

ANNUAL REPORT

July 1, 2021 – June 30, 2022

Great Lakes Research Center

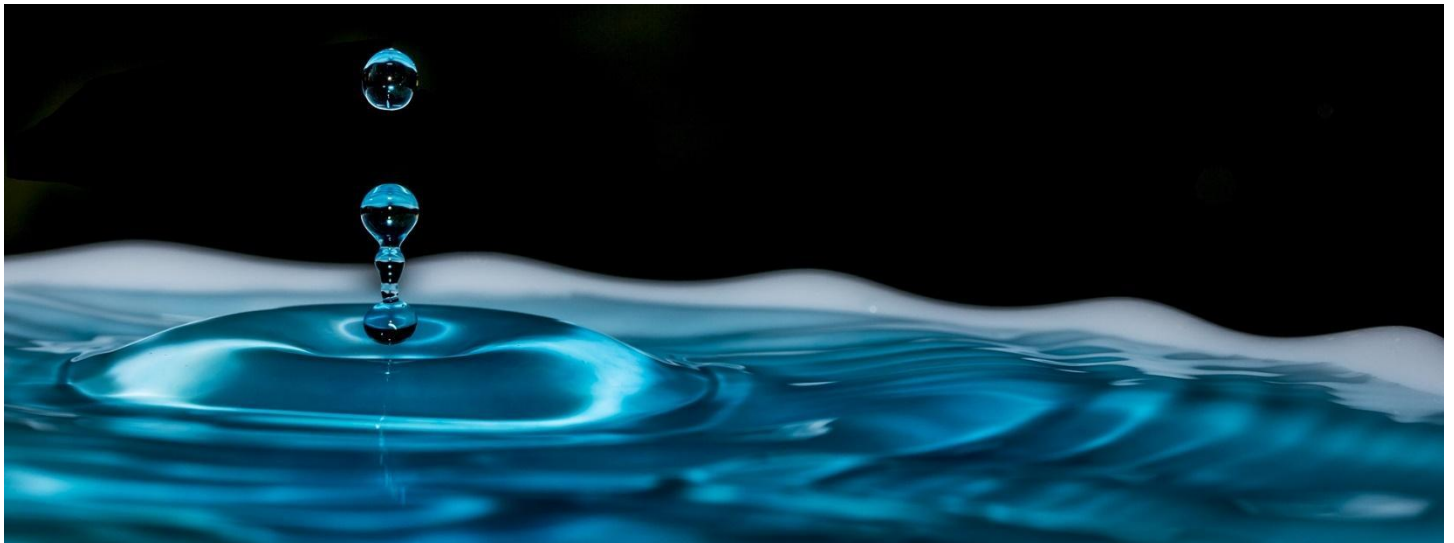


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Michigan Technological University

FY22 Budget Summary

The Great Lakes Research Center (GLRC) Institute’s budget summary for July 1, 2021 – June 30, 2022 (FY22) reflects lower than anticipated payroll and other expenditures, and higher than forecasted IRAD revenue. Lower personnel costs are a result of hiring delays and staff ability to direct charge salary and wages to other sources including sponsored research, teaching, and University service.

REVENUE	BUDGET	ACTUAL	PERCENTAGE
FY21 Carry Forward		\$ 48,699	100%
VPR Strategic Initiative Funding	\$ 138,592	\$ 99,441	77%
FY22 IRAD	\$ 590,570	\$ 628,868	106%

EXPENDITURES	BUDGETED	ACTUAL	PERCENTAGE
Personnel	\$ 512,857	\$ 347,771	73%
Other	\$ 265,004	\$ 183,643	69%

The Department’s budget summary for July 1, 2021 – June 30, 2022 (FY22) also reflects lower than anticipated payroll and other expenditures, and slightly higher than forecasted IRAD revenue.

REVENUE	BUDGET	ACTUAL	PERCENTAGE
FY21 Carry Forward		\$ 42,935	100%
FY22 IRAD	\$ 64,360	\$ 64,835	101%

EXPENDITURES	BUDGETED	ACTUAL	PERCENTAGE
Personnel	\$ 104,236	\$ 84,066	81%
Other	\$ 3,058	\$ 1,131	37%

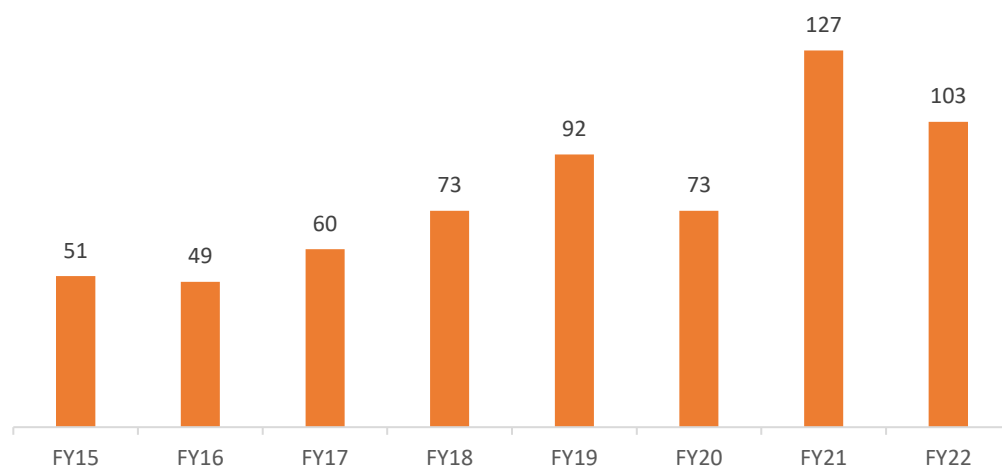
FY22 Research Highlights

Proposals. GLRC affiliated researchers submitted 103 proposals in FY22—a decrease of 24 from the previous reporting period, an all-time high—with cumulative budget requests exceeding \$55.6M (all-time high). Fifteen proposals included requests greater than \$1M (up eight from the previous reporting period). Principal Investigators who lead proposal requests greater than \$1M include Chelsea Schelly (SS); Tim Havens (CS); Stephen Technmann (BIO); Trista Vick-Majors (BIO); Audra Morse (CEGE); Thomas Oommen (GMES); Pengfei Xue (CEGE); Erika Vye (GLRC); Judith Perlinger (CEGE); and, Amy Marcarelli (BIO).

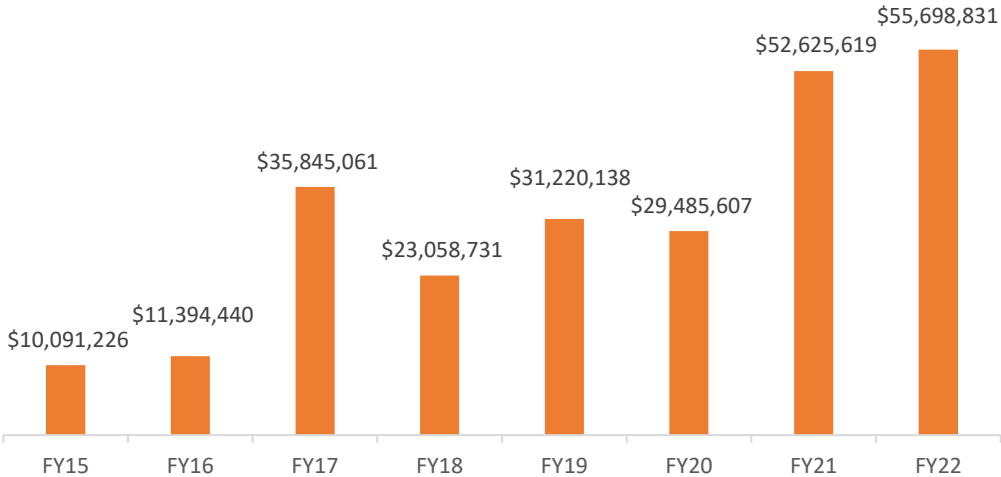
Awards. GLRC affiliated researchers were awarded 77 grants and contracts in FY22, an increase of 8 over any other previous reporting period. The cumulative value of the FY22 awarded grants and contracts exceeded \$9.2M with an average value of \$120,000, both all-time highs. This included one incrementally funded award greater than \$1M led by Dr. Stephen Techtmann (BIO) and a \$999K award led by Thomas Oommen (GMES). During FY22, 61 faculty and staff from 15 units were engaged in active externally sponsored research affiliated with the GLRC.

Active Projects and Research Expenditures. At the close of FY22 Q4, there were 111 active research indexes affiliated with the GLRC, \$7.1M in research expenditures, and \$628,868 in IRAD returns supporting the GLRC’s financial sustainability and strategic growth. Proposal, award, active project, research expenditures, and IRAD return trends for FY15-FY22 (actual) are charted on pages 3-6. A listing of proposals submitted and awards received during FY22 is included in this report on pages 14-29.

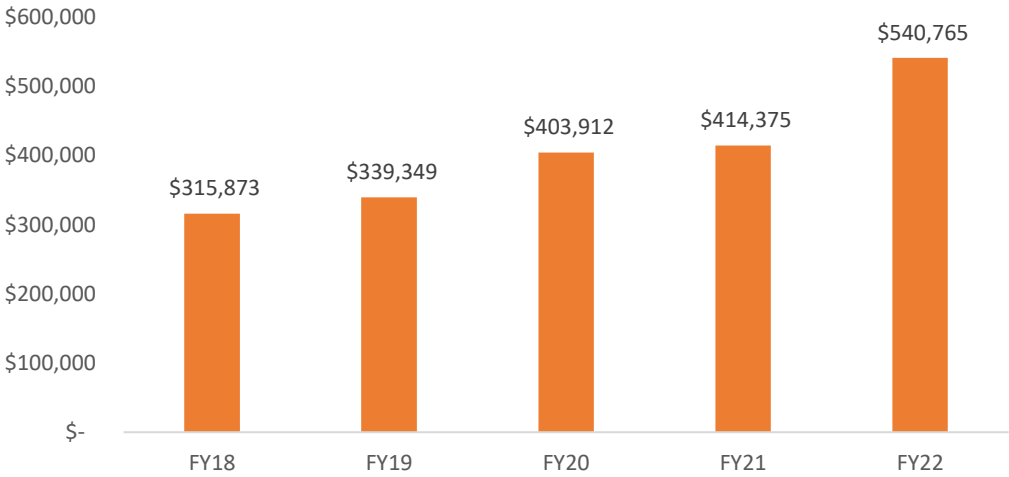
Number of Proposals by Fiscal Year



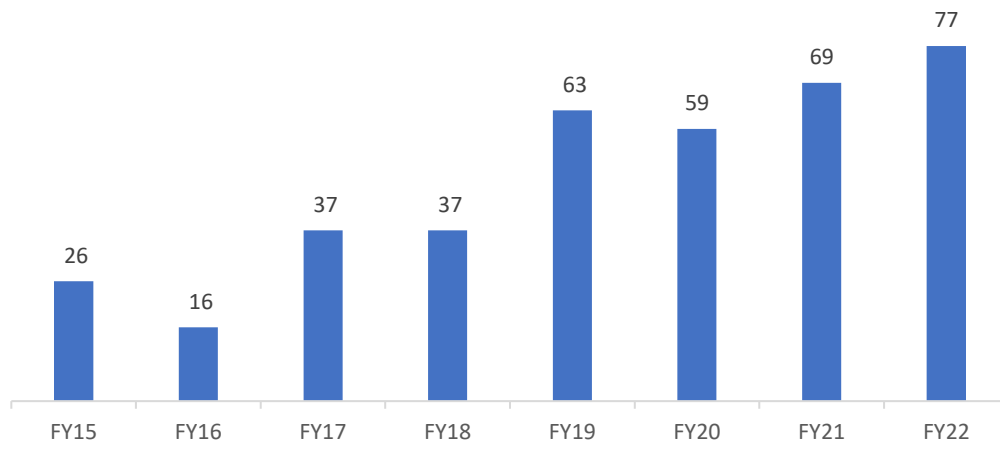
Proposal \$ Requested by Fiscal Year



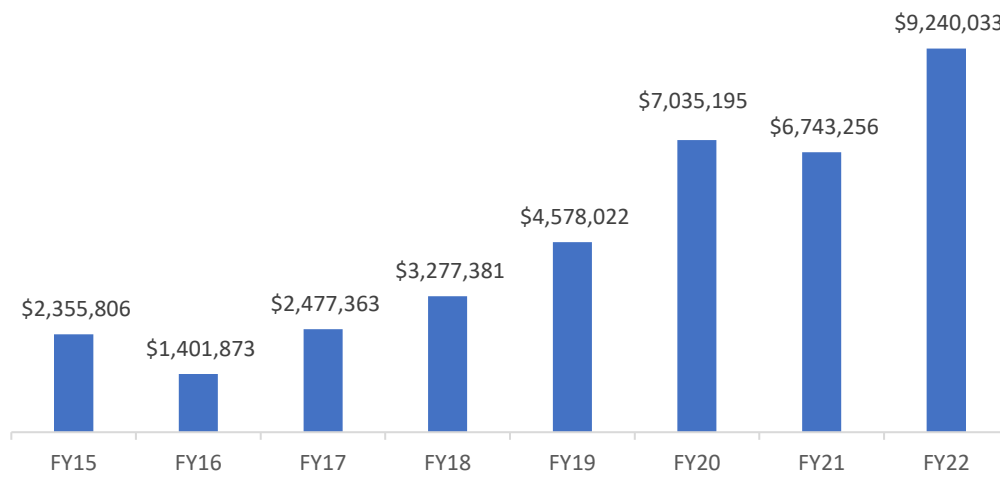
Five-year Average Proposal \$ Request



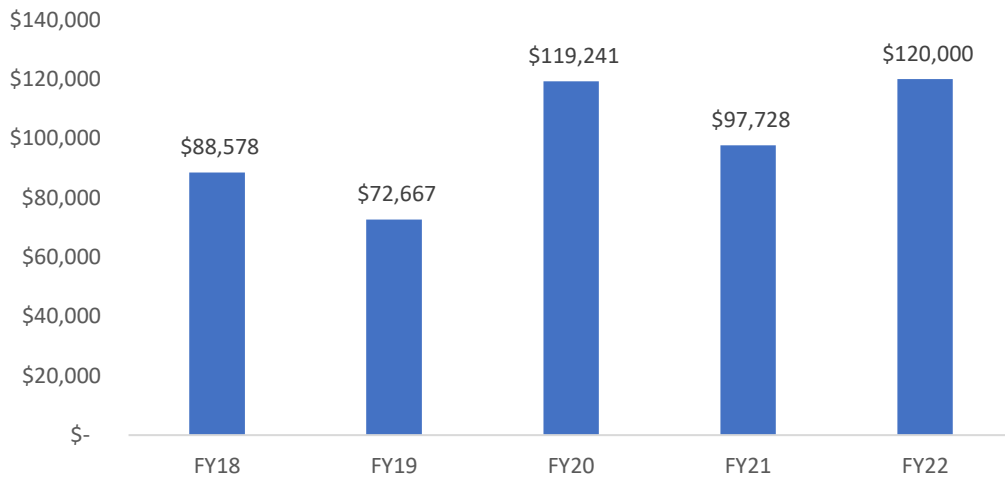
Number of Awards by Fiscal Year



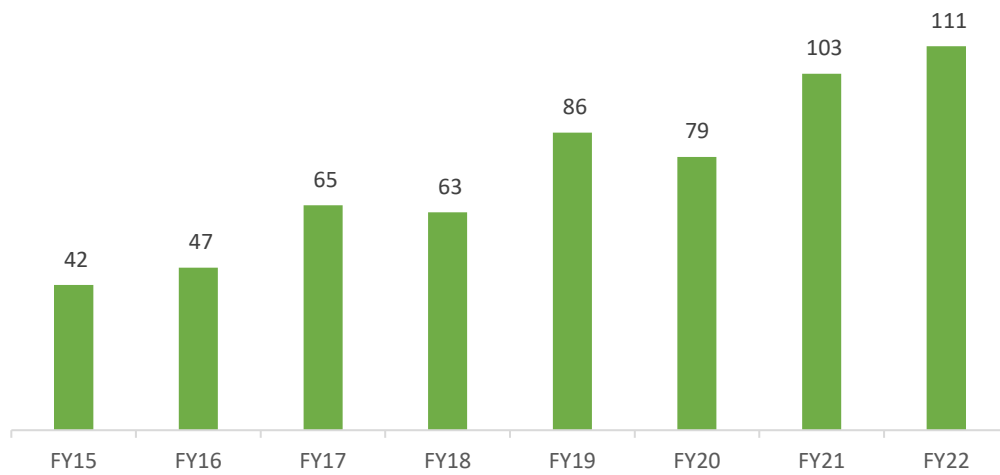
Award \$ by Fiscal Year



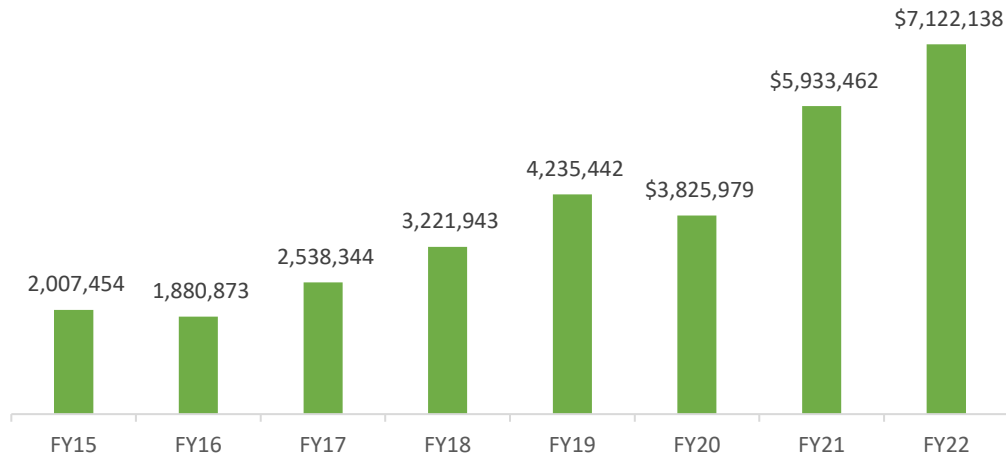
Five-year Average Award \$



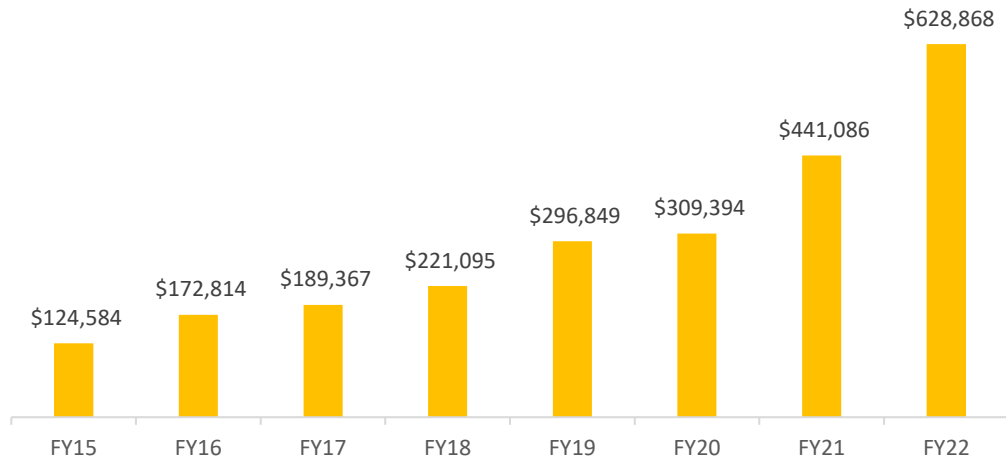
Number of Projects by Fiscal Year



Expenditure \$ by Fiscal Year



Center/Institute IRAD Returns by Fiscal Year



FY22 Staffing Highlights

In FY22, the GLRC hired five additional staff to support a growing research portfolio and offer more services to researchers. Hires included Dr. Daniel Trepal, PhD, as a senior geospatial researcher; Mr. Steven Senczysyn, MS, as a research engineer in the area of underwater acoustics, autonomous vehicles, and image and signal processing; Mr. Hayden Henderson, MS, as relief captain and a research engineer in the areas of limnology and physical oceanography, and surface and underwater autonomous and remotely operated marine platforms and integrated technology; Mr. Bob Cowling as a GIS data librarian; and Dr. Rachel Rulison as an administrative coordinator. The GLRC's payroll roster included 35 administrative and research staff, and hourly students during the spring semester of FY22.

FY22 Programming Highlights

Partnerships and Memberships

- The GLRC continued to support the establishment of a National Marine Sanctuary in the Keweenaw Peninsula. The Keweenaw Lake Superior National Marine Sanctuary (NOAA) nomination document is in progress. This activity is being led by Dr. Erika Vye (GLRC).
- Michigan Tech and the Great Lakes Research Center are the Houghton Hub of the Lake Superior Living Labs Network (LSLLN). LSLLN is a collaborative network fostering interdisciplinary and place-based research, learning and community engagement. The LSLLN partnership is being led by Dr. Erika Vye (GLRC).
- The GLRC was engaged in the management of the Great Lakes Evaporation Network (GLEN) with colleagues at the Environment and Climate Change Canada and CU-Boulder, as well as a collaborative project with Northern Michigan University to support and maintain the GLEN monitoring site at Granite Island (near Marquette). GLEN collaboration is being led by Dr. John Lenters (GLRC).
- The GLRC continued its membership in the Undersea Technology Innovation Consortium (UTIC), which provides opportunities for researchers to propose on limited Navy Other Transactional Authority (OTA) projects through the Naval Undersea Warfare Center at Newport. The UTIC partnership is being coordinated by Erik Kocher (GLRC).
- The GLRC supported Michigan Tech's memberships in the National Marine Association of Laboratories (NAML), the University-National Oceanographic Laboratory System (UNOLS), and the Marine Technological Society (MTS). These memberships provide opportunities to promote Michigan Tech's capabilities, identify collaboration and networking possibilities, obtain information on efforts to increase federal funding for Great Lakes and coastal ocean research, and expand the sphere of influence of the GLRC staff by assuming influential and leadership roles within these organizations.
- The GLRC established a MOU with Michigan State University in FY19 to house a Michigan Sea Grant Extension (MSGEx) educator in the Western Upper Peninsula. Dr. Lauren Jescovitch (MSU) was hired and located in Houghton, MI at the GLRC to help advance the MSU Extension and MSGEx missions in the region and to facilitate greater collaboration and partnership across programs and organizations. In Q1 of FY22 a three-year renewal was executed.

Strategic Activities

- The GLRC administrative team began streamlining the proposal development process, creating a repository for facilities and equipment descriptions, a style guide for proposal development, and revised proposal development dashboard and timeline templates. These tools will allow the GLRC admin team to more efficiently support a growing demand for proposal development support.
- An initiative to update the GLRC Strategic Plan is underway. The initial step was to provide a State of the GLRC Update for Deans, Department Chairs, and University Leadership. Afterwards, a kickoff meeting was held with GLRC affiliated faculty and staff to review the original strategic plan, share the current state of the GLRC, and to solicit volunteers to assist with the initiative. Thirty-three volunteers provided input via focus group discussion and planning exercises. The focus group data has been consolidated and is being reviewed by GLRC leadership in preparation for a report-out on next steps in FY23.
- In FY22, the Great Lakes Research Center saw growth in its maritime mobility testing portfolio with numerous projects being awarded via the Michigan Mobility Funding Platform, Office of Future Mobility and Electrification, and Department of Environment, Great Lakes & Energy. Each of these projects addresses the State of Michigan's priorities to address climate, energy, and mobility challenges in the Great Lakes region through innovative maritime solutions.
 - a. The Great Lakes Research Center received an \$8,000 grant to provide maritime stakeholders with data insights for better, faster shipping. This project installed equipment from DockTech on the Research Vessel Agassiz to collect sonar and GPS data that will be used to enhance safe navigation of the Marine Autonomous Research Site (MARS). This data will also contain historical data such as shipwrecks for other researchers and the public.
 - b. The Great Lakes Research Center received a \$99,997 grant from EGLE through the Michigan Great Lakes Protection Fund to help advance the region as a hub for the maritime industry by continuing to develop and grow the Smart Ships Coalition. This grant has allowed the GLRC to engage stakeholders to increase action in areas of research, business development, workforce preparation, and development of standards for design and testing of maritime autonomous systems.
 - c. Great Lakes Research Center received a \$100,000 grant to explore clean electrification of ferries traveling to and from Mackinac Island in partnership with Mackinac Economic Alliance. Michigan Technological University's GLRC designed a testing regime to determine hydrological energy flow, direction, and generating capabilities from hydrokinetic turbines in the historic river depths of the Straits of Mackinac. Michigan Technological University analyzed the energy requirements of the ferries and recommended the technology best suited to generate and store electricity for new or retrofitted ferries in the Straits and various vessel types within the Great Lakes.
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- The GLRC received \$17,143 from Michigan Tech’s Tech Forward Initiative to continue development of an autonomous surface vehicle. Funding support include travel costs to demonstrate the autonomous jet ski at a freshwater oil response exercise in Rogers City, Michigan, coordinated by the USCG.
- Memorandums of Understanding (MOUs) were established with ESC (Director Marcarelli PI); with the Ecosystem Restoration Hub (joint initiatives with ESC); and a formal collaboration with ICC was established that provides additional IRAD return to support joint initiatives and ICC growth.

Outreach

- The GLRC sponsored the 2022 Joint Aquatic Science Meeting, May 15-20, in Grand Rapids, MI. Twenty faculty, staff, and students from Michigan tech participated in-person and virtually. The GLRC sponsored an exhibit booth and provided attendees with logo polo shirts. Contact information was collected at the booth (+260 names and contact info) for use in future GLRC email updates and social media outreach.
- The GLRC participated in the May 17, 2022 visit by a delegation from Finland. Delegates toured the facility and attended a presentation on the GLRC’s efforts with the Smart Ships Coalition.
- GLRC hosted the first Cyber Boat Challenge at Michigan Tech, May 23-26, in partnership with the State of Michigan.
- In collaboration with Keweenaw Bay Indian Community, Michigan Tech hosted the Great Lakes Encounter Symposium. Elizabeth Hoy (GLRC), Tim Havens (GLRC/CS), and Roman Sidortsov (SS) served as the local host committee.
- GLRC staff and members supported the 2022 World Water Day and Tribal Water Day events promoting and hosting virtual presentations.

Facility

- Administrative storage space was created in GLRC 106.
- The GLRC supported the installation of a Cold Room in laboratory 103.
- Building WiFi was updated and coverage expanded to eliminate gaps in connectivity.

Student Research Grants

Ten students were awarded GLRC Student Research Grants in FY22, for a total of \$7,127 in funding. Six of the students worked on research that contributed to \$853,678 in funded research awards and \$1,184,426 in pending proposal submissions.

1. Manas Warke, a PhD student in the Biological Sciences department, advised by Rupali Datta (BIO), was awarded \$729. His research contributed to a proposal submitted to the Department of Housing and Urban Development for a Lead Technical Studies grant, entitled “Lowering the Bioavailability in Residential Soils of Variable Physico-Chemical Properties using Sustainable In-Situ Treatment Methods”, which was awarded \$699,916 in funding.
2. Jacob Chizek, a BS student in the Mechanical Engineering–Engineering Mechanics department, advised by Ana Dyreson (MEEM) and Timothy Scarlett (SS), was awarded \$750 in funding. His

research contributed to a proposal submitted to NSF's NNA STAR program, entitled "Collaborative Research: NNA Incubator: Sustainable Transitions through Arctic Redevelopment (STAR)", and was awarded \$79,998 in funding.

3. John McCall, a MS student in the Biological Sciences department, advised by Gordon Paterson (BIO), was awarded \$750. His research contributed to a proposal submitted to the Great Lakes Fishery Commission, entitled "An Epigenetic Assessment of Stamp Sand Toxicity to Salmonid Eggs from Buffalo Reef, Lake Superior", and was awarded \$73,764 in funding.
4. Laura Schaerer, a PhD student in the Biological Sciences department, advised by Stephen Techtmann (BIO), was awarded \$750. Her research contributed to a pending proposal submitted to NSF's Building Synthetic Communities program, entitled "Collaborative Research: Synthetic microbial consortia for plastic valorization: Model systems for studying the rules of community engineering", with a potential of \$794,426 in funding.
5. Michelle Kelly, a PhD student in the Biological Sciences department, advised by Amy Marcarelli (BIO), was awarded \$750. Her research is contributing to an NSF MSB-NES proposal that will be submitted in early November with a potential budget of \$300,000.
6. Tessa Tormoen, a BS student in the Biological Sciences department, advised by Jill Olin (BIO) and Kristin Brzeski (CFRES), was awarded \$750. Her research is contributing to a proposal that will be submitted to the Mid-Atlantic Fisheries Management Council, in early November, with a potential budget of \$90,000.
7. Theresa Passe, a BS student in the Civil, Environmental, and Geospatial Engineering department, advised by Jennifer Becker (CEGE), was awarded \$748.
8. Zachary Hough Solomon, a MS student in the Social Sciences department, advised by Nancy Langston (SS), was awarded \$750.
9. Gary Swain, a MS student in the Biological Sciences department, advised by Charles Kerfoot (BIO), was awarded \$400.
10. Benjamin Reuss, a MS student in the Civil, Environmental, and Geospatial Engineering department, advised by Cory McDonald (CEGE), was awarded \$750.

Clarke and Nancy Borgeson Endowed Research Grant

The GLRC awarded the first Borgeson Endowment Student Research Grant to Samantha Kurkowski, a MS student in the College of Forest Resources and Environmental Science department, advised by Rodney Chimner. Samantha's proposal was titled, "Mapping, Identification, and Conservation of Vernal Pool Characteristics Across National Parks in the Great Lakes Region". Samantha was awarded \$1,967 to collect data about vernal pools on Isle Royale in May 2022. This research advanced vernal pool ecology and conservation research.

Student Travel Grants

1. Tim Stone (adviser Don Lafreniere, SS)
2. Shardul Tiwari (advisor Chelsea Schelly, SS)
3. Carleigh Leonard (advisor John Lenter, GLRC)
4. Arita Chakrabarty (advisor Richelle Winkler, SS)
5. Julia Peterson (advisors Nancy Langston and Richelle Winkler, SS)
6. Dalton Norris (advisor Gord Paterson, BIO)
7. Michelle Kelly (advisor Amy Marcarelli, BIO)
8. Maci Quintanilla (advisor Trista Vick-Majors, BIO)

9. Vanessa Cubillios (advisor Trista Vick majors, BIO)
10. Aradea Hakim (advisor Pengfei Xue, CEGE)
11. Ben Reuss (advisor Cory McDonald, CEGE)

Member Funding Support

1. Melanie Kueber Watkins (CEGE) - \$2,000 support for equipment acquisition
2. Trista Vick-Majors (BIO) - \$6,500 support for Cold Room installation
3. Thomas Oommen (GMES) - \$6,569 for acquisition of two HPC workstations
4. Gordon Parker (MEEM) – \$3,490 hourly student support
5. Charlie Kerfoot (BIO) - \$1,500 hourly student support
6. Pengfei Xue (CEGE) – \$3,200 Machine Learning Course at MIT

FY22 Performance by Division

The following table summarizes the GLRC Institute's overall performance in FY22. The table reports the percentage of the total value of proposals, award, space, and IRAD generated by unit, for the reporting period. Individual unit detail is available to unit leadership upon request.

COLLEGE OF SCIENCES & ARTS				
Department/Organization	% SPACE	% IRAD	% PROPOSALS	% AWARDS
Biological Sciences	38.5%	13.2%	53.3%	42.1%
Chemistry	3.4%	0.2%	-	-
Social Sciences	0.4%	4.4%	5.9%	4.2%
Cognitive & Learning Sciences	-	0.4%	-	-

COLLEGE OF COMPUTING				
Department/Organization	% SPACE	% IRAD	% PROPOSALS	% AWARDS
College of Computing	6.3%	0.4%	6.1%	0.8%
Computer Science	-	0.7%	-	-
Applied Computing	-	0.0%	-	-

COLLEGE OF FOREST RESOURCES & ENVIRONMENTAL SCIENCE				
Department/Organization	% SPACE	% IRAD	% PROPOSALS	% AWARDS
College of Forest Resources & Environ. Sci.	-	2.8%	-	0.5%

COLLEGE OF ENGINEERING				
Department/Organization	% SPACE	% IRAD	% PROPOSALS	% AWARDS
Civil, Environmental, & Geospatial Eng.	20.6%	17.7%	17.1%	7.8%
Mechanical Engineering	-	4.2%	5.0%	3.0%
Chemical Engineering	-	20.6%	1.9%	2.6%
Electrical & Computer Eng.	3.7%	3.1%	-	-
Materials Science & Engineering	-	4.0%	-	-
Biomedical Engineering	-	0.1%	-	-
Geological & Mining Engineering & Sciences	-	4.0%	4.1%	10.8%

VICE PRESIDENT FOR RESEARCH, CENTERS & INSTITUTES				
Department/Organization	% SPACE	% IRAD	% PROPOSALS	% AWARDS
Great Lakes Research Center	16.2%	23.4%	4.5%	20.6%
Michigan Tech Research Institute	-	-	2.1%	5.6%
Vacant Space	10.8%	-	-	-

OTHER UNITS				
Department/Organization	% SPACE	% IRAD	% PROPOSALS	% AWARDS
Provost's Office	-	0.6%	-	2.1%

FY23 Initiatives

The following highlights some key initiatives planned for FY23 to facilitate the GLRC's leadership among research Centers and Institutes, as a non-academic department, and in a collaborative approach to stewarding the GLRC facility.

- 1) **Leadership.** Under the leadership of GLRC Director, Dr. Timothy Havens, two associate director positions will be created to support continued growth and management of the Institute.
- 2) **Staffing.** To continue to support a foundation for strategic growth, budget has been allocated for four new positions. A PhD researcher will be hired to work with Dr. Amanda Gonczi (GLRC) in the areas of curriculum development and STEM education program evaluation. A PhD researcher will be hired to expand research being led by Dr. Pengfei Xue in the area of hydrodynamic modeling. Two additional PhD research hires will be explored to add capacity in areas of strategic opportunity.
- 3) **Facility.** Budget has been reserved to support the renovation of space to allow for a command center for the Marine Autonomy Research Site.
- 4) **Outreach.** Working with the University's Marketing and Communication division, the GLRC's marketing and communication strategy plan will continue to expand with the addition of more research highlight features on the GLRC website, increased presence on social media, and in-person hosting of workshops and stakeholder meetings to promote research, programs, scholarship, people, and science.
- 5) **Strategic Planning.** GLRC leadership will synthesize and report out on the outcomes of the GLRC's FY22 Strategic Planning activities including findings and changes to the organization's strategic direction to better support the research community, external partners, and the University.
- 6) **Process Improvement.** In FY23, GLRC will continue to document, review, and update processes towards incremental improvements in efficiency in operations. Continued improvements will allow the GLRC to provide better research support services to researchers and external partners and manage strategic growth.