and indirectly to weather and climate change, natural climate variability, and interactions between the oceanic and atmospheric environments, including the Great Lakes
 - Authorizing activities to promote basic and applied research to develop, test, and deploy innovations and improvements in coastal and ocean observation technologies, modeling systems, and other scientific and technological capabilities to improve our conceptual understanding of weather and climate, ocean-atmosphere dynamics, global climate change, physical, chemical, and biological dynamics of the ocean, coastal and Great Lakes environments, and to conserve healthy and restore degraded coastal ecosystems.

§4002. National harmful algal bloom and hypoxia program

- Establishment

Not later than 1 year after June 30, 2014, the Under Secretary, acting through the Task Force, shall maintain and enhance a national harmful algal bloom and hypoxia program, including-

 - (1) a statement of objectives, including understanding, detecting, predicting, controlling, mitigating, and responding to marine and freshwater harmful algal bloom and hypoxia events; and*
 - (2) the comprehensive research plan and action strategy under section 4003 of this title.*

- (f) *National Oceanic and Atmospheric Administration activities: The Under Secretary shall-*
- (1) *maintain and enhance the existing competitive programs at the National Oceanic and Atmospheric Administration relating to harmful algal blooms and hypoxia;*
 - (2) *carry out marine and Great Lakes harmful algal bloom and hypoxia events response activities;*
 - (3) *develop and enhance, including with respect to infrastructure, which shall include unmanned systems, as necessary, critical observations, monitoring, modeling, data management, information dissemination, and operational forecasts relevant to harmful algal blooms and hypoxia events;*
 - (4) *enhance communication and coordination among Federal agencies carrying out marine and freshwater harmful algal bloom and hypoxia activities and research;*
 - (5) *to the greatest extent practicable, leverage existing resources and expertise available from local research universities and institutions;*
 - (6) *increase the availability to appropriate public and private entities of-*
 - (A) *analytical facilities and technologies;*
 - (B) *operational forecasts; and*
 - (C) *reference and research materials;*
 - (7) *use cost effective methods in carrying out this Act; and*
 - (8) *develop contingency plans for the long-term monitoring of hypoxia.*

§ 4005: Great Lakes hypoxia and harmful algal blooms

- Directs the Inter-Agency Task Force on Harmful Algal Blooms and Hypoxia [established per U.S.C. 33 §4001(a) and chaired by the Department of Commerce] to provide to Congress and the President an integrated assessment to address the causes, consequences, and approaches to reduce hypoxia and harmful algal blooms in the Great Lakes, including the status of and gaps within current research, monitoring, management, prevention, response, and control activities.
- Directs the Inter-Agency Task Force to develop a plan to reduce, mitigate, and control hypoxia and harmful algal blooms in the Great Lakes.

Executive Order 13112. Invasive Species

- Establishes a National Invasive Species Council which includes and is co-chaired by the Secretary of Commerce.
- Describes the duties of the National Invasive Species Council

Executive Order 13751. Safeguarding the Nation from the Impacts of Invasive Species

- Establishes a national policy to prevent the introduction, establishment, and spread of invasive species, as well as to eradicate and control populations of invasive species.

- Directs each federal agency whose actions may affect the status of invasive species to conduct research on invasive species to prevent introduction and provide environmentally sound control of invasive species.
- Amends Executive Order 13112 pertaining to the National Invasive Species Council membership, meetings, and duties.

Title 42: Public Health and Welfare

§ 7412m: Hazardous air pollutants - Atmospheric deposition to Great Lakes and coastal waters

(1) Deposition assessment

The Administrator, in cooperation with the Under Secretary of Commerce for Oceans and Atmosphere, shall conduct a program to identify and assess the extent of atmospheric deposition of hazardous air pollutants (and in the discretion of the Administrator, other air pollutants) to the Great Lakes, the Chesapeake Bay, Lake Champlain and coastal waters. As part of such program, the Administrator shall-

- (A) monitor the Great Lakes, the Chesapeake Bay, Lake Champlain and coastal waters, including monitoring of the Great Lakes through the monitoring network established pursuant to paragraph (2) of this subsection and designing and deploying an atmospheric monitoring network for coastal waters pursuant to paragraph (4);*
- (B) investigate the sources and deposition rates of atmospheric deposition of air pollutants (and their atmospheric transformation precursors);*
- (C) conduct research to develop and improve monitoring methods and to determine the relative contribution of atmospheric pollutants to total pollution loadings to the Great Lakes, the Chesapeake Bay, Lake Champlain, and coastal waters;*
- (D) evaluate any adverse effects to public health or the environment caused by such deposition (including effects resulting from indirect exposure pathways) and assess the contribution of such deposition to violations of water quality standards established pursuant to the Federal Water Pollution Control Act [33 U.S.C. 1251 et seq.] and drinking water standards established pursuant to the Safe Drinking Water Act [42 U.S.C. 300f et seq.]; and*
- (E) sample for such pollutants in biota, fish, and wildlife of the Great Lakes, the Chesapeake Bay, Lake Champlain and coastal waters and characterize the sources of such pollutants.*

(2) Great Lakes monitoring network

The Administrator shall oversee, in accordance with Annex 15 of the Great Lakes Water Quality Agreement, the establishment and operation of a Great Lakes atmospheric deposition network to monitor atmospheric deposition of hazardous air pollutants (and in the Administrator's discretion, other air pollutants) to the Great Lakes.

- (A) As part of the network provided for in this paragraph, and not later than December 31, 1991, the Administrator shall establish in each of the 5 Great Lakes at least 1 facility capable of monitoring the atmospheric deposition of hazardous air pollutants in both dry and wet conditions.*

(B) The Administrator shall use the data provided by the network to identify and track the movement of hazardous air pollutants through the Great Lakes, to determine the portion of water pollution loadings attributable to atmospheric deposition of such pollutants, and to support development of remedial action plans and other management plans as required by the Great Lakes Water Quality Agreement.

(C) The Administrator shall assure that the data collected by the Great Lakes atmospheric deposition monitoring network is in a format compatible with databases sponsored by the International Joint Commission, Canada, and the several States of the Great Lakes region.

(3) Monitoring for the Chesapeake Bay and Lake Champlain

The Administrator shall establish at the Chesapeake Bay and Lake Champlain atmospheric deposition stations to monitor deposition of hazardous air pollutants (and in the Administrator's discretion, other air pollutants) within the Chesapeake Bay and Lake Champlain watersheds. The Administrator shall determine the role of air deposition in the pollutant loadings of the Chesapeake Bay and Lake Champlain, investigate the sources of air pollutants deposited in the watersheds, evaluate the health and environmental effects of such pollutant loadings, and shall sample such pollutants in biota, fish and wildlife within the watersheds, as necessary to characterize such effects.

Boundary Waters Treaty of 1909

- Treaty is among the United States of America, Great Britain, and Canada.
- The Boundary Waters Treaty was signed in 1909 to prevent and resolve disputes over the use of the waters shared by Canada and the United States and to settle other transboundary issues.
- The treaty established the International Joint Commission (IJC) to help the two countries carry out its provisions.
- Great Lakes Water Quality Agreement of 1978
 - Agreement is between Canada and the United States of America.
 - Including predecessor agreement of 1972 and amendments of 1983, 1987, 2012
 - The Great Lakes Water Quality Agreement provides the framework for binational consultation and cooperative action to restore, protect and enhance the water quality of the Great Lakes to promote the ecological health of the Great Lakes basin.

Great Lakes Environmental Research Laboratory Charter

Great Lakes Environmental Research Laboratory (GLERL)

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Vision:

A trusted scientific enterprise to advance observation, modeling, understanding, and prediction of the Great Lakes and coasts to sustain resilient ecosystems, communities, and economies.

Mission:

Research, Develop, Transition

Conduct research to understand and predict the Great Lakes and coastal ecosystems; develop technology to improve NOAA science, service, and stewardship; and transition the results so they are useful to society.

Core Competencies:

- Harmful Algal Blooms Research
- Hypoxia Research
- Great Lakes Long-term Ecological Research
- Invasive Species Research
- Great Lakes Water Level Forecasting and Lake Hydrology
- Great Lakes Real-Time Environmental Coastal Observing Network
- Great Lakes Coastal Forecasting System
- Great Lakes CoastWatch
- Ice Research, Monitoring and Forecasting
- Great Lakes Regional Climate Modeling and Forecasting
- Great Lakes Physical Observations
- Great Lakes Regional Fleet
- Communications and Outreach

Statutory Authorities:

CONGRESSIONAL MANDATES

14 U.S.C. COAST GUARD

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 8. 15 U.S.C. §8531 NOAA satellite and data management
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 22. 33 U.S.C. §2326b Water resources development
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 24. 33 U.S.C. §3601 Integrated Coastal and Ocean Observation System
 25. 33 U.S.C. §4005 Great Lakes hypoxia and harmful algal blooms
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EXECUTIVE ORDERS

27. Executive Order 13112 Invasive Species

28. Executive Order 13751 Safeguarding the Nation from the Impacts of Invasive Species

TREATIES

29. Boundary Waters Treaty of 1909
Prevention and resolution of disputes over waters shared by Canada and the United States

AGREEMENTS

30. Great Lake Water Quality Agreement of 1978 –
Restore, protect, and enhance water quality of the Great Lakes

Science Themes and Research Areas:

GLERL's approach to scientific research—integrated around physical, chemical and biological interactions—serves as a framework to address the complex environmental challenges posed by a large-lake system in a state of flux as well as to serve as a model for other freshwater and coastal ecosystems of the world. GLERL is uniquely organized to maintain its integrated scientific research program. GLERL's organizational structure is built upon the following four branches that drive GLERL's research agenda:

Observing Systems and Advanced Technology (OSAT)

Through the development of cutting-edge instrumentation, observing, and remote sensing technologies, the OSAT branch team members acquire the data and develop information products needed to improve understanding of the Great Lakes and coastal ecosystems and support decision-making for resource managers and other stakeholders.

Ecosystem Dynamics (EcoDyn)

The EcoDyn branch strives to anticipate, monitor, analyze, understand, and forecast changes in the Great Lakes and coastal ecosystems to strengthen capacity for managing water quality, fisheries, and ecosystem and human health.

Integrated Physical and Ecological Modeling and Forecasting (IPEMF)

The IPEMF branch conducts innovative research and develops numerical models to predict the physical, chemical, biological, and ecological response in the Great Lakes due to weather, climate, and human-induced changes. The forecast models and quantitative tools developed at GLERL allow scientists, coastal resource managers, policy makers, and the public to make informed decisions for optimal management of the Great Lakes.

Information Services (IS)

The IS branch coordinates and supports information flow internally among NOAA staff, and externally with stakeholders and the general public to advance science, service, and stewardship of the Great Lakes and coastal ecosystems.

Products and Results:

GLERL supports NOAA's goals to understand and predict changes in climate, weather, oceans and coasts; and to share that knowledge and information with others. GLERL research programs, guided by NOAA priorities, deliver products to a broad suite of stakeholders. GLERL's experimental forecasting capabilities, e.g., the Great Lakes Forecasting System, experimental harmful algal bloom, hypoxia, and lake level forecasts, are the foundation for ecosystem approaches to management. GLERL is also home to NOAA's CoastWatch program for the Great Lakes that produces a number of real-time and retrospective satellite data products. The stakeholders of GLERL's research and development products, services, and information include federal, public, private, and academic organizations who apply the research outcomes to make better operational decisions supporting various societal and economic sectors.

Lead the world in earth system observation and prediction to enhance the nation's Blue Economy.

- Real-time Coastal Observation Network (ReCON) collecting high bandwidth data about ecosystems
- Harmful algal bloom and hypoxia forecasting
- Hydrology: water levels, ice prediction, and lake management
- Satellite Color-Producing Agent Algorithm
- Radar Satellite Ice-type Algorithm
- Hyperspectral imagery – phytoplankton functional types algorithm

Minimize the impacts of severe weather.

- Understanding hydrodynamic input to lake effect snow
- Understanding and forecasting Great Lakes ice dynamics
- Meteotsunami research

Customers:

GLERL collaborates across NOAA and with the Cooperative Institute for Great Lakes Research, Great Lakes Sea Grant, and a wide range of academic partners to pursue research that leads to an ecosystem approach to management. GLERL also serves as the DOC's representative on the Great Lakes Interagency Task Force, as outlined by a Presidential Executive Order (No. 13340), to restore and protect the Great Lakes. This task force brings together eleven Agency and Cabinet-

level departments at the Secretary level. GLERL is a partner in the interagency Great Lakes Restoration Initiative and administers the program for NOAA. Since 2010, NOAA has received \$272.3 million and GLERL has received \$43.2 million. GLERL constituents include the Great Lakes and coastal science communities, state and federal government agencies, state, national and international commissions, K-12 and higher educational institutions, professional scientific organizations, other non-government organizations, and the general public.

Future Expectations:

Going forward, GLERL will continue to be a leader in large lakes of the world research. GLERL is aligning with NOAA's new strategies in key science and technology focus areas including uncrewed systems, artificial intelligence, data, and 'omics to guide transformative advancements in the quality and timeliness of NOAA science, products and services. By implementing our GLERL Strategic Plan we will continue to solve tough problems and set the course to strengthen NOAA's freshwater environmental S&T leadership for the coming decades.