



Ecosystem Science Center Annual Report

FY2023 (July 1, 2022 - June 30, 2023)

Director: Amy Marcarelli, Professor of Biological Sciences



Mission

The Ecosystem Science Center (ESC) at Michigan Technological University was established in 2004 and aims to advance knowledge through research on ecosystems. We define ecosystems following Odum (1969) as, “any unit that includes all of the organisms in a given area interacting with the physical environment so that a flow of energy leads to exchange of materials between living and non-living parts of the system.” Ecosystem science applies to natural and built environments, degraded and restored habitats, and socio-ecological systems.

Mission Statement

The mission of ESC is to advance knowledge through research on ecosystems.

Vision

ESC will be a productive, vibrant, and inclusive community of scholars at Michigan Tech who collaborate across disciplines to conduct basic research and help steward ecosystems in the Anthropocene.

Guiding Principles/Core Values

- Research excellence and integrity
- Shared governance
- Diversity, equity, inclusion, and respect
- Stewardship

Summary of FY Activities and Highlights

Brief narrative summary of primary activities and accomplishments

The past year was the ESC’s 19th successful year. ESC continues to be a leader in research activities across campus, thanks to the hard work and dedication of our members to interdisciplinary, collaborative research with partners nationally and internationally. The ESC continued to rank first across the fifteen Centers and Institutes at Michigan Tech in terms of number of research awards (79) and projects (197) in FY 23. ESC expenditures ranked fifth overall (\$6,098,230), which only trailed the Tier 1 Centers and Institutes, and continued a trend of growth that has been particularly evident since FY 20 (Table 1). F&A returns from these expenditures allowed us to sustain and grow our portfolio of activities in support of ecosystem-related research and student training, as detailed in this report.

Table 1. ESC awards, projects, and expenditures from FY14 through FY22.

Fiscal Year	Number of Awards	Amount Awarded	Number of Projects	Expenditures
FY14	88	\$3,095,545	189	\$3,543,913
FY15	104	\$3,740,245	193	\$3,072,743
FY16	89	\$3,279,250	187	\$3,274,666
FY17	85	\$5,667,434	224	\$3,760,110
FY18	67	\$3,550,733	182	\$3,814,755
FY19	92	\$3,070,691	185	\$3,875,273
FY20	88	\$4,627,728	160	\$3,782,119
FY21	108	\$6,645,909	198	\$5,006,687
FY22	86*	\$4,332,499*	211*	\$5,949,851*
FY23	79*	\$5,579,062*	197*	\$6,098,320*

*FY22 and 23 includes awarded projects where IRAD is shared via MOUs between ESC and GLRC, where GLRC is the primary center. Therefore, these totals differ from those listed in the “Awards and Expenditures for Michigan Tech Academic Research Centers and Institutes” compiled annually by the VPR office.

Governance Structure

ESC operates through a shared-governance system, where Center members work together, with leadership of the Center Director and staff, to allocate resources and make decisions about priorities and programming. The Center is governed by a [charter](#) created by members, and which was last revised in 2022. The Director provides general oversight of the Center and must be a voting member of the Center. Center work is carried out via a combination of member committees, the Center Director, and Center staff.

Center Membership Policy

Membership in the Center is open to all faculty, staff, postdoctoral associates, and adjunct faculty participating in research and graduate education in the subject area. Members are classified as Voting or Affiliated. Voting members are limited to those members serving as Principal Investigator, Co-Principal Investigator or Official Collaborator on currently funded extramural projects that generate overhead return. Voting membership may also be granted to faculty and staff that directly support Center activities through other funding avenues, such as direct support of ESC staff. Membership status is established annually based on activities at the start of the Michigan Tech fiscal year. Any amount of overhead generated or direct funding provided is sufficient to participate as a full voting member of the ESC.

New members joining between July 1, 2022 and June 30, 2023 include: Hannah Abbotts (NIACS), Karen Bacula (IRI), Parth Bhatt (CFRES), Laura Brown (CS), Stacy Cotey (CFRES), Dukka KC (CS), Luke Nave (CFRES), Tom Oliver (CSEO), Sidike Paheding (Applied Computing), Ashraf Saleem (Applied Computing), and Jae Sung Kim (CEGE). A full list of members who were active during FY 23 appears in Appendix A.

Table 2. Number of members by year.

FY18	FY19	FY20	FY21	FY22	FY23
54	56	54	58	64	68

Progress towards FY 23 goals

Goal #1 Foster a vibrant, and inclusive community of scholars who conduct research with relevance to ecosystems.

ESC dedicated more than half of our FY 23 expenditures to support ESC core activities and programs that benefit faculty and students, including student development through travel grants, research grants, the ESC Student Research Forum, and the very successful and well-respected Distinguished Ecologist Lecture Series.

The ESC Student Research Forum returned to the Rosza Center Lobby and included a buffet lunch for faculty and students which proved to be a success. 21 students presented their research posters, and 5 students received awards for their presentations, specifically, Natalie Howard (Undergraduate Grand Prize), Tessa Tormoen (Undergraduate Merit Award), Sam Hervey (Graduate Student Grand Prize), Ryan Heines (Graduate Student Merit Award), and Cassandra Reed-VanDam (Graduate Student Merit Award).

ESC continues working to build strong connections with other centers and institutes. This includes championing the establishment of MOUs to share F&A returns for proposals led by investigators who are deeply invested in multiple centers. Such an MOU was created between ESC and the new Center for Innovation in Sustainability and Resilience (CISR), similar to the first one ESC entered into with the Environmental Restoration Hub (ERH). Other MOUs specific to individual awards and/or PIs exist with the Great Lakes Research Center (GLRC) and the Michigan Tech Transportation Institute (MTTI).

Goal #2 Enhance member efforts to acquire external funds for ecosystem research.

ESC supported PI efforts to obtain externally funded research by sharing funding opportunities with members, organizing formal and informal discussions to general research ideas and teams relevant to funding opportunities, and by supporting grant-writing and preparation efforts. Center Manager Henquinet provided support to 14 PIs to submit proposals to USDA-NIFA, NSF, MI DNR, USDA-FS, DOE and The Nature Conservancy, including several large, multi-institutional efforts. Additionally, one proposal submitted at the end of FY 23 included funding for Henquinet as a project manager, a role we hope he can provide on additional projects in the future.

Student research awards serve as essential micro-grants that allow faculty to conduct pilot-level research with their students which sometimes result in successful proposals that emerge months to years later. ESC awarded \$17,975 total in Students Research Grants to 16 students during FY23.

Goal #3 Support and grow internal and external partnerships and capacity to achieve novel broader/research impacts

Center Director Marcarelli attended the May 2023 Research Development trip to Washington DC and organized meetings for ESC members with program managers from the Ecosystem Science panel at National Science Foundation. ESC also renewed its membership in the Association for Ecosystem Research Centers (AERC), and members will attend their annual meeting and activities in October 2023 to learn more about opportunities for partnership with other universities through this organization.

Budget Overview

Summary of Awards and F&A Funds Generated

An overarching, long-term goal of Ecosystem Science Center continues to be to increase extramural grants and IRAD return generated for ecosystem-related research at Michigan Tech. In the 2022 renewal, the ESC extended the goal set in the previous renewal to increase the value of annual research awards by approximately 30% and F&A funds generated by 40% during the renewal period, using the average of FY 21 and 22 as our benchmarks for growth (see *Strategic Goals for The Next Five Years* below). Thus, our current targets are \$7,135,000 in awards and \$1,150,000 in F&A generation by the ESC by 12/31/2027.

At the end of FY 23, ESC had made good initial progress on this 5-year goal, with 79 new awards totaling \$5,579,062, an increase of 29% over FY 22 awards (including 2 awards totaling \$134,200 where GLRC is the primary center, but IRAD is shared between ESC and GLRC via MOUs; Table 1). The FY 23 awards brought ESC's total number of projects to 197 (including 3 shared between ESC and GLRC via MOU), with awards from a variety of federal, industrial, public and private sources (Table 2). All of this success is due to the hard work of our members, who continue to submit proposals at a very high rate, resulting in the largest number of awards and projects among all of Michigan Tech's Centers and Institutes. A full list of proposals submitted through ESC during FY 23 is included in Appendix B.

Table 3. Sponsors of ESC awards that were active as of October 2023 (from Aspire). Only includes projects where ESC is named the primary center.

Sponsor Name/Type	Award Value	Remaining Funds
USDA (includes Forest Service)	\$7,194,583.00	\$3,636,597.00
National Science Foundation	\$4,784,681.00	\$1,391,642.00
Industry (primarily wood protection group)	\$1,863,984.00	\$727,257.00
State of Michigan	\$874,569.00	\$386,137.00
US Department of Energy	\$728,299.00	\$188,400.00
Subawards from other universities (mostly federal pass-thru)	\$190,211.00	\$38,101.00
National Park Service	\$372,991.00	\$49,565.00
US Fish and Wildlife Service	\$318,424.00	\$126,262.00
Other	\$298,535.00	\$98,285.00
Foundations/Trusts	\$166,611.00	\$120,949.00
Total	\$17,191,746	\$6,907,246.00

Our FY 23 research expenditures reached \$6,098,320 (Table 1), which exceeded the FY 22 expenditures of \$5,902,764. Together, these two years demonstrate the strong growth in research activities at ESC since FY 20 (Table 1). These expenditures ranked fifth among Michigan Tech's eighteen centers and institutes, trailing only APSRC, GLRC, KRC, and MTRI, all of which are Tier I centers. These increased expenditures led to another all-time high in ESC F&A generation (Figure 1). A total of \$961,553 in F&A funds were generated by ESC expenditures in FY23. This demonstrates good progress towards our goal of \$1,150,000 in F&A generation by 12/31/2027.

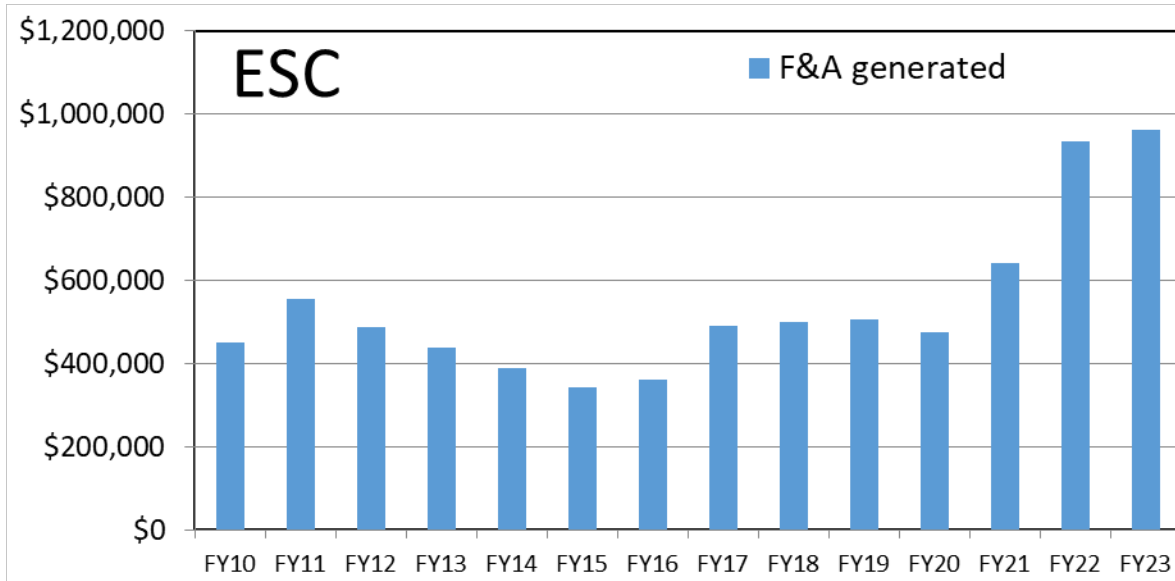


Figure 1. F&A generated by ESC grants from FY 10 through FY 23.

Summary of FY 23 budget

The Center is funded through the receipt of Internal Research and Development (IRAD) funding provided by MTU in proportion to the total F&A charged on funded projects submitted through the Center. The IRAD distribution amount is governed by MTU policy and has historically ranged from 15.5 to 20%. The IRAD return split to ESC in FY23 was 15.5%, with additional splits of 10% to the PIs, 7.5% to departments, 7.5% to colleges, and 3.5% to shared facilities.

In FY23 we received \$149,195 in IRAD transfers directly to ESC to support center activities. We also received \$1,965 of IRAD transferred from GLRC via two MOUs to share IRAD on three awards led by Center Director Marcarelli (Table 3).

Table 4. ESC expenses, income and IRAD account (E35288) balances from FY19 to FY23.

Category	Sub-category	FY19	FY20	FY21	FY22	FY23
Expenditures	S&W & Fringes	\$16,958	\$18,801	\$18,806	\$35,541	\$40,251
	Supplies & Fees	\$5,176	\$332	\$2,003	\$2,400	\$2,539
	Equipment	\$6,307	\$26,850	\$14,560	\$5,000	\$12,654
	Student Support*^	\$34,420	\$10,550	\$26,350	\$38,435	\$38,319
	Collaboration Building**	\$5,932	\$4,582	\$1,500	\$4,812	\$9,231
	Member funds requests^^	\$8,346	\$28,031	\$6,654	\$25,890	\$24,789
	Transfers to hubs	-	-	-	\$4,164	\$4,442
	Total Expenditures		\$77,138	\$89,146	\$69,873	\$116,243
Income	IRAD Transfers	\$92,369	\$90,161	\$102,513	\$128,000	\$149,195
	IRAD transferred from other centers (MOUs)	\$0	\$0	\$0	\$141	\$1,965
	Other Transfers In	\$10,056	\$0	\$0	\$0	\$0
	Total Income	\$102,425	\$90,161	\$102,513	\$128,141	\$151,262
Carry Forward		\$48,858	\$74,144	\$75,159	\$107,799	\$119,697
Year End Balance¹		\$74,144	\$75,159	\$107,799	\$119,697	\$138,734

¹Excludes encumbrances at year end

*student travel and research awards, Research Forum

**DELS, ESC coffee, meetings

^\$11,000 in student research awards from spring 2020 were funded in FY21

^^FY21 and 22 values include expenditures from member funds requests that were awarded in prior years

FY 23 IRAD Use

In FY 23 we spent 84.5% of IRAD generated on expenses to support ESC member capacity and core programs (Table 3). For FY 23, spending priorities included:

1. Funding a portion of the Director's annual salary to support efforts described above.
2. Increasing funds allocated to staff (i.e., the Center Manager) to support proposal development and post-award project management for large proposals.
3. Funding member requests likely to lead to successful proposals, such as preliminary data generation, travel for collaborative proposal development, help in purchasing needed equipment and repair/refurbishment of existing essential research capabilities.

For priority 1 and 2, in FY 23 we spent 26.6% of our IRAD revenue on supporting the Center Director and Manager. The center director was supported for a total of 4.525 weeks of effort (7.8 hours of effort in summer 2022, 173.2 hours in summer 2023). We also funded 0.25 FTE for Center Manager Henquinet until January 1, when our support increased to 0.375 FTE. This will continue until December 2023 when ESC support will increase to 0.5 FTE. The remainder of his 0.75 FTE position is funded from the NRW&E Tech Forward Initiative, which will continue until December 2024 after which time ESC will provide full support for the position.

For priority 3, we spent 24.8% of IRAD revenue on a variety of research seed and cost-share opportunities. We funded two new faculty research seed proposals, and also funded expenditures from seed proposals awarded in prior fiscal years. We provided proposal cost share for two REF-research seed awards to ESC members, and contributed funds to purchase new equipment that will benefit multiple ESC members (Table 4). We also contributed to services to assist member research: a university-wide license for the survey software Qualtrics, a university membership in The Carpentries, and support to hire a new manager for the ChARM lab that is part of the Microanalytical Facility.

The remainder of our FY 23 budget was dedicated to support ESC core activities and programs, including 23.7% to support student development through travel and research grants (see full list of students awards in Appendix C), 7.7% for collaboration-building activities including a weekly coffee hour, the Distinguished Ecologist Lecture Series and the Student Research Forum, and the remainder for administrative supplies, services and travel.

The ESC continues to be in sound financial condition. As of June 30, 2023, the ESC IRAD account (E35288) balance was \$137,778. This positive balance is the result of increases in IRAD income in recent years (Figure 2), and will enable us to continue to support equipment purchases and provide research seed and cost-share support to members. It also provides a buffer fund to allow us to confidently increase support of the ESC manager position from 0.375 FTE in 2023 (calendar year) to 0.5 FTE in 2024 and fully support the 0.75 FTE position starting in 2025, as the NRW&E Tech Forward initiative support ends.

Table 5. Summary of member research seed awards in FY 23.

PI Name	Award Date	Project title	Award Amount
Yinan Yuan	Fall 2022	Efficient Custom Tailing of 3'-End of RNA With Modified ATPs for Direct Nanopore Total RNA Sequencing	\$6,000
Kristen Brzeski	Spring 2023	GTseq: the future of wildlife noninvasive genetic management	\$10,000

Table 6. Summary of cost-share commitments in FY 23.

PI Name	Award Date	Description	Award Amount
Trista Vick-Majors	Fall 2022	Liquid Scintillation Counter	\$5,000
Kristin Brzeski	Fall 2022	REF-RS	\$3,000
Tao Liu	Fall 2022	REF Seed	Not Awarded
Wood Protection Group (Xie, Bal)	Fall 2022	Used autoclave purchase	\$3,904
Evan Kane	Spring 2023	CHARM Manager Salary Contribution	\$5,000
VPR	Spring 2023	Qualtrics subscription	\$1,000
Laura Brown	Spring 2023	Carpentries workshop	\$3,100

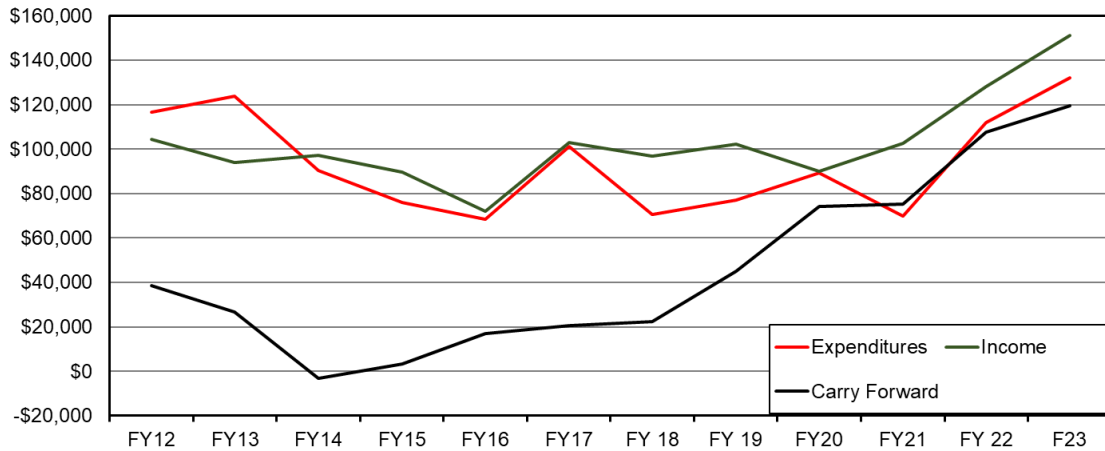


Figure 2. Trends of research expenditures, income, and budget carryforward in the ESC main account for FY 12 through FY 23.

FY 23 Budget Projections

Budget projections (Figures 3, 4) suggest that ESC is in a good position to continue to maintain our IRAD return and supported activities in FY 24. ASPIRE projections show slight declines in both total awards and F&A generated expected relative to FY 23 levels, but there are awards submitted since the start of FY 24 that are not currently appearing in the ASPIRE projections, including one large, 5-year award led by former Director Burton and several other NSF awards led by various ESC members. Our past records of F&A return show a long-term trend for ESC F&A generation to be 80 to 85% of the ASPIRE projection. Therefore, we estimate that more than \$700,000 in F&A should be generated by ESC in FY 23 based only on the proposals currently appearing in ASPIRE, which allows us to confidently plan to sustain ESC’s core programs and strategic goals.

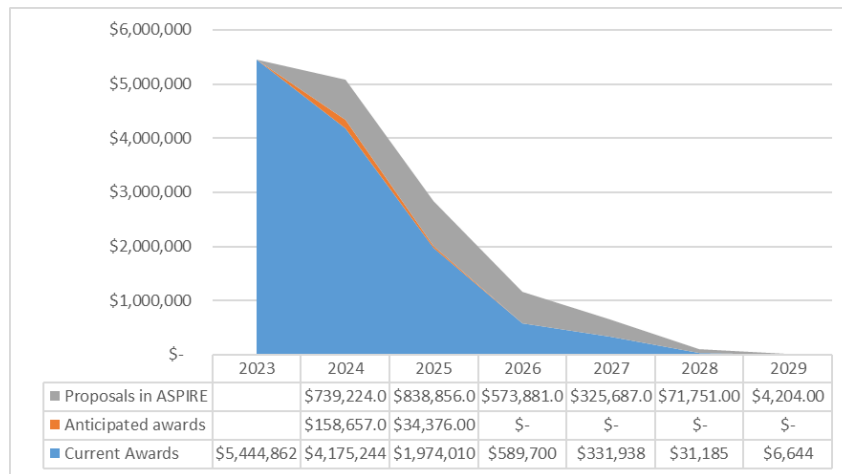


Figure 3. ASPIRE projections for ESC remaining balance from existing awards, anticipated increments of existing awards, and proposals in progress for FY 24 through 29. FY 23 are actual values included for comparison.

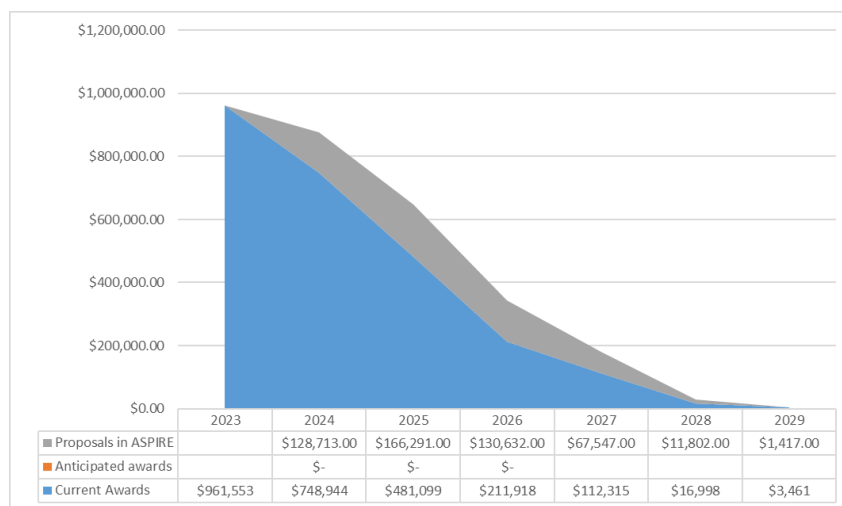


Figure 4. ASPIRE projections for ESC F&A generation from existing awards, anticipated award increments, and proposals in review for FY 24 through 29. FY 23 are actual values included for comparison.

Future Plans and Goals

Strategic Goals for The Next Five Years

As part of our charter and strategic plan revision approved in Sept 2022, ESC has set the following strategic goals to govern our next 5 years of center activities:

1. Foster a vibrant, and inclusive community of scholars who conduct research with relevance to ecosystems
2. Enhance member efforts to acquire external funds for ecosystem research.
3. Support and grow internal and external partnerships and capacity to achieve novel broader/research impacts

The strategic plan also included a range of actions to meet these strategic goals. In the next section we will highlight a few specific goals that will guide our actions for the next year.

An overarching, long-term goal of Ecosystem Science Center continues to be to increase extramural grants and IRAD return generated for ecosystem-related research at Michigan Tech. This is the core activity needed to support our mission and any strategic activities of the center. At the last renewal review, we set the goal of increasing the value of annual research awards by approximately 30% and F&A funds generated by 40% during the renewal period. Given the impressive growth of IRAD returns and F&A generated during that time period (2017-2022), we propose to extend this goal for the next 5-year period, but to use the average of FY 21 and 22 as our benchmarks for growth given that the FY 21 total was inflated (and the FY 22 total deflated) by several federal agency decisions to fully fund proposals from the start, rather than in annual increments. Thus, our new targets are \$7,135,000 in awards and \$1,150,000 in F&A generation by the ESC by the end of the next renewal period. We propose to meet these targets by (1) continuing to support our core researchers whose industry and USFS contracts form the core of ESC awards (Table 2), while (2) continuing to provide support and leadership on ecosystem-specific research awards from NSF, DOE and other federal agencies, and (3) pursuing new opportunities to participate in and lead large, multi-investigator and multi-university programs and proposals.

Specific priorities for FY 2023

Based on the 3 goals from our strategic plan and our long-term goal to increase extramural grants and IRAD return, we will focus on the following specific priorities for FY 2023 that will guide our FY 24 budget (Table 5):

1. Participate in discussions internal and external to Michigan Tech to sustain research and build capacity related to our core values.

In the past year, our activities related to Strategic Goal #1 have been focused on growing the community of researchers at Michigan Tech working on Ecosystem science-related questions, adding members from all colleges across campus, entering into the MOU to establish the new CISR joint center, and hosting community-building events like weekly coffee hours across

campus. We have made great strides in these areas and plan to continue these efforts, but in FY 23 we want to move our efforts external to Michigan Tech to explore new partnerships and opportunities to build research capacity. For example:

- Support member attendance and participation in the annual meeting of the Association for Ecosystem Research Centers (AERC) and American Institute of Biological Sciences (AIBS) congressional briefings in Washington DC.
 - Support visits by the Center Director and Manager to travel to regional and national scientific meetings to share ESC capabilities and explore opportunities for partnerships.
 - Plan with Research Development a visit to agencies in Washington DC focused on environmental and sustainability programs and PIs.
 - Build connections between ESC researchers and scientists at HBCUs with common interests (e.g., 1890's land grant universities), building on recent efforts started by the Office for Diversity and Inclusion, CFRES and Biological Sciences.
2. Sustain and grow ESC staff to support pre-award activities and enhance post-award programming and effectiveness.

In the past year, the Manager's time has increasingly been spent supporting proposal development as members have worked on large proposals and also learned more about Jeff's capabilities in grant writing and potential for future project management. An important goal for FY 23 is to continue to grow these efforts, ideally to the point where there is adequate demand and funding to add additional staff to support center operations. The center manager will also continue to learn the basics of MTU internal project management processes and policies with respect to externally-funded research projects to further refine where and when he can contribute in a way that is supportive and in demand by PIs.

3. Identify and lead large, multi-institution, interdisciplinary proposals related to our mission and vision (e.g., climate change, stewardship, transdisciplinary research)

ESC has long aimed to submit large, collaborative proposals - for example, this was a key goal presented during the 2016 request for renewal. We have been stymied in the past by limited support staff for such proposals, and limited time/support of the Center Director to lead such activities. We have addressed these challenges, and have also gained experience in the past year with such large proposal efforts, and are now well-positioned to participate in and/or lead such efforts. In FY 23, current Director Marcarelli and past Director Burton both led efforts that fit this goal (USDA NIFA-AFRI, REU site). We also shared a series of new programs at NSF that could be of interest to a team at Michigan Tech – we will continue these efforts this year and will seek additional opportunities to build teams to respond to timely proposals; NSF INCLUDES, URoL:EN, IntBIO, MSB-NES and DISES are all possible targets for such programs, as are USDA AFRI, DOE/NASA ROSES, and other emerging opportunities.

4. Build visibility of ESC research external to Michigan Tech (social media, marketing)

Although ESC is well-respected within the Michigan Tech community, we are not well-known as an entity on the national level. We routinely hear from visiting scholars (such as the speakers

from the Distinguished Ecologist Seminar series) that although they knew of individual ecosystem scientists at Michigan Tech, they had no idea that we have such a broad and cohesive research community. This was a goal that we set for FY 22 where we have made limited progress. Therefore we have set some more specific goals to help address this goal for FY 23:

- Hire a graduate student intern to assist with social media outreach.
- Engage regularly on two social media platforms: Facebook and LinkedIn.
- Produce at least two news/outreach items for non-social media distribution, such as MTU's unscripted Blog, tech today, MTU research magazine, or external publications.

Space or Facility Needs/Goals For Center/Institute And Members

As of right now ESC space is limited to office space for the Center Manager (129 Noblet). Director Marcarelli conducts ESC business in her regular faculty office (727 Dow). Although this is sufficient, it is a limitation that ESC does not have a space-based identity - there is no place where someone can drop in to find us, where members can gather for informal meetings or discussion, or where the Director and Manager can easily work together on projects and proposals. A welcoming home for the ESC would be a great development, but it is not essential for the long-term success of the center.

Challenges and Barriers

Although ESC has had several very strong years, we do face challenges to continued growth, particularly as we continue to exist as a Tier 2 center with limited support staff and overhead returns, but with aims to grow our research portfolio and services for members. We have adequate carry-over funds to support several years of budget deficits, but if we do not meet our long-term IRAD targets or increase project funding for the center manager we may need to limit some of our programs to maintain the center manager position.

A continued challenge is the variable IRAD return rates to Centers and Institutes, which makes long-term planning for support of staff and programs challenging. Our growth in IRAD revenue to ESC are particularly impressive considering the reduction in F&A return from 20% to 18% in FY 2018, and more recently to 15.5% in FY 22. A return to 18% return for centers and institutes as recommended by the IRAD Task Force report in December 2021 would be a major benefit as we work to grow support for ESC staff.

A related point, although not necessarily a challenge, is the need to monitor the effects of the research hubs/joint centers on Center IRAD returns. The goal of these joint centers is to stimulate research at the interfaces between established centers and institutes, and if they do that, they should result in a net benefit in the form of new proposals that would not have been submitted or funded previously. However, if such new research activity does not emerge, the actual effect could be a siphoning away of center IRAD to a subgroup of researchers. We will closely monitor the net effects of these agreements on the IRAD returns and renegotiate the MOUs as needed to ensure the long-term success of ESC.

Table 7. ESC projected budget for FY 24, in comparison to actual spending for FY 21-23 and budget spending for FY 23. Note that this budget is preliminary until approved by the ESC membership at the first FY 24 meeting, which will be held on October 11, 2024. The negative budget projection is due to our conservative estimates for IRAD revenue based on 80-85% of the projected IRAD in ASPIRE and the current center return rate of 15.5%. Carryover budget of \$138,734 from FY 22 (Table 3, Figure 2) provides a buffer to support these programs, and also to support strategic activities outlined above.

Item	Actuals FY 21	Actuals FY 22	Budget FY 23	Actuals FY 24	Budget FY 24
Income					
ESC IRAD Revenue	\$102,513	\$128,142	\$120,770	\$149,297	\$115,631
IRAD Sharing Revenue				\$1,965	\$2,000
Direct Support				\$0	\$0
Other Income				\$0	\$0
Expenses					
<i>Admin</i>					
Center Director salary and fringe (actuals include all staff in FY21)	\$18,806	\$16,326	\$15,000	\$15,577	\$16,000
ESC Center Manager salary and fringe	\$0	\$19,215	\$27,540	\$24,674	\$27,992
Supplies & equipment			\$100	\$397	\$500
Training, travel, misc			\$500	\$2,142	\$2,000
<i>Direct Student Support</i>					
Student research grants (transfers - E35299)	\$23,750	\$22,412	\$25,000	\$18,000	\$20,000
Student travel grants (transfers - E35292)	\$1,500	\$12,645	\$15,000	\$17,870	\$12,000
<i>Member support</i>					
Equipment				\$12,654	\$10,000
Non-equipment cost-share (e.g., REF)	\$14,559	\$10,000	\$20,000	\$6,000	\$10,000
Member research grants (transfers - E36100)	\$6,664	\$22,890	\$20,000	\$17,475	\$18,000
Member Travel				\$1,315	\$5,000
<i>Events</i>					
Coffee Hour			\$2,400	\$2,790	\$2,000
DELS			\$2,500	\$4,400	\$4,000
Fall Welcome			\$600	\$28	\$2,000
Research Forum			\$2,750	\$2,449	\$2,500
Other events				\$2,013	\$2,000
Other (coffee, DELS, supplies, welcome)	\$4,603	\$8,591	NA	\$2,790	NA
<i>Other expenses</i>					
IRAD Transfers Out (to hubs)		\$4,164	\$4,500	\$4,442	\$4,500
Total expenditures	\$69,873	\$116,243	\$135,890	\$132,225	\$138,492
Net income	\$32,640	\$11,899	-\$15,120	\$19,036	-\$20,861

Appendix A. Member List

Name	Position, Unit	Areas of Expertise
Hannah Abbotts	CCRC Content Manager, NIACS	Science Communication, Outreach, Climate Change
Jenny Apriesnig	Assistant Professor, COB	Coupled human and environmental systems, Fishery economics and management, Regional Natural Resource Economic Modeling
Tara Bal	Assistant Professor, CFRES	Forest Health Management and Monitoring, Earthworm Invasion Ecology, Wood Decay Testing, Insect, Fungi, and Environmental Education, Wild Foods
Megan Berberich	Research Scientist, Biology	Biogeochemistry, Ecosystem ecology
Parth Bhatt	Assistant Teaching Professor, Researcher, CFRES	Geographical Information Systems, Remote Sensing, Digital Image Processing (Multispectral, LiDAR, UAV, Hyperspectral), Land use/cover Mapping, Invasive Species Mapping, Forest Health and Natural Resource Management, Spatial Data Analysis
Laura Brown	Associate Professor, Computer Science	Artificial Intelligence and Machine Learning, Data Mining and Data Science, Applications of AI and ML to Energy (microgrids, power systems), Health, and other domains
Kristin Brzeski	Assistant Professor, CFRES	Conservation genetics, Canid genomics, Noninvasive methods in wildlife management, Wildlife immuno- & epi-genetics, Applied conservation in Central Africa
Andrew Burton	Professor/Associate Dean, CFRES	Forest responses to global change factors, Belowground processes, Carbon and nutrient cycling, Physiological ecology of tree roots, Undergraduate research
Julia Burton	Associate Professor, CFRES	Silviculture, Functional ecology, Conservation of biodiversity in managed forests, Climate change adaptation and mitigation, Forest community and stand dynamics, Disturbance ecology
Angie Carter	Associate Professor, Social Science	Environmental sociology, Rural sociology, Community-based and participatory research, Social movements and social change

Name	Position, Unit	Areas of Expertise
Molly Cavaleri	Professor, CFRES	Forest canopy structure and function, Forest response to global change, Carbon and water cycling through forests, Tree ecophysiology, Stable isotope ecology, Invasive trees
Rod Chimner	Professor, CFRES	Peatland and wetland restoration, Peatland and wetland carbon cycling, Mountain wetlands, Tropical peatlands, Ecosystem carbon cycling, Wetland ecohydrology
Stacy Cotey	Assistant Teaching Professor, CFRES	Student success, Landscape ecology, Wildlife-habitat relationships, Mesocarnivore ecology, Science communication
Ana Dyreson	Assistant Professor, ME-EM	Solar photovoltaic and thermal power plants, Electricity grid operational modeling, Energy-water nexus
Jennifer Eikenberry	Assistant Research Scientist, CFRES	Stable isotopes, Forest ecology, Mass spectrometry
David Flaspohler	Professor and Interim Dean, CFRES	Conservation biology, Avian ecology and reproduction, Cascading effects of deer overbrowse, Island ecology
Val Gagnon	Assistant Professor, CFRES	University-Community partnerships, Research engagement, Equitable practice and design in research, Environmental justice and policy, Indigenous / Native American studies
Kathleen Halvorsen	Associate Vice President for Research Development Professor Social Sciences/CFRES	Woody bioenergy, Climate change, Natural resource policy, Biodiversity policy, Bioenergy policy
Rob Handler	Senior Research Engineer, Chemical Engineering	Sustainable water and energy systems, Life-cycle assessment, Bioproducts and bioenergy, Sustainable materials and manufacturing, Aquaponics and hydroponics
Jeffrey Henquinet	Center Manager, ESC	Grant writing, Project management, NEPA and environmental compliance, Natural resources policy
Erika Hersch-Green	Associate Professor, Biological Sciences	Plant evolutionary ecology, Ecological genetics, Eco-evolutionary dynamics

Name	Position, Unit	Areas of Expertise
Sarah Hoy	Research Assistant Professor, CFRES	Predator-prey interactions, Animal ecology and conservation, Population biology, Life-history trade-offs
Casey Huckins	Professor, Biological Sciences	Ecology of lakes, streams, and riparian interface with terrestrial systems, Fish ecology, biology, functional morphology, Effects of land use on ecological systems, Biomonitoring for research and restoration, Effects of invasive species
Mike Hyslop	Teaching Professor, CFRES; Master of GIS Program Director	Geographic information systems, Cartography, Global positioning systems, Great Lakes Quaternary (glacial) geomorphology
Maria Janowiak	NIACS Director, USFS Northern Research Station	Translating science related to climate change and carbon into usable information, resources, and tools for forestry and conservation professionals
Mickey Jarvi	Assistant Teaching Professor, CFRES	Forest ecology, Use of multispectral and hyperspectral imagery attached to unmanned aerial vehicles investigate forestry and natural resource issues
Chandrashekhar Joshi	Department Chair and Professor, Biological Sciences	Cellulose and lignin biosynthesis in trees, Wood formation, Tree growth and development, Engineering trees, Forest bioinformatics
Martin Jurgensen	Research Professor, CFRES	Forest soil productivity, management and sustainability, Global climate change impact on soil biology, Organic matter decomposition and ecosystem nutrient cycling
Evan Kane	Associate Professor, CFRES	Soil carbon, Plant/soil relationships, Decomposition, Dissolved organic carbon, Wildfire, Black carbon
Dukka KC	Associate Dean for Research, College of Computing; Associate Professor, Computer Science	Bioinformatics, Data Science, Machine Learning/Deep Learning, High-performance Computing
Carsten Külheim	Associate Professor, CFRES	Genetic basis of trait variation, Plant adaptation to local environment, Plant secondary metabolism, Functional genomics of plant defenses

Name	Position, Unit	Areas of Expertise
Nancy Langston	Professor, Social Sciences	Toxics, forested watersheds, and northern lakes, Environmental history, Watershed change and water quality, Mining history
Patricia Leopold	Research Scientist I, CFRES & Climate Change Outreach Specialist, NIACS	Ecosystem response to climate change, Climate change adaptation and management strategies, Outreach and technical transfer of climate change tools and resources
Erik Lilleskov	Research Ecologist and Director's Rep., USFS NRS; Adjunct Professor, CFRES	Forest ecology, Ecosystems ecology, Physiological ecology, Community ecology, Fungal ecology, Mycorrhizal fungi, Molecular ecology, Soil ecology, Global environmental change impacts on forest ecosystems, Invasive species impacts, Biogeography of invasive soil organisms
Fengjing Liu	Associate Professor, CFRES	Ecohydrology in forests, Watershed hydrology in montane and lake-dominated catchments, Biogeochemistry in snow-dominated, agricultural and forested catchments, Numerical modeling in watershed hydrology, Forensic hydrology with natural geochemical and isotopic tracers
Tao Liu	Assistant Professor, CFRES	Remote sensing, Change detection, Natural disaster mapping, Invasive species mapping, Landcover mapping, Vegetation property extraction with remote sensing techniques
Carol MacLennan	Research Professor, Social Sciences	Environmental anthropology/political ecology, Anthropology of industry (mining, sugar), Hawai'i and the Pacific, Anthropology of public policy
Amy Marcarelli	ESC Director and Professor, Biological Sciences	Limnology, Ecosystem ecology of streams and rivers, Biogeochemistry
Luke Nave	Research Associate Professor, CFRES	Forest ecology, Soil carbon management, Biogeochemistry, Data synthesis and meta-analysis
Jill Olin	Assistant Professor, Biological Sciences	Ecology of aquatic systems, Fisheries science, Aquatic-terrestrial energy linkages, Dietary biomarkers (e.g., stable isotopes, fatty acids, compound-specific isotopes of AA and FA), Trophic ecology of top predators in marine, estuarine and coastal communities, Predator-prey interactions

Name	Position, Unit	Areas of Expertise
Tom Oliver	Director, CSEO	Biological fieldwork for game and nongame threatened and endangered species, Collaboration on legislative development, and K-12 education
Rebecca Ong	Associate Professor, Chemical Engineering	Development of fuel and products from lignocellulosic materials and upcycled waste plastics, sustainability of the bioenergy and bio-based product industries.
Gordon Patterson	Assistant Professor, Biological Sciences	Legacy and emerging pollutants, Ecotoxicology, Great Lakes fisheries, Multiple stressors, Fisheries bioenergetics
Judith Perlinger	Professor, Civil, Environmental, and Geospatial Engineering	Air and water quality, Atmosphere-biosphere exchange of chemicals, Micrometeorology, Environmental analytical chemistry, Sustainability
Rolf Peterson	Research Professor, CFRES	Mammalian ecology, Predator-prey relationships, Ecology and behavior of gray wolves
Sigrid Resh	Research Assistant Professor, CFRES Coordinator, KISMA	Forest carbon dynamics, Soil sustainability, Invasive species education/outreach, control, and research
Mark Rouleau	Associate Professor, Social Sciences	Social simulation (agent-based modeling), Policy analysis, International relations, Sustainability assessment, Norm evolution and social influence
Mark Rudnicki	Professor of Practice, CFRES	Forest Biomaterials, Tree biomechanics, Wind and trees, Dendrochronology, Extension and Outreach
Ashraf Saleem	Assistant Professor, Applied Computing	Data acquisition and real-time control, Robotics system design and Integration, UAV-based Remote Sensing, Drone-based oil spill detection in Ocean, Artificial Intelligence Applications in Remote Sensing, Computer Vision and AI, Control of Pneumatic Systems
Chelsea Schelly	Associate Professor, Social Sciences	Alternative technology adoption, Renewable and alternative technology policy, Sustainable communities, Energy conservation and consumption practices, Self-provisioning, Environmental education
Danielle Shannon	Research Scientist,	Climate change and adaptation, resources management,

Name	Position, Unit	Areas of Expertise
	CFRES	decision-making
Terry Sharik	Research Professor, CFRES	Academic leadership in natural resources, Educational reform in natural resources, Trends in natural resource enrollments, Regeneration ecology of forests
Samantha Smith	Assistant Professor, Cognitive and Learning Sciences	Cognitive demand of physical tasks, Cognitive state assessment, Multitasking, Sustained attention
Andrew Storer	Interim Provost and Professor, CFRES	Forest insect ecology, Insect/fungus/plant interactions in forest ecosystems, Impacts of exotic species on forest ecosystems, Interactions among fire, insects and disease in forests, Urban forest health
Jae Sung Kim	Assistant Professor, CECE	Photogrammetry, Remote Sensing, GIS, Geospatial Cyberinfrastructure, Application of geospatial technology to agriculture and environmental science
Stephen Techtmann	Associate Professor, Biological Sciences	Environmental microbiology, Next-generation sequencing technology and bioinformatics, Microbial physiology and biochemistry, Microbes as sensors for the environmental impacts of oil and gas production, Microbial-mediated remediation of crude oil contamination
Colin Tucker	Ecologist/Lab manager, USFS Northern Research Station	Analysis of environmental samples for understanding carbon cycling and potential impacts of climate change on ecosystems
Noel Urban	Professor, Civil, Environmental, and Geospatial Engineering	Environmental cycles of major and trace elements, Sediment diagenesis and stratigraphy, Chemistry of natural organic matter, Wetland biogeochemistry, Environmental impact and fate of pollutants, Influence of organisms on the chemical environment, Role of chemical environment in controlling populations
Trista Vick-Majors	Assistant Professor, Biological Sciences	Microbial ecologist who studies the reciprocal relationships between microbial communities and biogeochemical processes in aquatic ecosystem
Steven Voelker	Associate Professor,	Dendrochronology, Forest Ecology & Paleoecology, Stable Isotope Geoscience, Carbon Cycling, Forest Health,

Name	Position, Unit	Areas of Expertise
	CFRES	Disturbance Ecology, Plant Ecophysiology
John Vucetich	Professor, CFRES	Demographic and genetic elements of population biology, Ecology of wolves and moose, Environmental ethics
Leah Vucetich	Research Assistant Professor, CFRES	Isle Royale wolf genetics, Field research methods
Christopher Webster	Professor, CFRES	Gap dynamics and disturbance ecology, Invasion biology of exotic species, Landscape ecology, Plant community response to herbivory, Restoration silviculture, Wildlife habitat relationships
Hairong Wei	Professor, CFRES	Identification of genes regulating complex traits via systems biology approaches, Gene expression data analysis, Gene network construction and decomposition, Developing software for mining large-scale biological data, Genomics of wood formation
Richelle Winkler	Associate Professor, Social Sciences	Rural sociology, Population and environment, Environmental sociology, Community engaged scholarship, Internal migration, GIS and spatial analysis
Jared Wolfe	Assistant Professor, CFRES	Wildlife conservation in working landscapes, Temperate and tropical avian ecology, Demographic modeling, Avian molts and plumage
Xinfeng Xie	Associate Professor, CFRES	Carbon materials derived from wood, lignin, and cellulose; Integrated thermochemical conversion and fractionation of lignocellulosic biomass; Carbon-polymer composites and hybrid materials; Wood protection and preservation; Wood properties, quality, and modification
Yinan Yuan	Assistant Professor, CFRES	Identification and characterization of natural antisense transcripts in woody plants, Alternative splicing and salicylic acid metabolism in populus, Sequencing complex plant genome through gene-enriched methods

Appendix B. Proposals Submitted

There was a total of 107 proposals submitted in 2023. Of those 50 proposals were awarded for a total of \$2,691,586 in requested funds. Additionally, 52 proposals are still pending at the time of this report.

PROPOSAL #	STATUS	PRINCIPAL NAME	PROPOSAL TITLE	REQUESTED AMT
2207030P1	Awarded	Julia Burton	Forest management strategies in a changing world	\$10,000.00
2207051P1	Awarded	Rodney Chimner	Peatland Ecology and Restoration Education in South America	\$465,000.00
2007040P3	Awarded	Andrew J. Burton	Modeling Carbon Storage and Fluxes in Tidal Freshwater Forested Wetlands in Southeastern United States under Climate Change Sea Level Rise and Resource Management	\$22,500.00
2208005P1	Awarded	Lucas Nave	LTREB Renewal: Drivers of temperate forest carbon storage from canopy closure through successional time	\$297,190.00
2208010P1	Awarded	Xinfeng Xie	Manufacture and Testing of OSB with Kraft Paper Overlay (2206)	\$9,690.00
2105059P2	Awarded	Hannah Abbotts	Outreach Support for Regional and National Hub Products	\$122,665.00
2107046P2	Awarded	Fengjing Liu	Ash Ecosystem Processes Across an EAB Infestation Gradient	\$97,100.00
2209062P1	Awarded	Mark Rudnicki	Hardwood Cross-Laminated Timber Research Assistance	\$25,000.00
2209046P1	Awarded	Fengjing Liu	Reducing Risk of Invasive Terrestrial Plants in the Great Lakes Region - Early Detection Remediation and Recovery	\$193,428.00
2210034P1	Awarded	Xinfeng Xie	Laboratory Soil Block Decay Test of OSB Materials with Different Orgins (2208)	\$26,533.00
2210035P1	Awarded	Xinfeng Xie	Field Performance Exposure of Exterior Materials (2208)	\$34,720.00
2210036P1	Awarded	Xinfeng Xie	Laboratory Termite Test of OSB Materials with Diffrent Origins (2208)	\$9,864.00
2210044P1	Awarded	Andrew J. Storer	FY23 McIntire Stennis Overall Program	\$345,612.00
2210054P1	Awarded	Lucas Nave	Decision Support for Forest Soil Carbon Management	\$70,000.00
2210074P1	Awarded	Tara Bal	Impact of Earthworm Invasion on Maple Sugar Content and Tree Health	\$12,520.00
2210075P1	Awarded	Kristin E. Brzeski	Assessing taxonomy of native remnant canids in the American southeast and habitat that support native genetics	\$12,520.00

2210076P1	Awarded	Andrew J. Burton	Effects of Global Change Factors on Belowground Processes and Carbon Storage in Northern Hardwood Species	\$12,520.00
2210077P1	Awarded	Julia Burton	Silviculture on the basis of functional traits	\$12,520.00
2210078P1	Awarded	Victor Busov	Regulation of dormancy release and bud-break in trees	\$12,520.00
2210079P1	Awarded	Molly A. Cavaleri	Investigating within-canopy phenotypic plasticity to assess the acclimation potential of temperate and tropical tree species to climatic change	\$8,000.00
2210080P1	Awarded	David J. Flaspohler	Improving the resiliency and sustainability of agroecosystem through improved understanding of bird ecosystem services and landscape pattern	\$8,000.00
2210081P1	Awarded	Valoree S. Gagnon	Bridging Indigenous and Western Sciences for Resilience Livelihood and Stewardship Planning: An Ojibwa Forest Ecosystem Characterization	\$8,000.00
2210082P1	Awarded	Sarah R. Hoy	Can near-infrared reflectance spectroscopy be used to monitor phytochemical traits of Balsam fir & chemically mediated interactions between fir climate and herbivory?	\$8,000.00
2210083P1	Awarded	Evan S. Kane	Incorporation of Historic Fire Regime Data in Lowland Conifer Forest Management in Northern Michigan	\$8,000.00
2210100P1	Awarded	Xinfeng Xie	Field Study of Effects of Dry Film Thickness on Durability of OSB Siding	\$38,048.00
2211007P1	Awarded	Tara Bal	Timing Oak Wilt in the North - Modeling Vectors and Host Phenology with Risk of Spread	\$159,099.00
2211032P1	Awarded	Xinfeng Xie	Selected Properties of Wood Treated with Different Types of Fire-Retardant	\$14,699.00
2211053P1	Awarded	Tara Bal	Advancing Mycobiocidal Techniques for Buckthorn Management	\$4,000.00
2211064P1	Awarded	Eli Paulen	Elucidating factors controlling stream temperatures in seasonally snow-covered forested catchment in the Great Lakes Region	\$5,000.00
2212035P1	Awarded	Sigrid Resh	AIS Prevention for KISMA with boat wash outreach and AIS education	\$20,000.00
2103003P2	Awarded	Molly A. Cavaleri	Interactive effects of press and pulse disturbances in biogeochemical cycling of a wet tropical forest in Puerto Rico	\$60,240.00
2301017P1	Awarded	Kari B. Henquinet	Understanding Community Connections with Nature in California El Salvador	\$5,000.00

2301021P1	Awarded	Parth Bhatt	Keweenaw Inventory Project	\$36,302.00
2007006P3	Awarded	Rodney Chimner	Monitoring Support for the Sustainable Wetlands Adaptation and Mitigation Program in South America	\$134,739.00
2201020P2	Awarded	Sarah R. Hoy	Isle Royale Wolf-Moose Population Monitoring	\$37,000.00
2301050P1	Awarded	Andrew J. Burton	Processing and Analysis of 100 Marine Sediments for Inorganic 13C and %C and total 13C %C %N	\$4,615.00
2301051P1	Awarded	Xinfeng Xie	A Laboratory Test on Metal Corrosivity of the Experimental OSB (2301)	\$8,300.00
2301065P1	Awarded	Andrew J. Burton	Assessment of the role of soil micro-topography in regulating carbon dynamics in wetland – upland gradient using Forest DNDC	\$26,000.00
2206021P2	Awarded	Lucas Nave	Decision support tools to sustain and increase soil carbon through forest management in the Northeast U.S	\$31,000.00
2002057P4	Awarded	Andrew J. Storer	Isle Royale Institute	\$10,000.00
2302035P1	Awarded	Joseph O. Eskola	Field Tests of CLT Trailer Deck Substrates in a Tropical Exposure - Phase 1	\$24,692.00
2302018P1	Awarded	Tara Bal	Understanding Management Options for Sugar Maple Dieback & Decline in Michigan	
2302047P1	Awarded	Xinfeng Xie	Lab Evaluation of Mold Resistance of Experimental OSB Panels (2301)	\$9,923.00
2211009P2	Awarded	Sigrid Resh	Maintaining KISMA Core Capacity for Invasive Species Outreach and Management	\$60,000.00
2303042P1	Awarded	Andrew J. Burton	Analysis of 14 Tree Sap Samples for Total Nitrogen Dissolved Organic Carbon pH Conductivity and 10 elements by ICP-oes.	\$1,357.00
2212028P2	Awarded	Jared D. Wolfe	Collaborative Research: Forest fragmentation and climate change result in understory destroy warming that adversely affects tropical avian biodiversity at the BDFFP	\$109,469.00
2304036P1	Awarded	Julia Burton	Long-term forest dynamics in hemlock-hardwood forests of Sylvania Wilderness	\$10,000.00
2304023P1	Awarded	Sigrid Resh	MDARD sponsored Spotted Lanternfly Mock Exercise	\$1,904.00
2304048P1	Awarded	Xinfeng Xie	Field Exposure of an Experimental Panel Roof System (2302)	\$5,005.00
2305005P1	Awarded	Tara Bal	Field Test of Pressure Treated End-jointed Lumber	\$43,292.00
2207040P1	Declined	Yinan Yuan	CAREER: Unraveling the Functionality of Antisense Transcription a Hidden Layer of Genetic Regulation in Tree Response to Drought	\$1,121,742.00

2207050P1	Declined	Andrew J. Burton	From Individual Tree to Ecosystem Scales: Applying UAV-Based Remote-Sensing Technology for Sustaining Forest Function and Productivity	\$9,999,627.00
2210032P1	Declined	Kristin E. Brzeski	Collaborative Research: Functional ecology of admixed taxa and reviving ghost genetic variation of an endangered wolf	\$519,131.00
2212034P1	Declined	Carsten Külheim	Genetic and epigenetic signatures of climate change resilience in red oak	\$1,818,545.00
2303060P1	Declined	Kristin E. Brzeski	Collaborative Research: BoCP-Implementation. Past present and future: Tracking drivers and changes in functional biodiversity of carnivores across human-altered landscapes	\$580,622.00
2208002P1	Pending	Xinfeng Xie	Field Exposure of LP Siding and Trim Products - 2206	\$42,925.00
2208027P1	Pending	Fengjing Liu	Responses of Stream Temperature to Future Climate Scenarios in Menge Creek Falls River and Silver River Catchments	\$54,497.00
2209075P1	Pending	Hannah Abbotts	Climate Adaptation through Forest Extension (CAFE)	\$395,946.00
2210027P1	Pending	Jared D. Wolfe	Science-informed action to promote host persistence with infectious disease in a changing climate	\$151,596.00
2210030P1	Pending	Sigrid Resh	Relating Genetic and Phenotypic Variability to Improve Differentiating Introduced and Native Phragmites	\$58,535.00
2211014P1	Pending	Lucas Nave	Collaborative Research: MRA: Bioclimatic Regulation of Soil Organic Matter Persistence at the Macroscale: Framework Process and Forecasting	\$382,761.00
2211004P1	Pending	Sigrid Resh	Prioritizing and Restoring Landscapes in Michigan's Keweenaw Peninsula	\$200,000.00
2211030P1	Pending	Sigrid Resh	Goats Managing Buckthorn on Community Recreational Trail System	\$50,000.00
2302032P1	Pending	Chelsea L. Schelly	URoL:ASC: EMERGENCC: Economic Modeling of Energy Resources Growth Equity and Nature for Climate Change	\$356,649.00
2302020P1	Pending	Evan S. Kane	Estimating Trace Gas Flux Dynamics in Boreal Wetlands: Linking Remote Sensing With Long-Term Field Measurements Data	\$89,220.00
2302050P1	Pending	Yinan Yuan	Effects of epitranscriptomic modifications on viral RNA synthesis	\$469,501.00
2303003P1	Pending	Tao Liu	AI-Aided Understanding of Spatial and Temporal Dynamics of Forest Mortality in a Changing Climate	\$141,897.00
2303010P1	Pending	Evan S. Kane	Interactive effects of fire and herbivory on forest recovery at Isle Royale National Park	\$131,010.00

2303020P1	Pending	Rodney Chimner	Mapping Vernal Pools in Hiawatha National Forest	\$52,000.00
2303035P1	Pending	Amy M. Marcarelli	Data Science Intern at Michigan Tech	\$7,000.00
2303037P1	Pending	Angela L. Carter	Meeting needs at the margins: Building networks to support "missed" land stewards	\$109,964.00
2303039P1	Pending	Xinfeng Xie	A novel application of hardwood CLT in composite I-beams for portable heavy duty vehicle bridges: commercial shear connections evaluation and bridge structural design and analysis	\$306,362.00
2303043P1	Pending	Jeremy P. Bos	Enabling WNS magament VIA autonomois monitoring of microclimates and animal state in bat hibernacula	\$63,137.00
2304002P1	Pending	Hannah Abbotts	International/Domestic Climate Hub Science Delivery	\$99,949.00
2304004P1	Pending	Evan S. Kane	Radiocarbon and carbon cycle research	\$25,000.00
2202031P2	Pending	Julia Burton	Pushing the limits: role of functional and structural complexity in determining upper limits of carbon storage and sequestration in cool-temperate old growth forest ecosystems	\$4,750.00
2104023P3	Pending	Evan S. Kane	Belowground Ecosystem Ecologist	\$65,000.00
2304047P1	Pending	Xinfeng Xie	Testing of Wood Flooring Systems	\$15,000.00
2304043P1	Pending	Angela L. Carter	Institutionalizing Farm to School Integration through Community Engagement School Purchasing Processes and Student Involvement: Western Upper Peninsula Farm to School Phase 2	\$39,990.00
2305011P1	Pending	Kailey F. Marcinkowski	Science Visual Informatioin for USDA Northern Forest Climate Hub	\$69,999.00
2305019P1	Pending	Hannah Abbotts	USDA Climate Hubs Webs Products	\$74,987.00
2305020P1	Pending	Madeline Baroli	Climate Adaptation Technical Assistance to R9 State Private and Tribal Forestry Partners	\$74,999.00
2305024P2	Pending	Tao Liu	A new method of estimating crop water use to support irrigation decision support system through multi-sensor and multi-model synergy	\$131,583.00
2305031P1	Pending	Adrienne Keller	Ecosystem Management For Climate and Carbon Benefits	\$90,076.00
2206032P2	Pending	Evan S. Kane	Uplands and Peatlands - a continuation	\$40,000.00
2306030P1	Pending	Xinfeng Xie	Demonstration of the Suitability of Eastern White Pine Lumber for Cross-Laminated (CLT) Production	\$11,816.00
2210054P2	Pending	Lucas Nave	Decision Support for Forest Soil Carbon Management	\$76,547.00

2212035P2	Pending	Sigrid Resh	AIS Prevention for KISMA with boat wash outreach and AIS education	\$20,000.00
2306024P1	Pending	Tao Liu	BRC-BIO: Mechanistic Understanding and Forecasting of Spatiotemporal Dynamics of Forest Mortality in a Changing Climate	\$499,445.00
2206008P2	Pending	David J. Flaspohler	Ecological factors that dictate the occurrence of southern disjunct biota isolated on granite bedrock glades	\$4,971.00
2211030P2	Pending	Sigrid Resh	Buckthorn Management by Goats on Community Recreational Trail System	\$50,000.00
2306047P1	Pending	Chelsea L. Schelly	Planning: CRISES: Human-centered solutions to socio-ecological crises: Developing capacity for a research Center at Dancing Rabbit Ecovillage (CADRE)	\$97,509.00
2306071P1	Pending	Rodney Chimner	IN CAYUSE: 23-9216 Enhancing research in aquatic ecosystems that provide traditional foods and medicines for the Keweenaw Bay Indian Community	\$12,000.00
2306061P1	Pending	Kristin E. Brzeski	Developing novel non-invasive genetic tools for wild red wolf recovery	\$17,000.00
1609003P6	Pending	Tara Bal	Great Lakes Northern Forest CESU: Beech reintroduction at Pictured Rocks National Lakeshore and Sleeping Bear Dunes National Lakeshore (Phasell - Supplement)	\$90,000.00
2306062P1	Pending	Julia Burton	Climate-Informed Restoration Information for USDA Northern Forests Climate Hub	\$122,326.00
2209041P1	Pending WIP	Julia Burton	PARTNERSHIP: Risk and reward: mechanisms underlying success of alternative climate adaptation strategies and consequences for ecosystem services in northern hardwoods forest	\$799,995.00
2210084P1	Pending WIP	Carsten Külheim	The genetic basis of climate adaptation on red oak	\$8,000.00
2210085P1	Pending WIP	Fengjing Liu	Impact of Trees and Microtopography on Snow Distribution and Snowmelt Regime in Mixed Hardwood Forests of Northern Michigan	\$8,000.00
2210086P1	Pending WIP	Tao Liu	Individual Tree Detection and Delineation using LiDAR Point Cloud and Aerial Images with Deep Learning Techniques	\$8,000.00
2210087P1	Pending WIP	Mark Rudnicki	Enabling the Forest-based Circular Bioeconomy Through Valorization of Residuals	\$8,000.00

2210088P1	Pending WIP	Steven Voelker	Development of Tree-Ring Growth and Stable Isotope Records For Records For Reconstructing Forest Productivity and Lake Effect Snow in the Lake Superior Region	\$8,000.00
2210089P1	Pending WIP	John A. Vucetich	Does deliberative democracy favor the conservation of controversial forest-dwelling species of wildlife?	\$8,000.00
2210090P1	Pending WIP	Christopher R. Webster	A Long-term investigation of winter foraging habitat selection and stand dynamics in relict eastern hemlock stand in the western Upper Peninsula of Michigan	\$8,000.00
2210091P1	Pending WIP	Jared D. Wolfe	Integrating economically valuable wildlife management into silviculture practices in northern Michigan	\$8,000.00
2210092P1	Pending WIP	Xinfeng Xie	Developing Lignocellulose-based Metamaterials for Broadband Microwave Absorption	\$8,000.00
2210093P1	Pending WIP	Yinan Yuan	Functional Characterization of Drought Responsive Antisense Transcripts on Populus	\$8,000.00
2210037P1	Tabled	Tara Bal	Northern Oak Wilt Modeling - Predicting Vector Timing and Risk of Spread with Climate Change and Phenology	\$26,450.00
2211009P1	Tabled	Sigrid Resh	Maintaining KISMA Core Capacity for Invasive Species Outreach and Management	\$100,000.00
2212028P1	Tabled	Jared D. Wolfe	Collaborative Research: LTREB: Forest fragmentation and climate change result in understory warming that adversely affects tropical avian biodiversity at the BDFFP	\$346,487.00
2305024P1	Tabled	Tao Liu	A new method of estimating crop water use to support irrigation decision support system through multi-sensor and multi-model synergy	\$150,989.00

Appendix C. List of student research and travel awards for FY 23

Table C1. List of student travel awards in FY23. Each student received \$750 to use as they chose towards travel and/or registration. A total of \$17,870 was awarded in FY 23.

Name	Advisor	Event
Shardul Tiwari	Chelsea Schelly	IASNR
Manuel Anderson	Tara Bal and Chris Webster	Natural Areas Conference
Tessa Tormoen	Kristin Brzeski	Wildlife Society
Mai Anh Tran	Val Gagnon and Chelsea Schelly	History of Science Society
Victoria Peck	Rod Chimner	Northwest Innovative Forestry Summit 2022
Kathy Huerta Sanchez	Chelsea Schelly	UN Climate Change Conf
Ayush Chutani	Ana Dyreson	UN Climate Change Conf
Shardul Tiwari	Chelsea Schelly	UN Climate Change Conf
Aritra Chakrabarty	Mark Rouleau	Word Social Science Association
Ali M. Awad	Ashraf Saleem	SPIE - Defense + Commercial Sensing Conferences
Hailee Petosky	Erika Hersch-Green	Botanical Society of America's Botany 2023
Jenna Brewer	Jared Wolfe	American Ornithological Society Conference 2023
Ricardo Jaramillo	Rod Chimner	2023 Ecological Society of America Annual Meeting
Sarvada Chipkar	Becky Ong	45th Symposium on Biomaterials for Fuels and Chemicals
Ayush Chutani	Any Dyreson	IEEE Photovoltaic Specialists Conference 2023
Shelbie Wickett	Ana Dyreson	IEEE Photovoltaic Specialists Conference 2023
Eileen Reeves	Andy Burton	2023 Ecological Society of America Annual Meeting
Tom Panella	Tara Bal	2023 Society of American Foresters National Convention
Swapan Chakrabarty	Carsten Küelheim	2023 American Society of Plant Biologists Annual Meeting
Kath Higdon	Tara Bal, Kristin Brzeski	2023 Entomological Society of America Annual Meeting
Rob Tunison	Molly Cavaleri	2023 Ecological Society of America Annual Meeting
Emma Shedd	Molly Cavaleri, Andy Burton	2023 Ecological Society of America Annual Meeting
Samuel Mensah Opoku	Andy Burton	2023 Ecological Society of America Annual Meeting
Sam Hervey	Kristin Brzeski	Society for Molecular Bio & Evolution Satellite Meeting

Table C2. List of student research awardees. Undergraduate awardees received up to \$750, and graduate awardees up to \$1,000 to use towards their research project. A total of \$17,975 was awarded for student research awards.

Student	Advisor	Title
Anderson, Manuel	Tara Bal	Adaptive silviculture solutions: Understanding the landscape of management practices for sugar maple dieback and decline in the Upper Great Lakes
Brewer, Jenna	Jared Wolfe & David Flaspohler	Development of an acoustic signal as a possible solution to bird-building collisions in cities
Ring, Libbie	Steven Voelker	Nitrogen Deposition and Sugar Maple Growth at Long-term Experimental Sites Throughout Michigan
Sankofa, Malik	Molly Cavaleri	The Effects of Experimental Warming on the Fungal Community of Tropical Soil
Shedd, Emma	Molly Cavaleri and Andrew Burton	Fine root respiration acclimation in <i>Quercus rubra</i> along a Midwest temperature gradient
Sutherlin, Caitlyn	Angie Carter and Kari Henquinet	Understanding Community Connections with Nature in California, El Salvador
Czarnecki, Jessica	Evan Kane	Extracellular enzyme activity potential as a key controller of peat decomposition
Higdon, Kath	Tara Bal and Kristin Brzeski	Comparing the Effectiveness of iDNA from Burying Beetles Obtained from Pitfall Trapping Versus Light Trapping
Hunter-Peck, Victoria	Rod Chimner	Methods testing: restoring northern white cedar in degraded swamps
McCall, John	Gord Paterson and Kristin Brzeski	Quantifying the genetic structure of Isle Royale and Buffalo Reef lake trout ecotypes
Milenkowoic, Adam	Julia Burton	Field Assistant for the Purpose of Observing Microclimate in Temperate Old-Growth Forest
Panella, Thomas	Tara Bal	American Beech Planting Trials & Monitoring Protocol: Efforts to increase Beech Bark Disease resistant genetics at two National Lakeshores
Paulen, Eli	Fengjing Liu and John Gierke	Elucidating Factors Controlling Stream Temperatures in a Seasonally Snow-Covered Forested Catchment in the Great Lakes Region
Petosky, Hailee	Erika Hersch-Green	Investigating the role of climate and anthropogenic changes on trophic interactions and insect biodiversity patterns

Quintanilla, Maci	Trista Vick-Majors	Microbial community dynamics and physiological responses to ice-cover in temperate freshwaters.
Reed-VanDam, Cassandra	Valoree Gagnon	Bridging Indigenous and Western Sciences to Investigate Environmental Conditions of Manoomin (Wild Rice) Restoration Sites within Keweenaw Bay Indian Community Homelands
Reeves, Eileen	Andy Burton and Carsten K�uelheim	Investigating the activity of saprotrophic fungi in situ
Rivers, Keenan	Juia Burton	Analysis of tree ring carbon stable isotopes for functional trait analysis of old-growth forest
Rutheford, Ryne	David Flaspohler	Ecological and anthropogenic factors associated with the occurrence of southern disjunct fauna isolated in warm refugia
Skillings, Nicolas	Rod Chimner and Erik Lilleskov	Mapping peatlands in the colombian paramos
Stump, Amanda	Carsten K�uelheim	Sampling and analysis of soluble plant secondary metabolites in Quercus rubra trees in the upper peninsula of Michigan