TESI®

Thompson Earth Systems Institute

2022-2023 Annual Report

Director's Message

Dear colleagues, partners, and supporters,

As I reflect on the first five years since a gift from longtime museum supporters Jon and Beverly Thompson catalyzed the establishment of the University of Florida Thompson Earth Systems Institute (TESI), I am constantly reminded of our team's hard work and passion to fulfill our mission. Our programs have reached UF students, researchers across Florida, lifelong learners, policy leaders, and decision-makers, as well as Florida public school teachers and students.

I take immense pride in witnessing how TESI has flourished, gained brand recognition, and evolved into a positive force within UF and across Florida. However, as my term as founding director draws to a close, I am excited to announce a new era for TESI under the leadership of Dr. Megan Ennes.

Dr. Ennes, an esteemed faculty member and assistant curator of museum education at the Florida Museum of Natural History, played a pivotal role as one of TESI's founding faculty members. She brings a wealth of expertise and experience in informal science education, particularly in museum settings. Her work with the National Network for Ocean and Climate Change Interpretation has equipped her with effective methods for communicating climate change research. Driven by her passion for broadening participation in science, she aims to establish TESI as the go-to institution for accessible, cutting-edge outreach about Earth systems science.

Dr. Ennes' former experience as an aquarium educator, coupled with her research on the impact of museum-based family programming, has shaped her belief in the power of connecting people with the wonders of our planet.

In her new role, she plans to build upon TESI's trusted reputation by fostering new collaborations with researchers at UF and across the state. Through strategic planning, implementation, and evaluation of education and outreach projects, TESI will continue to make significant contributions to the public understanding of Earth systems science. As I depart TESI, I express my deepest gratitude to each one of you for your unwavering support and contributions to the Institute's success.

Together, we have built an institution that promotes scientific literacy, environmental stewardship, and a sustainable future for Florida. I am excited to witness TESI's exciting journey as we continue to inspire, educate, and empower generations to come.

Sincerely,

Bruce MacFadden

Mission:

The University of Florida Thompson Earth Systems Institute is advancing communication and education about Earth systems science in a way that inspires Floridians to be effective stewards of our planet.

What is Earth systems science?

The study of the interactions among air, water, land, and life on Earth, and how these systems are influenced by human activities.

Vision:

Only by understanding how the Earth's systems interact will we be poised to fully understand the ways human activity affects the natural environment in which we live.

Our vision is to lead the way to a healthier planet by cultivating a responsible and curious society that values, trusts, and has access to science.

Table of Contents:

TESI's First Five Years: Impacts by the Numbers

More than **12,000** lifelong learners explored environmental issues through **56** public outreach events.

More than **$3.8 million** in private funding acquired to support Scientist in Every Florida School STEM learning and TESI outreach projects.

Scientist in Every Florida School team coordinated more than **4,000** visits to classrooms in **64%** of Florida's counties, reaching nearly **158,000** K-12 students in Florida.

8,626 people followed TESI on social media, and **256,000** unique users visited the TESI website to learn more about institute programs and Florida environmental issues.

More than **2,300** subscribers got TESI news and information delivered to their inbox.

TESI faculty and staff worked with nearly **1,000** scientists to disseminate current research to public audiences.

TESI social media channels focused on educational content garnered more than **1.1 million** impressions and **100,000** likes, comments, and shares. Educational videos on the TESI YouTube channel received **189,963** views.

More than **21,300** K-12 students and teachers attended **236** virtual field trips and events hosted by the SEFS.

387 UF undergraduates, graduate students and early career scientists learned about effective environmental communication and leadership through TESI and SEFS internships and professional development programs.

TESI faculty taught **20** classes aimed at helping students understand how to bring academic knowledge to public audiences.

TESI faculty, staff, and grant recipients published **32** research articles related to science education and outreach in peer-reviewed journals.

34 UF undergraduates participated in TESI paid internships and fellowships focused on environmental leadership and communication.

265 Florida public school teachers learned about current research and developed lesson plans with scientists during **16** SEFS professional development workshops.

2023 TESI Award Recipients

TESI hosted its first Annual Celebration & Awards Ceremony to highlight the work of collaborators who have excelled in Earth systems education, outreach, and communication.

"From scientists volunteering their time to visit classrooms to undergraduate students developing engaging social media posts to educators working to introduce current research into their curricula, fulfilling the mission of our Institute truly takes a village," said TESI founding director Bruce MacFadden.

Excellence in Science Communication

Dr. Savanna Barry
UF/IFAS Nature Coast Biological Station

TESI Outstanding Partners

UF Water Institute
Dr. Paloma Carton de Grammont

UF Office of Sustainability (Sustainable UF)
Matthew Williams

Scientist in Every Florida School Outstanding Collaborators

Julie Bokor
Alachua County Public Schools

Erin Benavides
Silver River Museum &
Environmental Education Center

TESI Outstanding Collaborator

Amanda Waddle
The Repurpose Project
and Zero Waste USA

Scientist in Every Florida School Outstanding Partner

ANGARI Foundation
Amanda Waite and Angela Rosenberg

Scientist in Every Florida School Outstanding Educators

Susie Hahn
Eagles Landing Middle School

Melissa Atkins
Tradewinds Middle School

Monika Moorman
Central Park Elementary School

Shark AI

SEFS helps prepare Florida teachers and students for an AI-powered future using shark teeth.

With the goal of preparing students for the future, our Scientist in Every Florida School team, the UF College of Education and the UF Herbert Wertheim College of Engineering partnered with the Calvert Marine Museum in Maryland on a three-year, $1.3 million project funded by the National Science Foundation to teach Florida middle school teachers and students how to use artificial intelligence (AI) to identify shark teeth fossils.

The program kicked off in summer 2022 with the first of three professional development workshops for teachers. The cohort of 12 teachers spent five days at UF's main campus in Gainesville learning how to train computers to use shape, color, and texture to identify the teeth of the extinct megalodon, using a branch of AI called machine learning. By the end of the week, teachers developed hands-on, standards-based lesson plans to bring to their classrooms that fall.

Melissa Atkins teaches science to sixth, seventh, and eighth grade students with special needs at Tradewinds Middle School in Greenacres, Florida. For her students, using project-based activities is crucial to bringing science to life. Enrichment programs like this one help her do that.

"A lot of my students don't get outside of that 3-mile radius from school," said Atkins. "So, for me, by bringing in a program like this, it helps extend that circle a little further."

By combining the charisma of sharks with the simplicity of their anatomy, teachers were able to develop lesson plans that easily engage students in the identification process, sparking their curiosity and setting the stage for deeper exploration into the potential of machine learning.

"It's not about teaching your students computer science, at all. It's teaching your children to think critically," said Donale Cochran, a teacher at Lake Weir Middle School in Marion County. "It's teaching your students to problem-solve, to recognize biases, and to recognize misinformation."

After the workshop concluded, participating teachers organized scientist visits to their classrooms, allowing students to interact with professionals and witness the real-world applications of AI. Regular check-ins with the project team ensured ongoing support and collaboration.

The project helps further the university's goal of becoming a national leader of AI instruction and application. Through this program, SEFS hopes to pave the way for an educational landscape where AI is seamlessly integrated, inspiring teachers and preparing them to empower their students for the challenges and opportunities of the ever-evolving digital world.

2022-23 Shark AI Cohort

Melissa Atkins
Tradewinds Middle School
Palm Beach County

Carmen Gonzalez
Fort McCoy School
Marion County

Donale Cochran
Lake Weir Middle School
Marion County

Cathy Hammel
Frostproof Middle Senior High School
Polk County

Robert Driscoll
Marathon Middle High School
Monroe County

Kathrin Landolfi
Horace O'Bryant School
Monroe County

Susan Gaboriau
Putnam County School District
Putnam County

Angela Pecor
Liberty Middle School
Marion County

Kevin Gamble
Gamble Rogers Middle School
St. Johns County

Allison Stidham
Tarpon Springs Middle School
Pinellas County

Monique Goldberg
Boca Raton Community Middle School
Palm Beach County

Larry Tannenbaum
Buddy Taylor Middle School
Flagler County

Broader Impacts, Outreach, and Evaluation

Departments across the university turn to TESI for science communication and education expertise.

TESI's team of experienced educators, communicators, and evaluators partners with research faculty across the University of Florida campus to develop impactful activities that advance public understanding of their grant-funded research projects. We specialize in helping researchers fulfill the National Science Foundation's Broader Impacts requirement. These activities might include K-12 outreach, digital communications campaigns, or public events for lifelong learners.

2022-2023 Collaborations

Upcoming

Dr. Larry Page, Curator of Fishes, Florida Museum of Natural History

Project name — Moving and Improving the Florida Museum of Natural History Fish Collection

Our SEFS will host a professional development program for Florida teachers focused on the importance of fish collections. During the workshops, the teachers will work with scientists to develop lesson plans. TESI will also provide evaluation services to help measure the effectiveness and impact of the educational program.

Completed

TESI, The Paleontological Society, Alachua County Public Schools

Project name — Chewing on Change: Using Fossil Horses to Teach About Macroevolution

SEFS hosted a paid professional development program in which eight Alachua County middle and high school teachers received classroom resources to teach concepts of macroevolution, adaptations, and climate change through museum collections.

Dr. Akito Kawahara, Curator of Lepidoptera, Florida Museum of Natural History

Project name — Collaborative Research: Silk Protein Innovation and Novelty (SPIN)

SEFS hosted a one-day professional development workshop in which six elementary school teachers collaborated and engaged with scientists who use CT-scanning technology to study the ways in which different insects produce various kinds of silk.

Dr. Rana Ezzeddine, Assistant Professor of Astronomy, University of Florida

Project name — Collaborative Research: Galactic Archaeology from Careful Modeling of Old Stars

SEFS hosted a one-day science field trip titled "Stellar spectroscopy and the origin of the elements STEM program for Florida Middle School Teachers and Students." During this interactive experience, students observed, analyzed, and determined the chemical abundances of stars using the local Gainesville teaching observatory and telescopes.

Ongoing Collaborations

Alberto López, Youth Outreach Coordinator, Florida Museum of Natural History

Project name — Museum in the Parks

Museum in the Parks is a reimagined Florida Museum program providing a unique combination of in-person and digital science programming at parks in and around the Gainesville area. TESI is providing evaluation services to help measure the effectiveness and impact of the educational program.

Dr. Wen-Yuan Song, Associate Professor of Plant Pathology, University of Florida

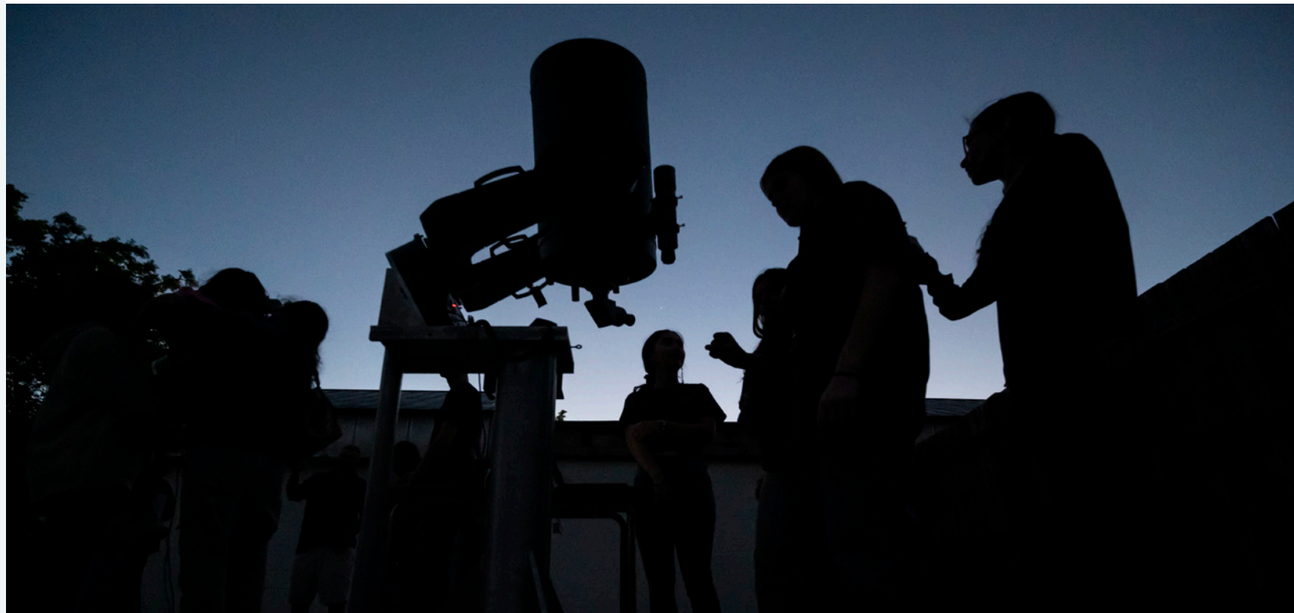
Project name — Intramembrane Proteolysis in Regulation of the Rice Receptor Kinase XA21

SEFS is hosting a series of four annual professional development workshops for Florida public high school teachers titled, "Research Experience for Florida High School Teachers in Plant Pathology." During the workshops, the teachers conduct experiments and work with scientists to develop lesson plans aimed at helping students understand agriculture and food security issues.

Dr. Bruce MacFadden, Distinguished Professor, University of Florida and Curator of Vertebrate Paleontology, Florida Museum of Natural History; Dr. Pasha Antonenko, Professor of Educational Technology, University of Florida; Dr. Jeremy Waisome, Assistant Professor of Engineering Education, University of Florida; Dr. Victor Perez, Visiting Assistant Professor of Environmental Studies, St. Mary's College of Maryland

Project name — K-12 Shark AI

SEFS is hosting a series of three annual professional development workshops for Florida public middle school teachers. During the workshops, the teachers will work with scientists to develop lesson plans that teach students how to use machine learning to identify shark's teeth.



TESI Immersive Environmental Education Fellowship for Miami-Dade County Middle and High School Teachers

SEFS brings South Florida teachers into the field to learn firsthand about environmental issues facing the state.

For the first time, SEFS brought one of its renowned hands-on professional development programs on the road. Thanks to funding from the Batchelor Foundation, scientists from a range of disciplines guided a cohort of 11 South Florida middle and high school teachers through an immersive, weeklong environmental education fellowship in Miami.

Each day, they engaged in field experiences, science content presentations, and classroom activities with one of TESI's partner organizations. They also participated in several hands-on activities that they could take back to their classrooms, such as a lionfish dissection and an interactive lesson on overfishing.

Monday: Teachers toured native and nonnative plants at Fairchild Tropical Botanic Garden and learned about eco-activism from the Xavier Cortada Foundation at Pinecrest Gardens.

Tuesday: Teachers tagged sharks with Florida International University and the ANGARI Foundation.

Wednesday: Teachers learned about bird diversity and migration from the Tropical Audubon Society at Bill Baggs Cape Florida State Park.

Thursday: Teachers were guided through a sea turtle survey with Marine Order for Research and Action through Environmental Stewardship on Virginia Key. They also toured the National Oceanic and Atmospheric Administration's Atlantic Oceanographic and Meteorological Laboratory to learn about sea turtles, coral reefs, and water quality.

Friday: Teachers received a VIP tour of the Frost Museum of Science.

After the workshop, teachers left with new tools to help their students better understand environmental issues in Florida. During the 2023-24 school year, the teachers will have the opportunity to work with the SEFS team, the rest of the cohort, and scientists to continue developing their lesson plans.

"Honestly, this PD [professional development] was amazing," said Oscar Flores, a teacher at Miami Norland Senior High School. "It aligned well with what I teach because the focus in my classes is on how we interact with our environment and how we manage our impact. And I think that it would be very impactful for other teachers in the county to get to experience something like this."

Photos by Mariela Pajuelo, TESI assistant scientist, Alise Cross, TESI education and communications assistant, and Susie Hahn, teacher at Eagles Landing Middle School in Palm Beach County.

Cultivating Environmental Leaders

Environmental Leaders Network aims to build a workforce that puts the future of our planet at the forefront.

When it comes to helping care for our planet, it's all hands on deck. Our Environmental Leaders programs connect UF students to environmental research, education and outreach, and civic engagement opportunities, regardless of their major.

From Fellows to Network Founders

In 2021-22, TESI hosted the inaugural TESI Environmental Leaders Fellowship with funding from the Henry David Thoreau Foundation. While the team worked to plan the next iteration of the cohort-based program, four former fellows wanted to extend some of the same resources they learned about in the fellowship to more UF students. From there, they developed the UF TESI Environmental Leaders Network, a new campus hub in which students can learn about environmentally focused volunteering opportunities, jobs, internships, seminars, professional development workshops, and more.

The network is open to any UF undergraduate. When they join, students gain access to an opportunity database, receive twice-monthly emails with updates, and are invited to social events where they can mingle with students from different disciplines. In its first year, the network boasted 230 members, representing 68 majors from aerospace engineering to English.

"The network is also a chance for TESI to be recognized among likeminded partners. Organizations, departments, and individuals with an environmental opportunity to share with students can easily do so through our website," said Becca Burton, TESI communications manager and a staff adviser for the program. "We then add that opportunity to our database and then send it out to network members."

So far, 50 organizations have shared 126 opportunities with network members.

"From interviews with our former fellows, we learned that a lot of students are aware of environmental issues, but they are unsure how to get involved," said Sadie Mills, TESI program coordinator and a staff adviser for the program. "Through the EL Network, we want students to have a place where they can go to find everything happening on campus and throughout the community."

Network Founders

Kamya Bates
UF '22
Marine Sciences

Sarisha Boodoo
UF '22
Sustainability Studies and Political Science

Aadil Rahman
UF '23
Zoology

Coleen Sailsman
UF '22
Environmental Science

TESI Education & Outreach Publications

In-service Teachers' (Mis)conceptions of Artificial Intelligence in K-12 Science Education
Author(s): **Pasha Antonenko, Brian Abramowitz**
Publication: Journal of Research on Technology in Education
Date published: September 9, 2022

Testing the Influence of Visual Framing on Engagement and Pro-environmental Action
Author(s): Gabby Salazar, Martha C. Monroe, **Megan E. Ennes**, Jennifer Amanda Jones, Diogo Veríssimo
Publication: Conservation Science and Practice
Date published: September 17, 2022

Children and Parents' Perceptions of Access to Science Tools at Home and Their Role in Science Self-efficacy
Author(s): **Megan E. Ennes**, M. Gail Jones, Gina M. Childers, Emily M. Cayton, Katherine M. Chesnutt
Publication: Research in Science Education
Date published: November 14, 2022

Book Chapter – "Family Influence and STEM Career Aspirations"
Author(s): **Megan E. Ennes**, M. Gail Jones, Heidi C. Cian, Remy Dou, **Brian Abramowitz**, Kathleen E. Bordewieck, Kimberly L. Ideus
Publication: International Encyclopedia of Education
Date published: November 2023

Accelerating High School Students' Science Career Trajectories Through Non-formal Science Volunteer Programs
Author(s): K. Rende, M. Gail Jones, Emma Refvem, Sarah J. Carrier, **Megan Ennes**
Publication: International Journal of Science Education, Part B
Date published: July 2022

Book Chapter – "Night Skies and Butterflies: Leisure Science Activities and STEM Interests"
Author(s): M. Gail Jones, **Megan Ennes**
Publication: "Amplifying Informal Science Learning"
Date published: June 2023

Family Science Experiences' Influence on Youths' Achievement Value, Perceived Family Value, and Future Value of Science
Author(s): **Megan Ennes**, M. Gail Jones, Katherine Chesnutt, Emily Cayton, Gina M. Childers
Publication: Research in Science Education
Date published: June 2023

One way TESI works to reach varying audiences across the state is through partnerships. Over the past year, we have collaborated with the following organizations:

UF Bob Graham Center for Public Service — Liberal Arts and Sciences

Mounts Botanical Garden of Palm Beach County

UF Office of Sustainability, University of Florida

UF Herbert Wertheim College of Engineering, University of Florida

iDigBio Integrated Digitized Biocollections

ANGARI FOUNDATION

FROST SCIENCE

Silver River Museum & Environmental Education Center

Nature Coast Biological Station

School of Forest, Fisheries, and Geomatics Sciences

ATMOSPHERE APPS

UF College of Education, University of Florida

UF Water Institute, University of Florida

Archie Carr Center for Sea Turtle Research, University of Florida

Calvert Marine Museum

Private Funding Partners

Smallwood Foundation
Felburn Foundation
Batchelor Foundation

For more information on how to support TESI's programs and mission, contact:

Marie Emmerson, *Executive Director, Advancement*
Florida Museum of Natural History
emmerson@ufl.edu • cell: 352-256-9614

Commitment to Sustainability

At the Thompson Earth Systems Institute, we are committed to reducing our negative impact on Florida and the planet. We strive to use the latest science to develop Institute policies that support a sustainable and healthy future. As part of our organizational culture, our commitments to sustainability include:

- Minimizing our **use of paper** and **recycling** any necessary paper materials
- Utilizing **reusable or compostable** dishware and utensils during catered events
- Encouraging **walking, biking, public transportation** and **carpooling** to meetings and events
- Selecting promotional items that serve a necessary function and that are made from **sustainable materials**
- Hosting **virtual meetings** when possible rather than meetings that require travel
- Encouraging our partners and collaborators to **practice sustainability**

Contact information:

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Cover image by Mariela Pajuelo, TESI assistant scientist

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