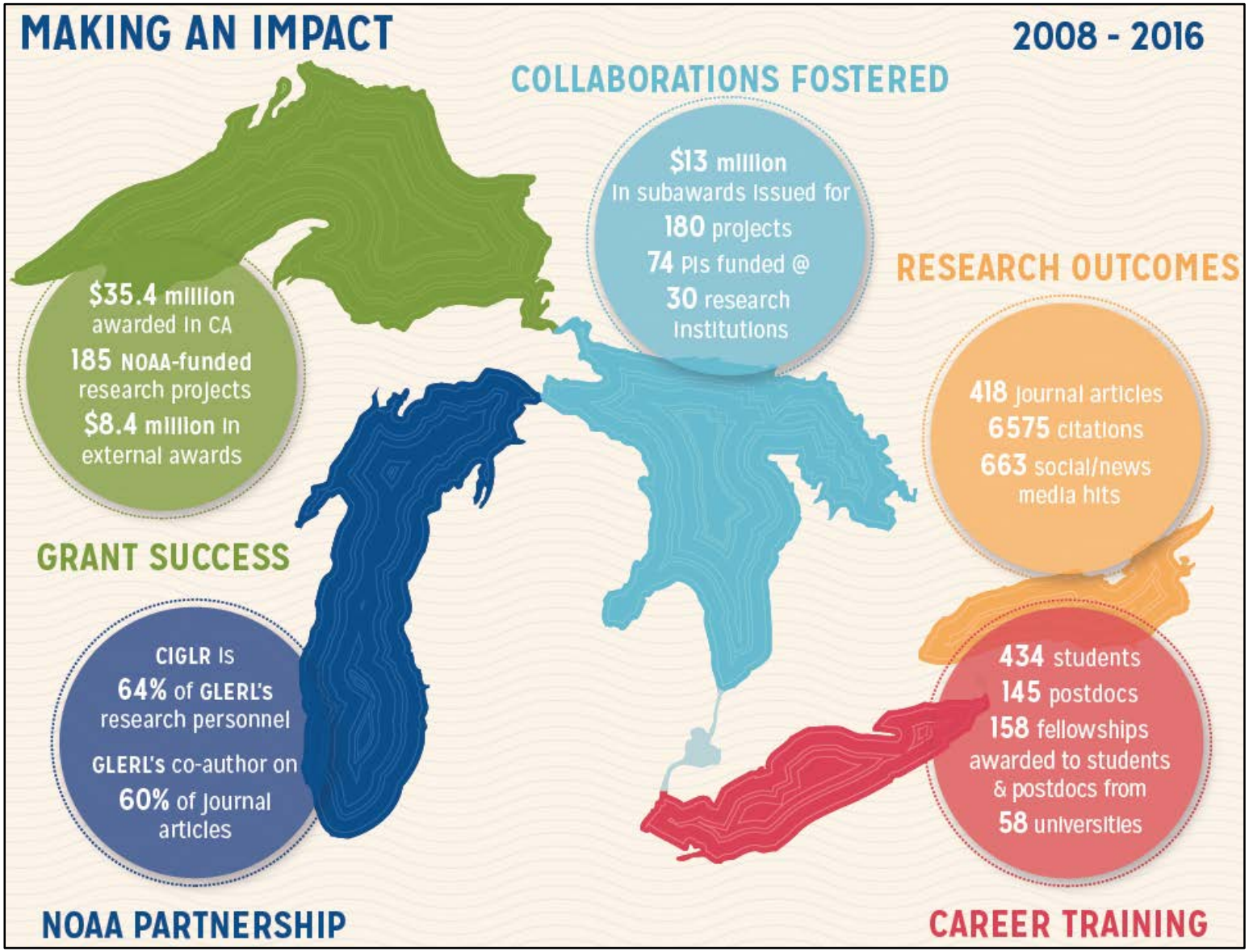

Cooperative Institute for
Great Lakes Research
CIGLR
Great Lakes Science for Society


MAKING AN IMPACT
2008 - 2016
COLLABORATIONS FOSTERED
$13 million
In subawards issued for
180 projects
74 PIs funded @
30 research
institutions
RESEARCH OUTCOMES
418 journal articles
6575 citations
663 social/news
media hits
$35.4 million
awarded in CA
185 NOAA-funded
research projects
$8.4 million in
external awards
GRANT SUCCESS
CIGLR is
64% of GLERL's
research personnel
GLERL's co-author on
60% of journal
articles
434 students
145 postdocs
158 fellowships
awarded to students
& postdocs from
58 universities
NOAA PARTNERSHIP
CAREER TRAINING

Cooperative Institute for Great Lakes Research

CIGLR

Great Lakes Science for Society

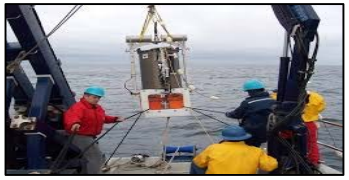
Greater research capacity. Regional Consortium includes 10 field stations, 12 vessels, 12 engineering/design labs, 38 observing systems, and an unprecedented set of specialty labs.

More interdisciplinarity. University Partners bring together a large group of natural and social scientists, as well as experts in engineering and design, who have committed to work together with NOAA-GLERL.

Bi-national collaboration. Partners include U.S. and Canadian universities working collaboratively with support of major international initiatives (IJC, CGLI).

Increased cost-sharing. University Partners guarantee NOAA a uniformly low cost of doing research across the Great Lakes with $5.3 million in cost-sharing and in-kind support.

Greater focus on co-design. Private-sector partnerships with consulting firms, technology development companies, Great Lakes industries, and NGOs help accelerate transition of scientific research into applications.



Faster R2A. Private-sector partnerships with consulting firms, technology development companies, Great Lakes industries, and NGOs who help us accelerate transition of scientific research into applications.

Cooperative Institute for Great Lakes Research

CIGLR

Great Lakes Science for Society

1. Mission & Goals
2. Organization
3. Research themes
4. Programs
5. Budget
6. Challenges & Opportunities

Cooperative Institute for Great Lakes Research

CIGLR

Great Lakes Science for Society

Mission

Lead research, develop applications and products, and engage with stake-holders to achieve sustainable management of the Great Lakes.

Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society

Goals

1. **Research institute.** Operate a research institute that complements NOAA-GLERL's workforce with a skilled, permanent group of research scientists, technicians, and staff.

2. **Regional consortium.** Expand GLERL's intellectual capacity and research infrastructure by building strong partnerships with universities, NGOs, and private-sector partners throughout the Great Lakes basin.

3. **Science translation.** Translate NOAA research into action-oriented products that meet the needs of end-user stakeholders like natural resource managers, businesses, public utilities, and citizen users of data.

4. **Engagement.** Support informed decision making by advising local, state, and federal policymakers about the importance of the Great Lakes for national security, commerce, health, prosperity and sustainability.

5. **Career development.** Foster development of a diverse, skilled workforce who will become the next generation of NOAA and Great Lakes scientists.

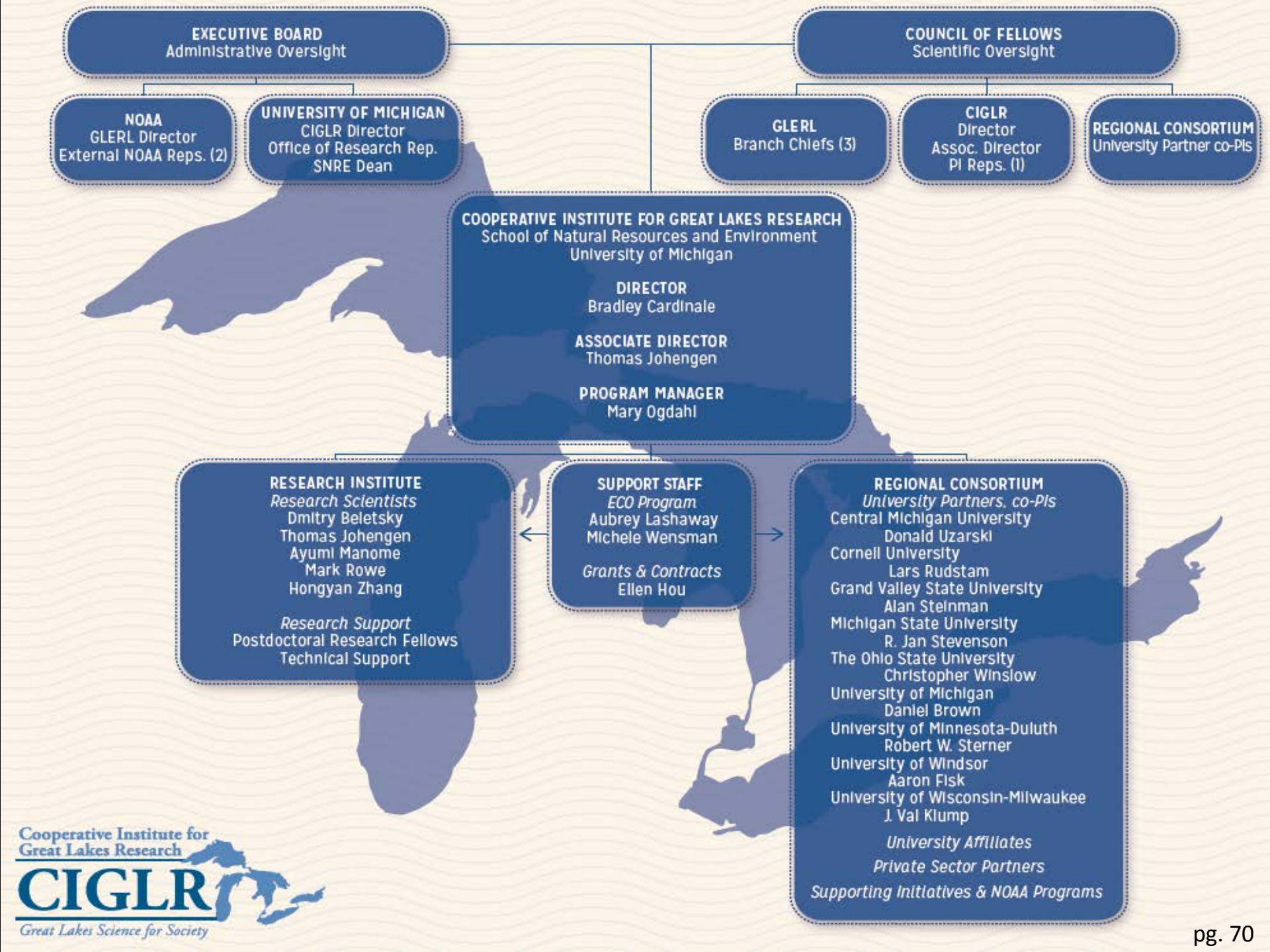
6. **Outreach & communications.** Advance Great Lakes environmental literacy by communicating the value, importance & usefulness of NOAA's research to the general public at local, state, and regional levels.

Cooperative Institute for Great Lakes Research

CIGLR

Great Lakes Science for Society

1. Mission & Goals
2. **Organization**
3. Research themes
4. Programs
5. Budget
6. Challenges & Opportunities



Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society

Research Institute …

5 Research scientists





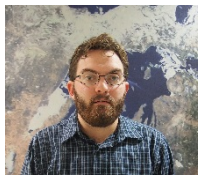
2 Postdoctoral fellows


17 Research staff

















> 20 Graduate students
and summer fellows

Regional Consortium …

Regional Consortium …

University Partners

University Partners agree to uniform 26% IDC rate on NOAA funds run through CIGLR

		CMU			S		M	UMD		UWM
Research Vessels		38' *Chippewa* 7 small vessels	29' Trawler 5 small vessels	66' *W.G. Jackson* 45' *D.J. Angus* 4-6 small vessels	---	47' *Gibraltar III* 37' *M/V BioLaB* 34' *Carmen* 27' *Echo* 3 small vessels	80' *Laurentian*	86' *Blue Heron* 25' *Kingfisher*	---	71' *Neeskay* 4 small vessels
Observing Systems		Ship-based system (L Michigan)	1 buoy (Oneida L)	1 buoy (Muskegon L), 5 ROVs	1 glider (regional)	1 buoy (L Erie) 2 ROVs (L Erie)	7 buoys (L Erie, L Michigan, Little Traverse Bay); 2 AUVs (regional); 3 gliders (regional)	2 buoys (L Superior) 2 gliders (L Superior)	5 gliders (regional)	2 buoys (L Michigan); 1 buoy (Green Bay); 2 ROVs, Ship-based system (L Michigan)
Field Research Stations	**Facility**	CMUBS: 130 ac, boat house, 4 labs, library, cafeteria	CBFS: 500 ac, 20 buildings, labs	AWRI: 14,000 ft² with 8 labs, vessel docks, meeting & office space, library	KBS: 17 km² bio-station, 3600 ft² greenhouse, 12 labs, library	StoneLab: 16ac biostation, vessel docks, 3,000 ft² lab space, office & meeting space, cafeteria, library	UMBS: 10,000 ac biostation, 24,000 ft² lab space, dining hall, library	LLO: 224 ac campus on L Superior, analytical labs	PERC: 22 ac research center, Point Pelee FERC: 3300 ft² center, Detroit R.	GLWI: 160,000 ft² facility, 30 labs, deep water dock, ship staging area
	Experimental Facilities	350 gal (12) climate cont aquaria	800 gal (16) climate cont aquaria	350 gal (12) climate cont aquaria	30 m dia ponds (18)	450 gal tanks (4), 75 gal climate cont streams (2), 2500 L pools (54), 30 m hatcheries (2)	10 L (180) climate cont algal chemostats 1000 L (160) tanks	---	3000 L (18) climate cont aquaria 40 x 60 x 2 m deep ponds (4)	Aquaculture center Aquarium facilities
	Housing	12 cabins, 1 dorm, sleeps 146	Cabins & dorms, sleeps 40	---	3 cabins, 12 dorms, 30 apts, sleeps 100+	2 cottages, 12 dorm suites, 12 houses, sleeps 90	100 cabins, 14 dorms, sleeps 300+	---	---	---
	Classrooms	3	2	2	6	6	17	1	---	6
Specialized Laboratories and Facilities		Biomolecular; Engineering/ design; Gas (volatile, & semi-volatile) spectroscopy: HP computing	Bioacoustics: Biomolecular: Engineering/ design; Satellite imagery; GIS; Remote sensing	Biomolecular; Engineering/ design; Satellite imagery; GIS; Remote sensing; Sedimentology	Biomolecular; Engineering/ design; HP computing; Stable Isotopes; Satellite imagery; GIS; Remote sensing	Biomolecular; Engineering/ design; Radioisotope; HP computing; Satellite imagery; GIS; Remote sensing	Aquaculture; Biomolecular; Engineering/ design; HP computing; Satellite imagery; GIS; Remote sensing	IRMS; LC-MS; XRF; Bio-molecular; Coring & core processing; Engineering/design	Biomolecular; Engineering/ design; HP computing; Satellite imaging; GIS; Remote sensing	Aquaculture; Biomolecular; Data visualization; Engineering/ design; HP computing; Radioisotope
Number of NOAA related PhD and MS programs (examples)		5 (Earth Science, Ecosystem Science, Mathematics, Conservation Biology)	9 (Ecology, Aquatic Science, Wildlife Science, Policy)	3 (Biology, Aquatic Sciences)	10 (Fisheries, Ecology, Environ Science & Policy, Communication, Tourism, Protected Area Management)	12 (Ecology, Environ Social Science, Fisheries & Wildlife, Watershed Systems, Atmospheric Sci)	12 (Conservation, Human behavior, Sustainable Systems, Policy & Planning, Atmospheric & Oceanic Sci)	8 (Chemistry, Physics, Limnology & Oceanography, Geology, Conservation)	6 (Aquatic Ecotoxicology, Ecology, Invasion Biology, Biogeochemistry)	7 (Ecology, Ecotoxicology, Fish & Aquaculture, Environ Health, Water Law & Policy, Atmospheric Sci)
# of PIs in:	**ED/NS/SS**	0/25/0	2/19/10	0/13/2	4/15/9	11/10/4	12/18/7	0/12/0	2/13/2	5/23/8
	Theme 1-4	8/8/18/7	6/16/22/11	3/7/13/13	9/18/8/12	18/12/13/10	19/16/11/15	9/6/12/0	5/9/11/5	9/20/8/24

Regional Consortium …

Private Sector Partners

The Nature Conservancy

One of the world's largest charitable organizations. TNC Laurentian Great Lakes Project works in 8 states and Canada. Will partner in research, engagement, communication, and outreach efforts.

National Wildlife Federation

Largest private, nonprofit conservation education and advocacy organization in US. Great Lakes Regional Center will help expand our efforts in policy engagement (National Advocacy Center).

LimnoTech

Leading water sciences and environmental engineering firm. Key role in observing / monitoring systems. Will partner to coordinate and expand observing systems – particularly, for public utilities

Fondriest Environmental

Leading distributor and certified repair center of sensors, platforms, and telemetry equipment. Will partner to build instrumented monitoring stations; offer support and repair services for existing monitoring instrumentation and systems.

GLEC

Contracting firm with labs for aquatic toxicology, environmental chemistry, and taxonomy. Will partner for monitoring and toxicology studies to fill gaps in expertise.

Regional Consortium …

Supporting programs & initiatives

Great Lakes Science Center

Cooperative Institute for Great Lakes Research

CIGLR

Great Lakes Science for Society

1. Mission & Goals
2. Organization
3. **Research themes**
4. Programs
5. Budget
6. Challenges & Opportunities

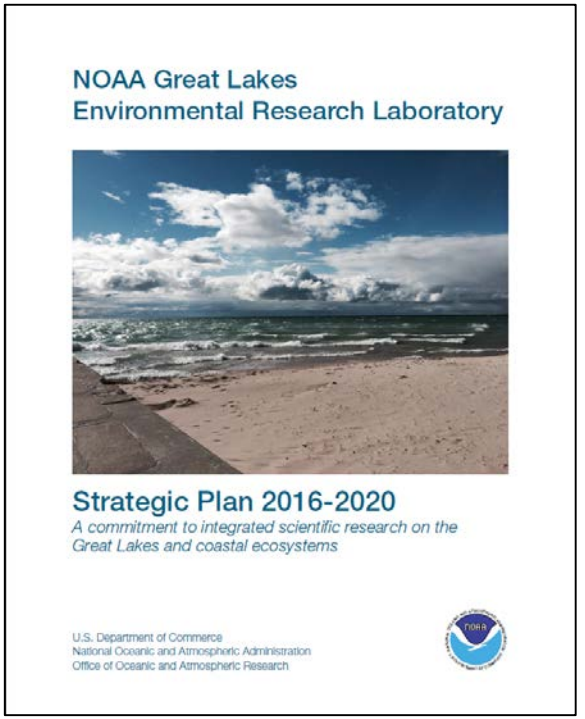
20 core / 24 new projects …

Theme 1. Observing Systems and Advanced Technology
Monitoring environmental change to help society navigate the Anthropocene

Theme 2. Invasive species and food-web ecology
Tracking the dynamics & functioning of Great Lakes ecological communities

Theme 3. Hydrometeorological and ecosystem forecasting
Modeling physical & biological processes to help predict the Great Lakes future

Theme 4. Protection and restoration of resources
Safeguarding habitats, natural capital, & ecosystem services in the Great Lakes



Box 1. NOAA's Grand Challenges and Research Priorities

NOAA's 20-yr Research Vision & Grand Challenges (N20)

1. *Enhance atmosphere-ocean-land-biology and human observing systems*
2. *Improve predictions of the water cycle at global to local scales*
3. *Characterize how climate variation impacts oceans (Great Lakes) and coasts*
4. *Characterize uncertainties associated with scientific information*
5. *Understand how biodiversity & ecosystem processes sustain ecosystem services* ←
6. *Develop approaches to reduce environmental degradation*
7. *Incorporate human behavior into Earth system sciences* ←
8. *Communicate science effectively to policy makers, the media, and the public* ←

NOAA's Next Generation Strategic Plan (NGSP)

1. *Climate adaptation & mitigation: anticipating & responding to climate impacts*
2. *Weather-ready nation: preparing society to respond to weather related events* ←
3. *Healthy oceans and Great Lakes: sustaining fisheries, habitats, and biodiversity*
4. *Resilient communities: environmentally & economically sustainable coasts* ←

NOAA's 5-year Research & Development Plan (N5)

1. *Climate variation and its impacts*
2. *Managing and leveraging big data*
3. *Extreme weather and water events*
4. *Preparing for and responding to unpredictable events*
5. *Modeling and managing complex systems*
6. *Integrating disciplines for a systems perspective* ←

Theme 1. Observing Systems and Advanced Technology

Monitoring environmental change to help society navigate the Anthropocene

Focus 1a. Development and operation of observing systems

Project 1a.1 – Observing Systems: Implementing a network of observing systems

Project 1a.2 – Remote sensing: Enhancing remote sensing systems

Project 1a.3 – Local monitoring systems: Expanding obs networks for key end-users

Focus 1b. Advancing technology for observing systems

Project 1b.1 – Fixed moorings: Advancing technologies for toxin and contaminant measurement

Project 1b.2 – Mobile platforms: Advancing technologies for monitoring physio-chemical & biological parameters

Project 1b.3 – Airborne platforms: Advancing technologies for lake-scale assessments of harmful algal blooms

Focus 1c. Data products for the science community and the public

Project 1c.1 – Data management: Support for the GLOS Data Assembly Center (DAC)

Project 1c.2 – Real-time information systems: Support for Great Lakes CoastWatch

Project 1c.3 – Advanced warning systems: Public applications of observing systems

Project 1c.4 – Beach forecast systems: Health monitoring to protect coastal recreation

Focus 1d. High-risk, potentially transformative projects

Project 1d.1 – Social observing systems: Developing a Great Lakes Observing System for Human Dimensions (GLOS-HD)

Theme 2. Invasive species and food-web ecology

Tracking the dynamics and functioning of Great Lakes ecological communities

Focus 2a. Invasive species

Project 2a.1 – Prevention: A human-natural systems approach to prevention

Project 2a.2 – Monitoring and early detection: Using eDNA to scan for invaders

Project 2a.3 – Rapid response: Support to guide eradiation or containment

Project 2a.4 – Impacts: Community and ecosystem impacts of invasive species

Project 2a.5 – Control and management: Support for education and outreach efforts

Project 2a.6 – Coordination & leadership: GLANSIS

Focus 2b. Food-web dynamics

Project 2b.1 – Pelagic systems: Core ecological monitoring of fish and invertebrates

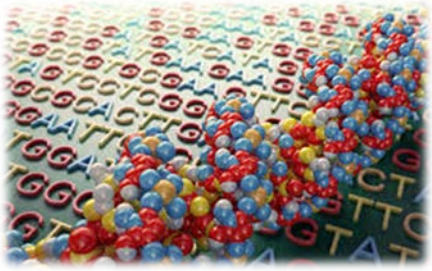
Project 2b.2 – Benthic systems: Monitoring to assess impacts of invasive species

Project 2b.3 – Littoral systems: Ecological assessment of Great Lakes coastal wetlands

Focus 2c. Development of ecological "omics"

Project 2c.1 – Opening the Great Lakes microbial black box using genomics

Project 2c.2 – Using eDNA to monitor rare and threatened vertebrate species



Focus 2d. High risk, potentially transformative projects

Project 2d.1 – Cyberinfrastructure for environmental omics of the Great Lakes

Theme 3. Hydrometeorological and ecosystem forecasting

Modeling physical and biological processes to help predict the Great Lakes future

Focus 3a. Hydrological/hydrodynamic models and forecasts

Project 3a.1 – Hydrological forecasts: Great Lakes in the National Water Model

Project 3a.2 – Water level forecasts: Improving models for shipping and commerce

Project 3a.3 – Coastal currents forecasts: NextGen coastal forecast system

Focus 3b Climate and weather forecasts

Project 3b.1 – Climate forecasts: Regional climate modeling

Project 3b.2 – Weather forecasts: Lake-effect snow

Project 3b.3 – Ice cover forecasts: Improved ice modeling

Focus 3c. Ecosystem state forecasts

Project 3c.1 – Harmful algal bloom forecasts

Project 3c.2 – Hypoxia forecasts: Modeling DO dynamics for public water systems

Project 3c.3 – Land use: Forecasting tipping points in Great Lakes water quality

Project 3c.4 – Fisheries: Improving models for recreational/commercial fisheries

Focus 3d. High risk, potentially transformative projects

Project 3d.1 – Predicting adoption of best management practices

Theme 4. Protection and restoration of resources

Safeguarding habitats, natural capital, and ecosystem services throughout the Great Lakes

Focus 4a. Valuation of ecosystem services

Project 4a.1 – Economic valuation: Quantifying use and non-use values

Project 4a.2 – Non-economic valuation of Great Lakes ecosystem services

Project 4a.3 – Business and enterprise: Adoption by Great Lakes industries

Focus 4b. Habitat protection and restoration

Project 4b.1 – Sanctuaries and Reserves: Mapping socioeconomic values

Project 4b.2 – Sanctuaries and Reserves: Quantifying sociocultural services

Project 4b.3 – Unique habitats: Exploring novel habitats

Project 4b.4 – Areas of Concern: Evaluating the benefits of restoring AOCs

Focus 4c. Social adaption and resilience of coastal communities

Project 4c.1 – Climate adaptation: Enhancing risk communication

Project 4c.2 – Coastal resilience: Scenarios to support resilience to water levels

Project 4c.3 – Coastal management: Local planning for resilient communities

Cooperative Institute for Great Lakes Research

CIGLR

Great Lakes Science for Society

1. Mission & Goals
2. Organization
3. Research themes
4. **Programs**
5. Budget
6. Challenges & Opportunities

Postdoctoral Fellowships. Two fellowships year^{-1} ($48K + 25% fringe) selected from annual call for proposals. Priority given to projects that link NOAA Research Scientists with University Partners

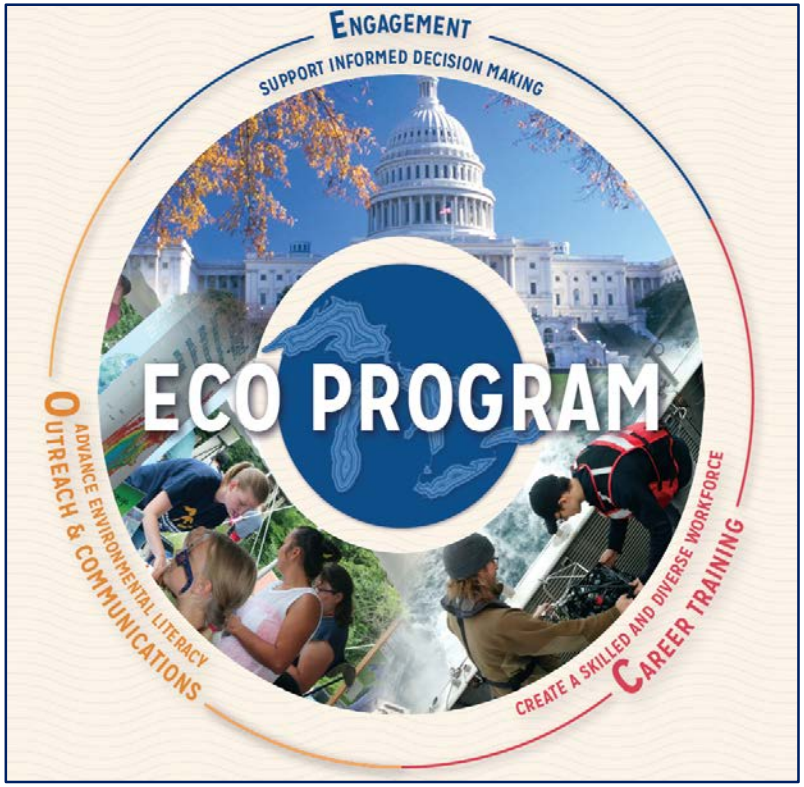
Graduate Fellowships. Two Graduate Research Fellowships per year ($25K) for students at University Partner institutions to collaborate with NOAA scientists.

Summer Fellowship Program. 10-12 fellowships per year for undergraduate and graduate students to work with CIGLR & GLERL PIs on summer projects.

Summits and Working Groups. 3-5 SWGs per year (up to $20K) convene experts from universities, NGOs, government agencies, & businesses to work together on the most pressing research and management needs in the Great Lakes.

Rapid Funding. Up to $10,000 to PIs & students from University Partner institutions who need short-term funds for initial response to an emergency or time-sensitive need (e.g., Flint water crisis, oil or chemical spills, etc.).

Outreach and Education Funding. Up to $2,000 to support undergraduate or graduate students at University Partner institutions who incorporate a public outreach or education component highlighting NOAA into their work.



Engagement. Support informed decision making by advising local, state, & federal policymakers about the importance of Great Lakes' ecosystem services.
Examples: Great Lakes Day, Congressional visits, SWGs

Career training. Promote a diverse, skilled workforce with career training for undergraduates, graduate students, & postdocs who will be the next generation of Great Lakes & NOAA scientists.
Examples: Student fellowships, Doris Duke Program

Outreach & communications. Advance environmental literacy by communicating the value, importance, & utility of NOAA's Great Lakes research to the general public. (Examples: Newsletters, Social Media, Outreach Events)

Cooperative Institute for Great Lakes Research

CIGLR

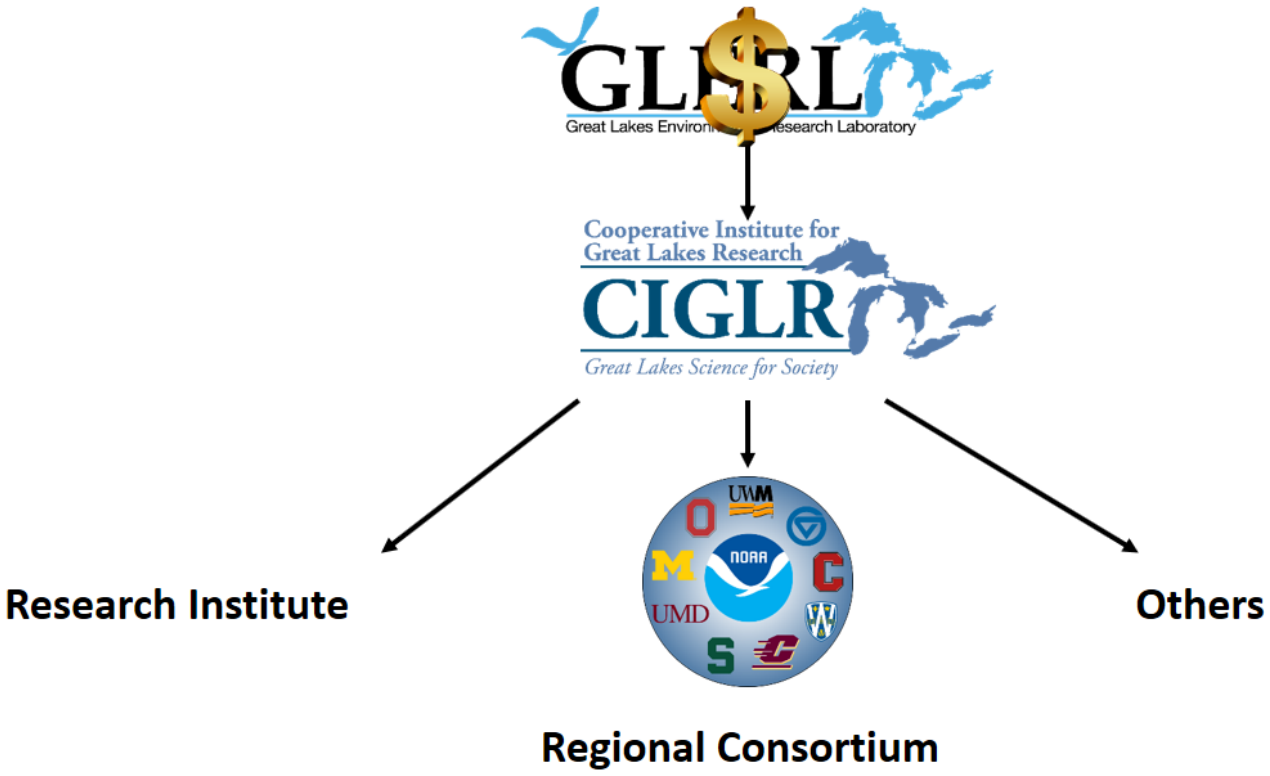
Great Lakes Science for Society

1. Mission & Goals
2. Organization
3. Research themes
4. Programs
5. **Budget**
6. Challenges & Opportunities

Research Institute
- ✓ 5 PIs
- ✓ 17 Research Staff
- ✓ 2 Post Docs
- ✓ Students

Regional Consortium
- ✓ 9 University Partners
- ✓ 148 Natural Scientists
  42 Social Scientists
  36 Engineering & Design

Others
- ✓ University Affiliates (25)
- ✓ All other sub-awardees


GLSRL
Great Lakes Environmental Research Laboratory
Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society
Research Institute
Others
UWM
NOAA
UMD
Regional Consortium

Research Institute

- 26% IDC @ UM
- 6% CIGLR Task I
- 3% CIGLR Task II

Regional Consortium

Others

Research Institute

- 26% IDC @ UM
- 6% CIGLR Task I
- 3% CIGLR Task II

Regional Consortium

- 0% IDC @ UM
- 6% CIGLR Task I
- 3% CIGLR Task II
- 26% IDC @ Partner University

Others

GLERL
Great Lakes Environmental Research Laboratory

Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society

Research Institute
- 26% IDC @ UM
- 6% CIGLR Task I
- 3% CIGLR Task II

Regional Consortium
- 0% IDC @ UM
- 6% CIGLR Task I
- 3% CIGLR Task II
- 26% IDC @ Partner University

Others
- 26% IDC @ UM (1st $25K)
- 6% CIGLR Task I
- 3% CIGLR Task II
- 42-60% IDC @ Recipient

Point 1: CIGLR offers uniformly low cost to NOAA for doing research across all the Great Lakes

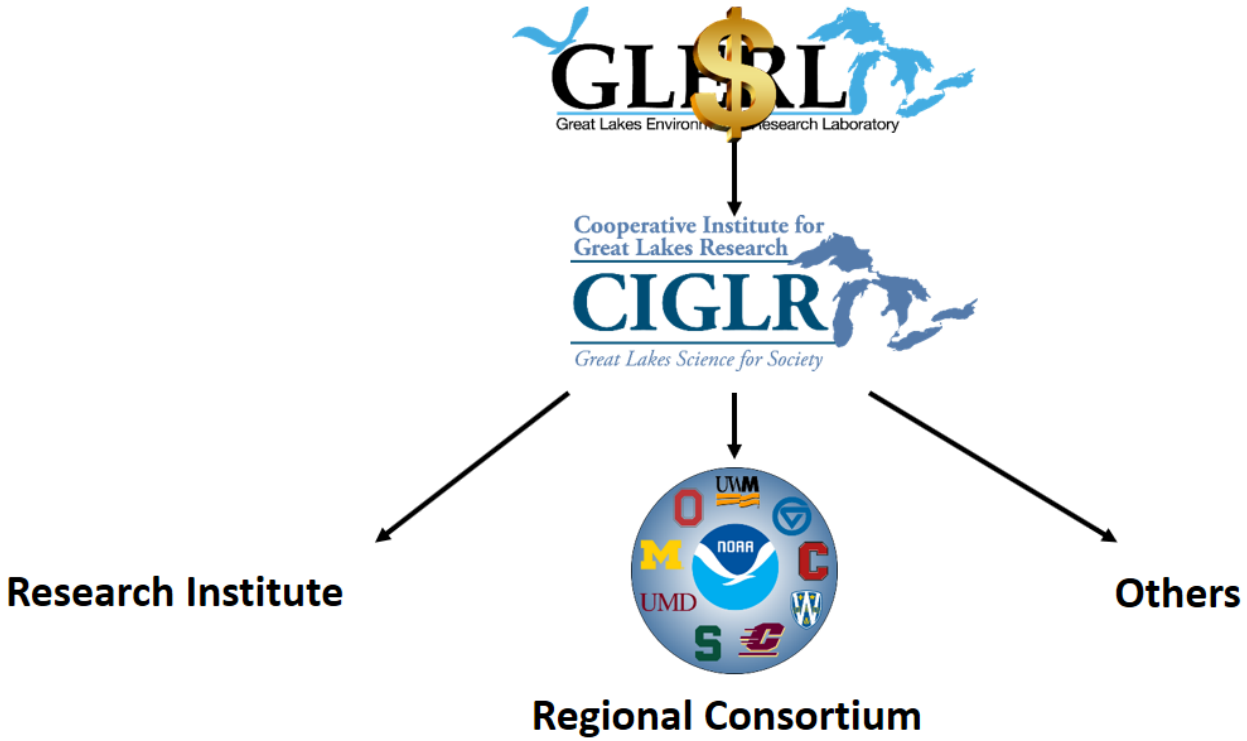
Research Institute
- 26% IDC @ UM
- 6% CIGLR Task I
- 3% CIGLR Task II

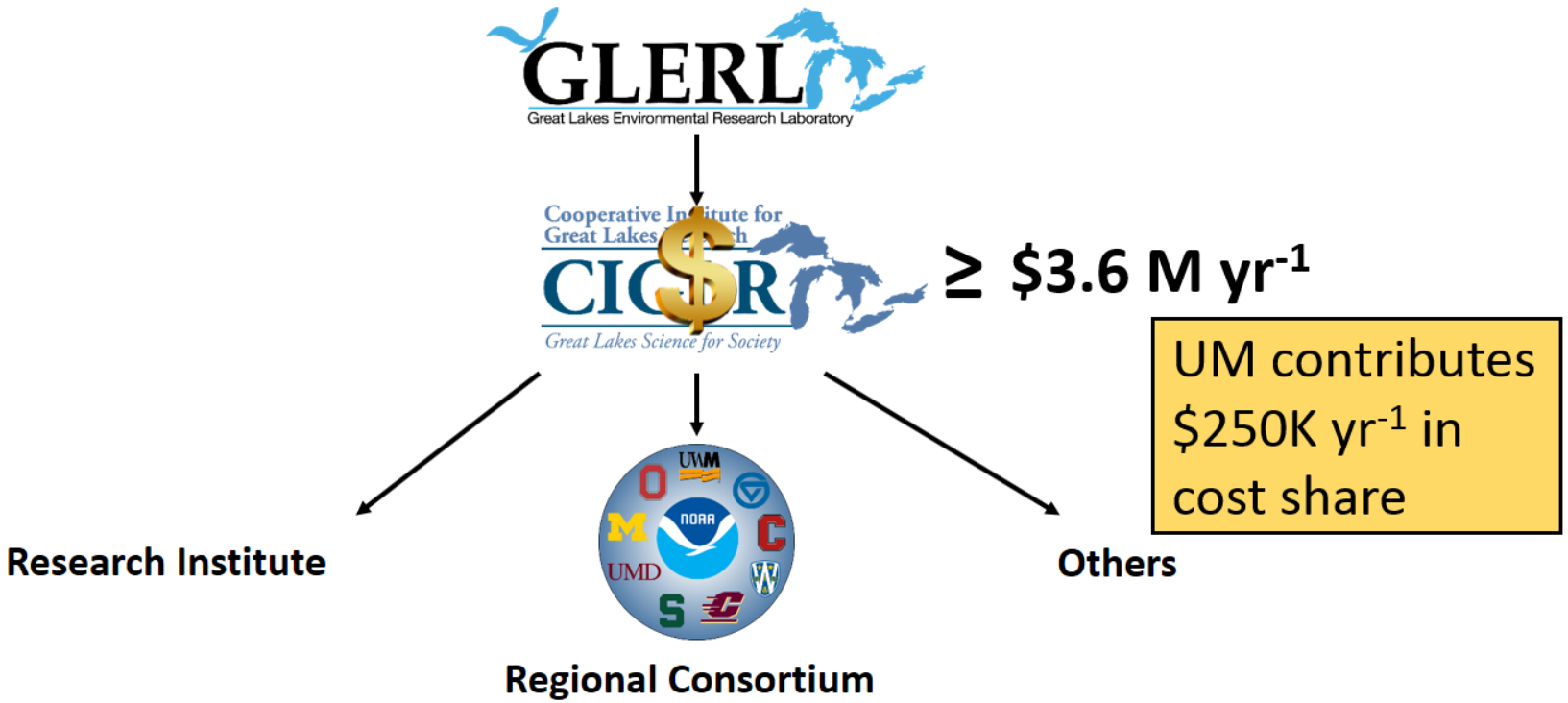
=

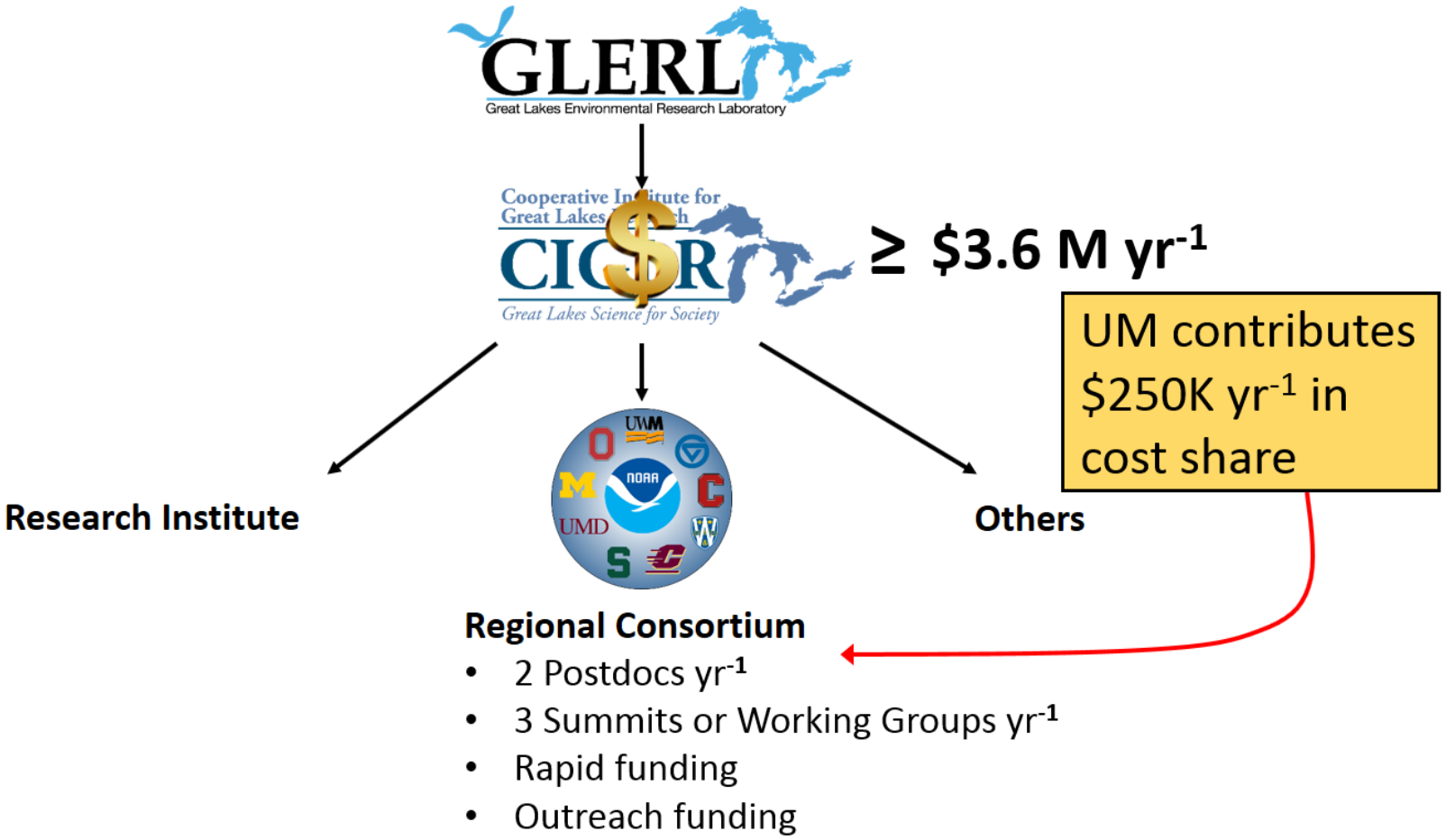
Regional Consortium
- 0% IDC @ UM
- 6% CIGLR Task I
- 3% CIGLR Task II
- 26% IDC @ Partner University

<

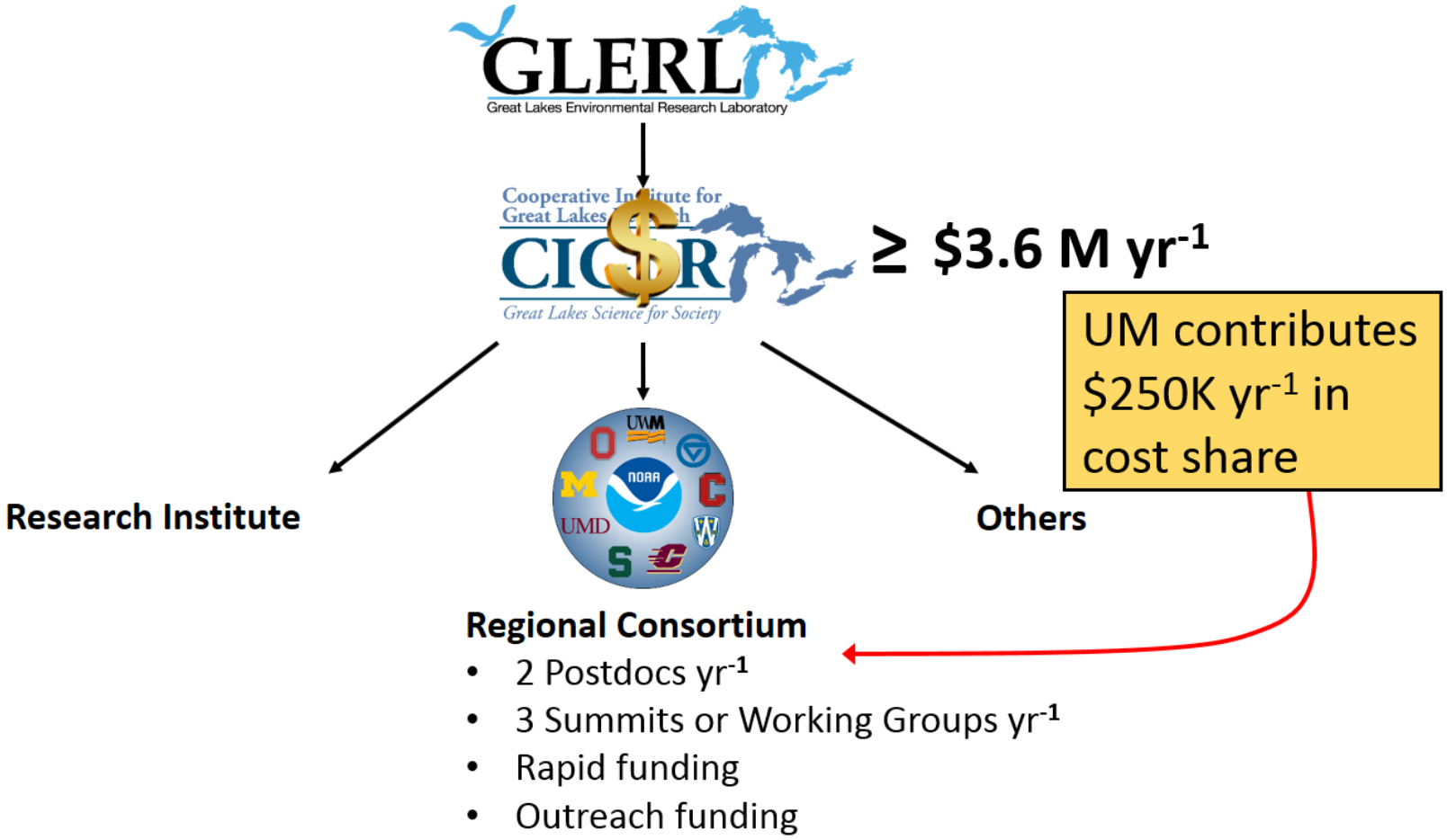
Others
- 26% IDC @ UM (1st $25K)
- 6% CIGLR Task I
- 3% CIGLR Task II
- 42-60% IDC @ Recipient

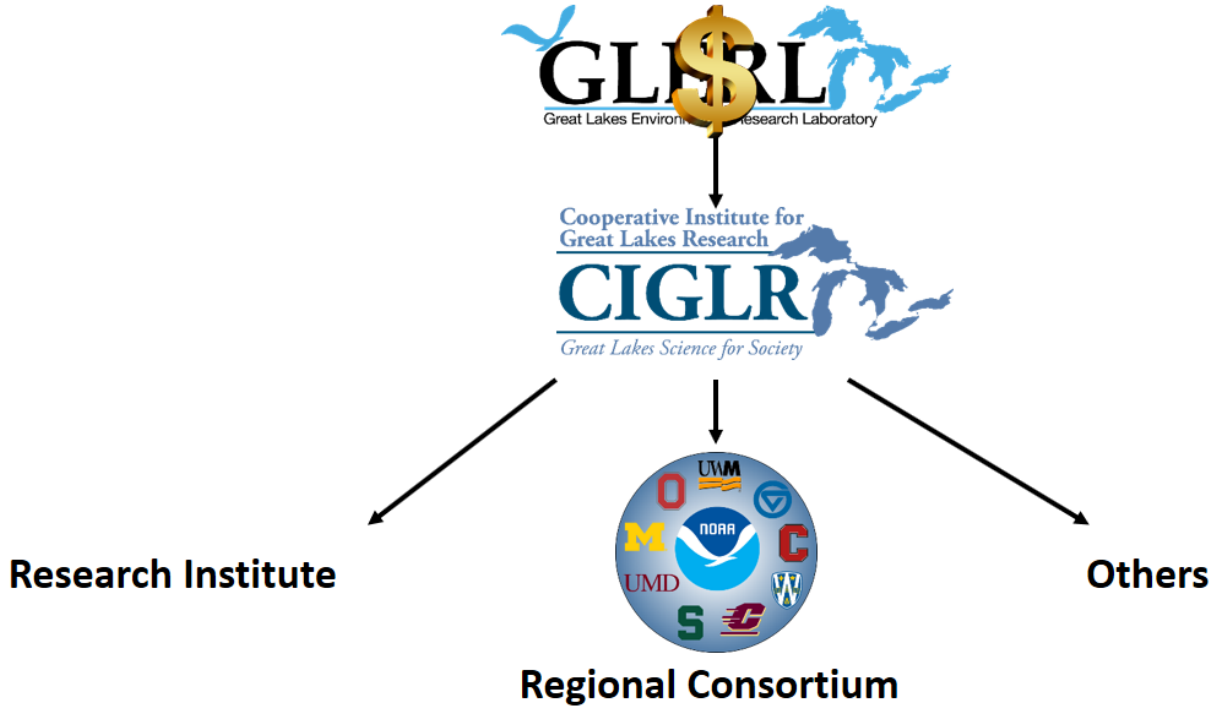

GLERL
Great Lakes Environmental Research Laboratory
Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society
Research Institute
Regional Consortium
Others

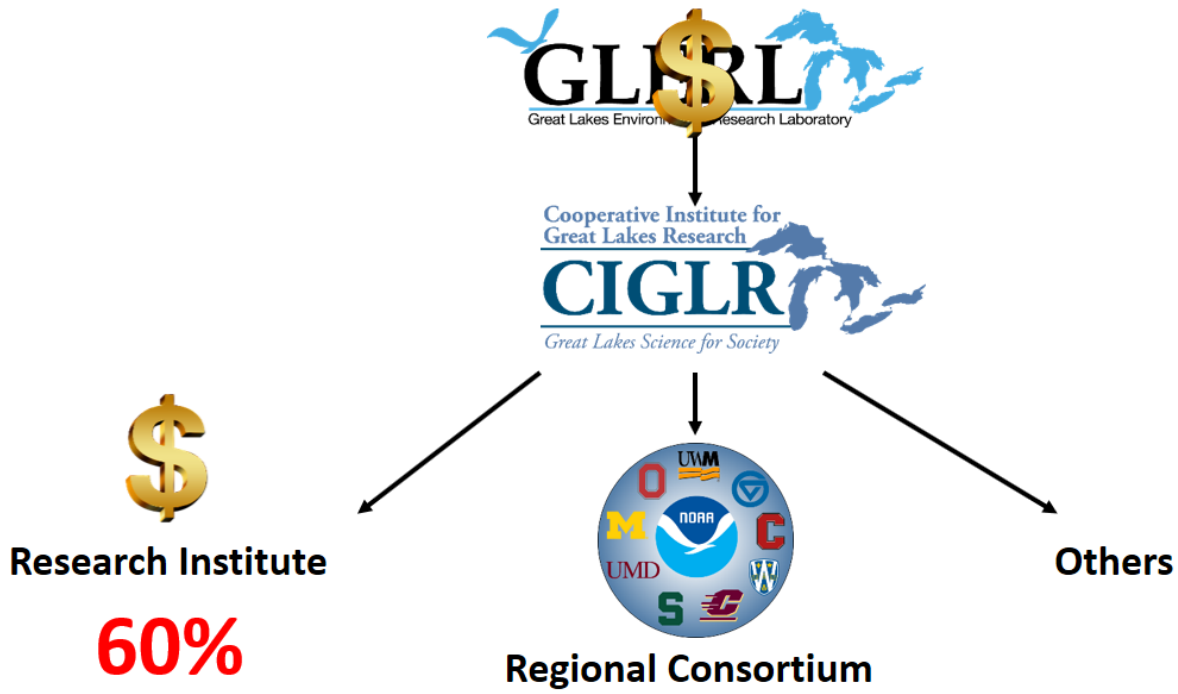

GLERL
Great Lakes Environmental Research Laboratory
Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society
≥ $3.6 M yr-1
UM contributes $250K yr-1 in cost share
Research Institute
Regional Consortium
Others

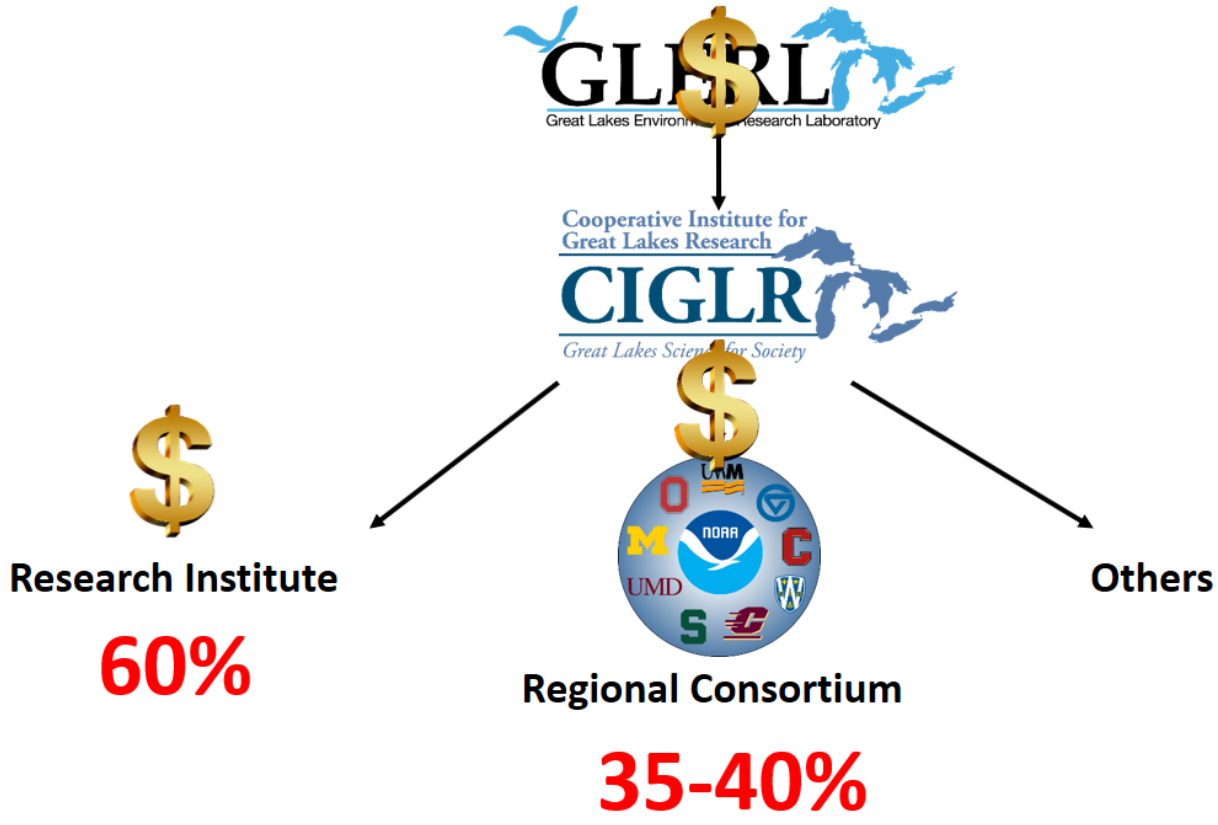

GLERL
Great Lakes Environmental Research Laboratory
Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society
≥ $3.6 M yr-1
UM contributes $250K yr-1 in cost share
Research Institute
Others
Regional Consortium
• 2 Postdocs yr-1
• 3 Summits or Working Groups yr-1
• Rapid funding
• Outreach funding

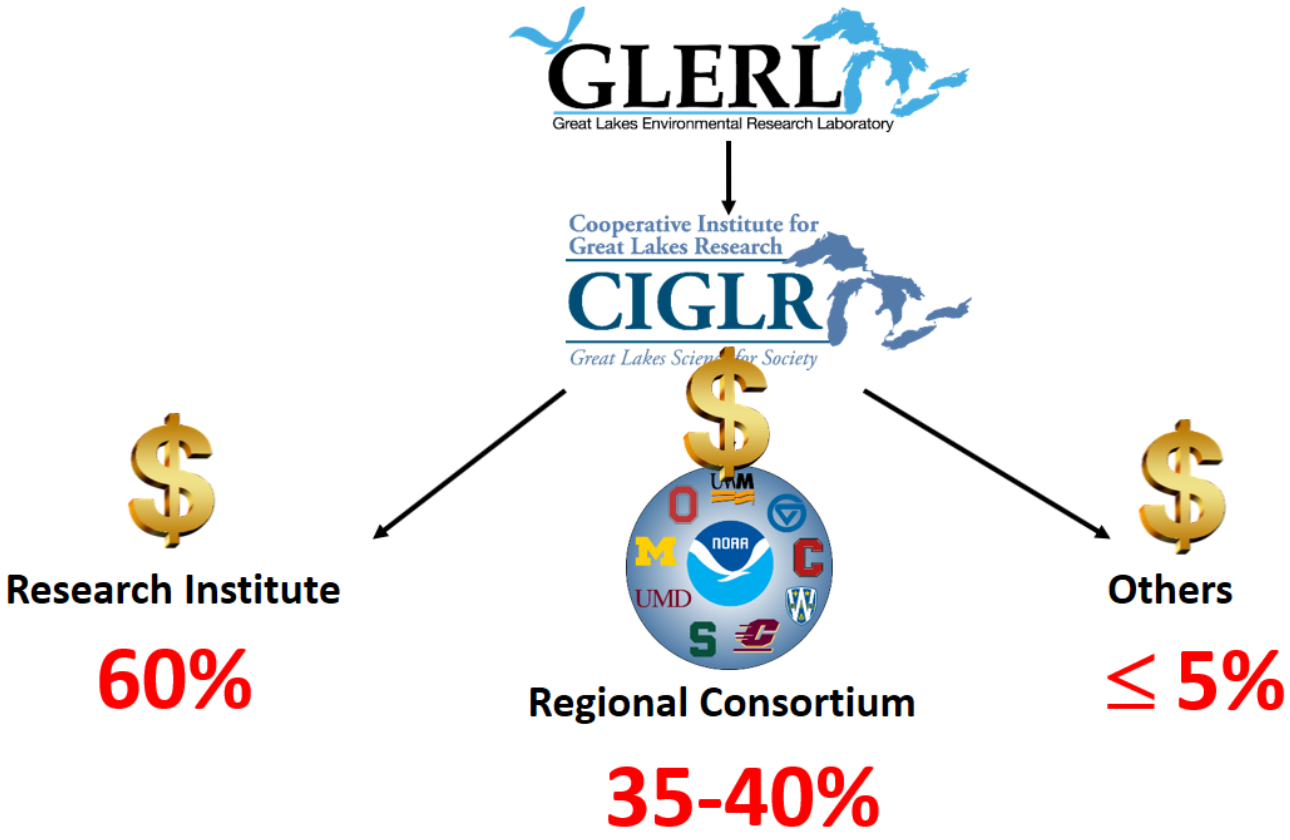
Point 2: Stable funding ensures UM support for programs



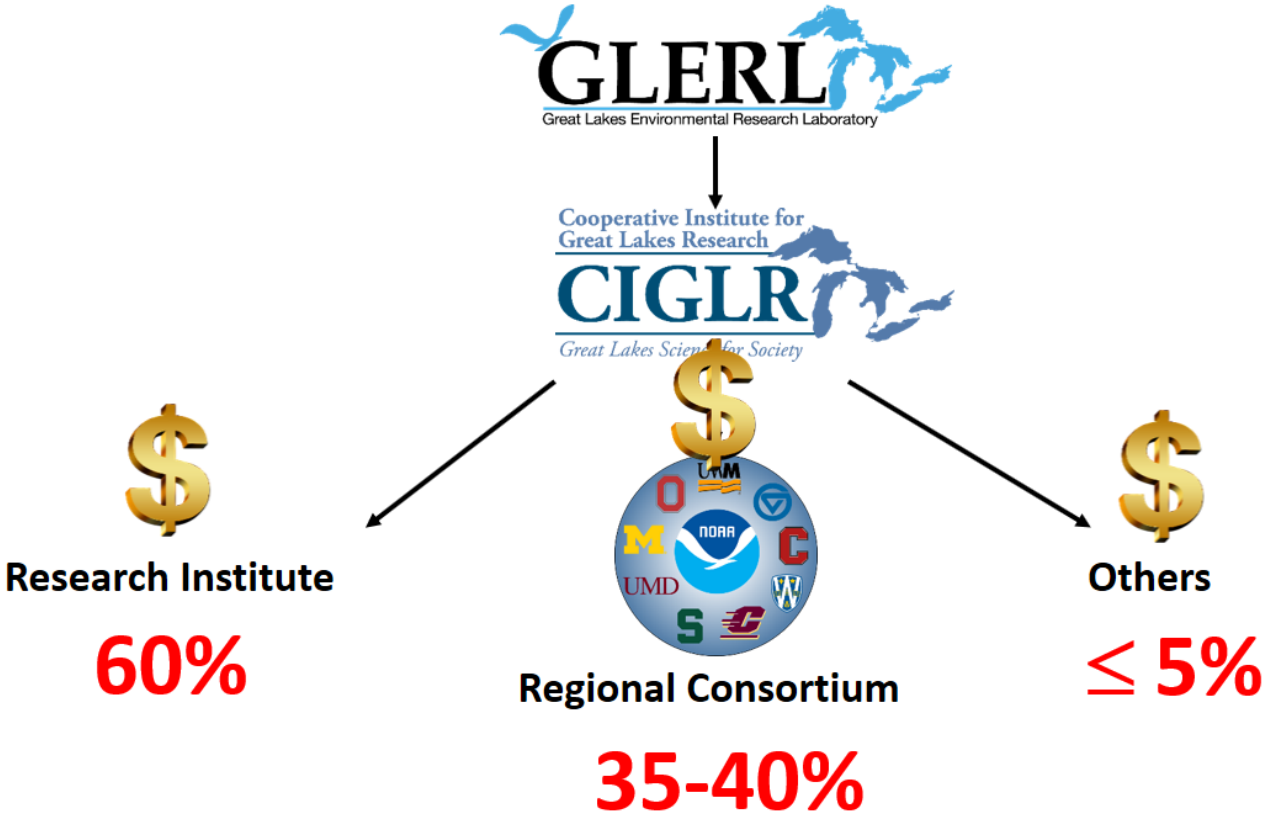

GLSRL
Great Lakes Environmental Research Laboratory
Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society
Research Institute
UWM
NOAA
UMD
Others
Regional Consortium


GLSRL
Great Lakes Environmental Research Laboratory
Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society
Research Institute
60%
Regional Consortium
Others


GLERL
Great Lakes Environmental Research Laboratory
Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society
Research Institute
60%
Regional Consortium
35-40%
Others
UMD
NOAA


GLERL
Great Lakes Environmental Research Laboratory
Cooperative Institute for
Great Lakes Research
CIGLR
Great Lakes Scien for Society
UMM
NOAA
UMD
Research Institute
60%
Regional Consortium
35-40%
Others
≤ 5%

Point 3: Funding distribution maintains functions of Research Institute AND fosters benefits of partnership



Cooperative Institute for Great Lakes Research

CIGLR

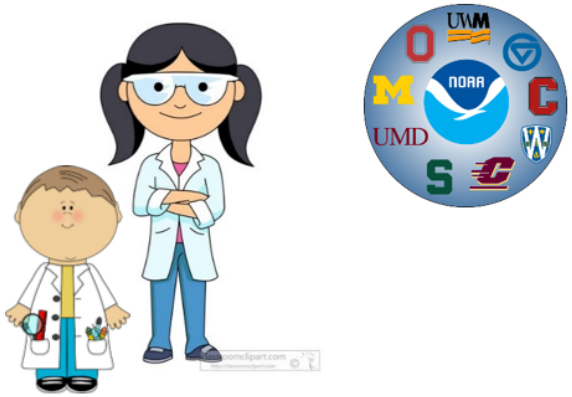
Great Lakes Science for Society

1. Mission & Goals
2. Organization
3. Research themes
4. Programs
5. Budget
6. **Challenges & Opportunities**

Making partnerships work …

Making partnerships work …

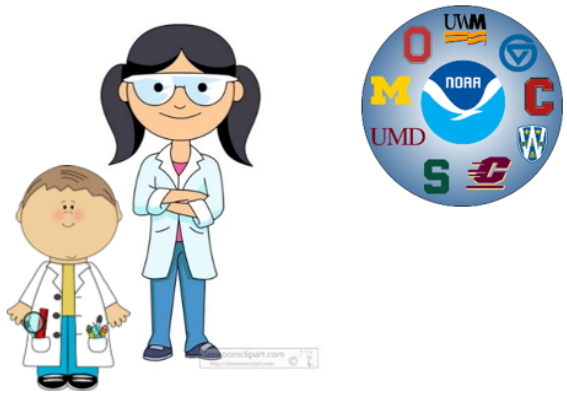
Making partnerships work …



Benefits of not partnering

- Control
- Efficiency
- Communication & interaction

Making partnerships work …



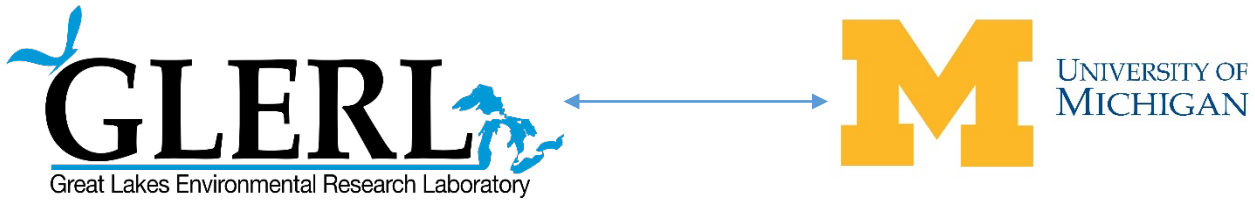
Benefits of not partnering

- Control
- Efficiency
- Communication & interaction

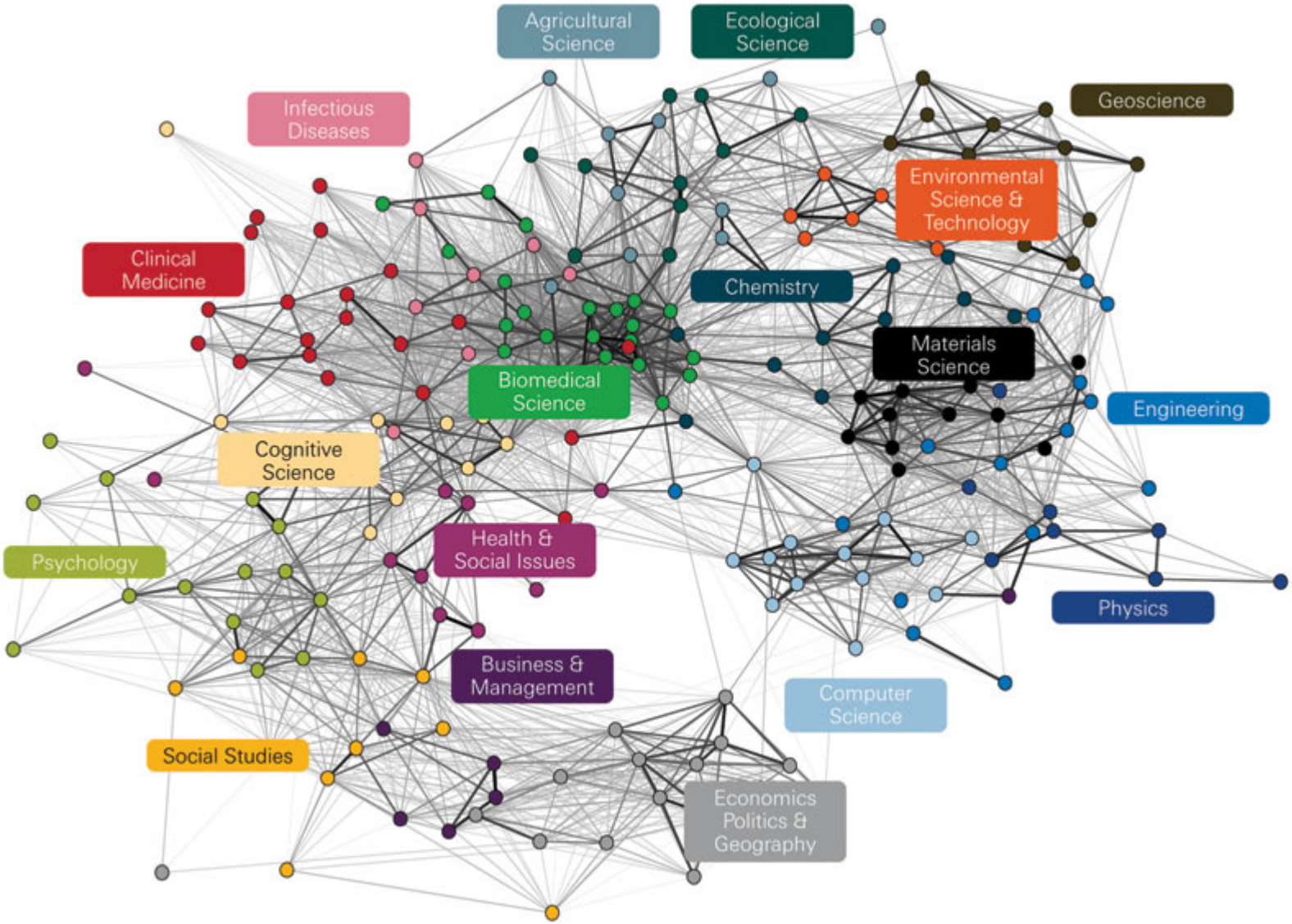
Benefits of partnering

- Additional resources
- Expertise
- ↑ Productivity and impact

Connecting with UM …



Achieving inter-disciplinarity …



Sustainability and diversity of funding …


Cooperative Institute for
Great Lakes Research
CIGLR
Great Lakes Science for Society