

Celebrating 60 years of groundbreaking science

Towards a resilient future for people and the planet

Smithsonian

Our world needs good science – now more than ever. At the Smithsonian Environmental Research Center (SERC), scientists are doing the research that will lead us to a more resilient future. Here, on the shores of Chesapeake Bay, researchers are uncovering the secrets to a world where people and the planet can thrive together.

SERC scientists study the most critical issues facing our planet today: sustainable food, biosecurity, pollution, conservation and climate change. They work alongside communities in the U.S. and abroad. And they share their findings with policymakers and stakeholders, so they can make decisions based on sound science.

From its headquarters in Maryland, the power of SERC science has stretched around the globe. In the last decade, our staff have worked in over 30 countries and formed collaborations with many more. And our 2,654-acre campus has become a hub where leaders from all sectors come together to create solutions for a healthier world.

Environmental science has the power to transform lives and communities. SERC does science for the future, and the future belongs to everyone.











FRITZ RIEDEL



The Smithsonian Environmental Research Center is turning 60 this year.

It began as a surprise bequest, when entrepreneur Robert Lee Forrest willed his abandoned dairy farm on Maryland's Rhode River to the Smithsonian. Over the last six decades, the center has transformed into a cutting-edge research campus that attracts experts from all over the world.

I've witnessed this transformation personally. I've worked at SERC since 1979, first as a marine ecologist with grant funding for fish, crabs and other critters of the Bay and beyond, and then as assistant director in 1988. For the last 20 years, I've served as the center's director. We have grown SERC research from five principal investigators to 21. We've also expanded our public programs to engage hundreds of volunteers and students and over 15,000 visitors annually.

This special issue will highlight discoveries and achievements from the last decade. And there have been many – too many to list in these pages. Our educators have found new ways to engage schools and communities, meeting people where they are and giving them a larger voice in our research. Our scientists have uncovered some surprising realities, thanks to new technologies and tools. And hundreds of volunteers have devoted thousands of hours helping our research and programs succeed.

I'm also incredibly gratified by how our campus has transformed. In 2015, SERC had just finished building the Charles McC. Mathias Lab. It was a landmark for green building then – the Smithsonian's first LEED-Platinum building. Since then, we've added six more LEED-Platinum buildings, with rooftop solar panels that send roughly half their renewable energy back into the grid. We also renovated the historic 1735 house on our campus.



Today, the Woodlawn History Center tells the stories of the Native Americans, enslaved families and free families who preceded us and shaped the land into what it is today.

This is my last year as director. A new leader will guide SERC into its seventh decade. While the projects and strategies may change, SERC's core mission will remain the same: to advance the science that protects the Earth and its people.

Anon WHines

Anson "Tuck" Hines Director, SERC

Where we work

Alaska

In Alaska, SERC has helped preserve the salmon fishery, detected new invasive species with volunteers and brought hands-on orchid experiments to classrooms.

Maryland

SERC works to restore and preserve Chesapeake Bay from its Maryland headquarters.

California

Since 2000, the Marine Invasions Lab has maintained a full-time presence on San Francisco Bay studying its native and invasive species and restoring shorelines.

Belize

The Marine Conservation Lab works with scientists in Belize and many other nations to measure carbon in mangrove ecosystems for their greenhouse gas inventories.

Ecuador

In the Galápagos Islands, the Marine Invasions Lab helped detect the arrival of dozens of non-native species.

Key regional and global networks

ACT Network

Managed by SERC, the Atlantic Cooperative Telemetry Network follows the underwater migrations of over 11,500 animals along the U.S. East Coast with acoustic telemetry tags.

Coastal Carbon Network

The Coastal Carbon Network works with communities around the globe to measure "blue carbon" stored in their marshes, mangroves, seagrasses and other coastal ecosystems.

COMBINA

Short for "Coastal Ocean Marine Biosecurity: International Network of the Americas," COMBINA launched in 2024 to combat marine invasions across the Americas.

Germany

In Germany's Wadden Sea salt marsh, the Technology in Ecology Lab runs a futuristic experiment to see how marshes respond to hotter temperatures. From their home base in Chesapeake Bay, SERC staff did environmental work in nearly 40 countries over the past decade and every region of the continental U.S.

Ghana

The Coastal Carbon Network engages with scientists and stakeholders in Ghana to study blue carbon and provide data management trainings. The Fisheries Conservation Lab travelled to Indonesia and the Philippines to study blue swimming crabs, a popular seafoo and vital fishery.

ForestGEO

The Forest Global Earth Observatory tracks how forests worldwide are responding to climate change, by censusing 7 million trees on every continent except Antarctica.

MarineGEO

Headquartered at SERC, the Marine Global Earth Observatory takes the pulse of ocean life by tracking biodiversity at coastal sites on six continents.

North American Orchid Conservation Center

Based at SERC, this continent-wide alliance brings together over 60 collaborators working to preserve North America's 200-plus native orchid species.

TreeDivNet

The world's largest network of experiments on tree biodiversity, TreeDivNet contains data from over 30 forest experiments, including SERC's BiodiversiTREE forest restoration.

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> SERC scientists ask the big questions about life on planet Earth – and follow the data points wherever they lead. In the process, they've discovered surprising twists in our understanding of climate, conservation and invasive species. Whether tracking the journeys of ocean plastic or uncovering what makes forest restorations succeed, SERC researchers embrace large-scale projects that span time and distance. And with the help of emerging technologies and new partners around the globe, they're using that science to find solutions that work for everyone.

"The ability to think independently is a core principle behind the impactful research from SERC. To see something in a prevailing idea or issue that needs attention and go after it. So many things that I have done in my career have been inspired by that attitude."

Pat Neale SERC emeritus photobiologist

Our science

Mangroves and coastal wetlands can store carbon an estimated



faster than the same area of tropical forest.







Top row: Technician and site manager Andrew Peresta on the Global Change Research Wetland. PHOTO: STEPHEN VOSS

Second row: SERC postdoc Alia Al-Haj examines a chamber for the GenX experiment on the Global Change Research Wetland. PHOTO: STEPHEN VOSS

Third row: SERC postdoc Hannah Morrissette stands in a mangrove forest in Belize. PHOTO: STEVE CROOKS, SILVESTRUM CLIMATE ASSOCIATES

Fourth row: Mangrove shoreline in Belize. PHOTO: JONATHAN LEFCHECK



Unlocking answers to <u>climate</u> change

Humans are resilient. Our ability to adapt helped us thrive for millennia. Today, humanity faces a new challenge: adapting to rapid climate change on our doorstep.

SERC scientists have long known that wetlands, mangroves and seagrasses – life-giving coastal ecosystems – are key to our protection. They shield us from hurricanes and floods. They can also slow climate change by storing massive amounts of "blue carbon."

Researchers at SERC are helping to conserve them. Emeritus scientist Candy Feller spent decades tracking mangrove health around the world. Ecologists like Steve Canty and Hannah Morrissette continue her legacy, joining scientists in Central America to measure how much blue carbon their mangroves can store. Those data are helping nations like Belize, Honduras and Panama include mangroves in their greenhouse gas inventories. James Holmquist, Andre Rovai and Jaxine Wolfe manage the Coastal Carbon Library and Atlas, which contains blue carbon data from 70 countries. And SERC's Biogeochemistry Lab helped bring blue carbon credits to market, making wetland conservation good business.

They're also tracking how these ecosystems are shifting. In the 1980s, Bert Drake launched the first futuristic climate experiment on SERC's Global Change Research Wetland. The last decade has seen three new experiments, managed by Pat Megonigal, Genevieve Noyce and Roy Rich. At SMARTX, scientists raise temperature and carbon dioxide. At GenX, scientists measure how wetland greenhouse gas emissions fluctuate. And at TEMPEST, scientists flood a forest to simulate heavier rainfalls and sea level rise. In a nearby tidal creek, they also created a "marsh organ" where scientists can run additional experiments by placing marsh pots at different depths to test the impacts of flooding.

SERC's climate scientists are dedicated to protecting these ecosystems, so they continue protecting us.

Looking forward

The Marine Conservation Lab entered a new partnership with Fundación Propagas in the Dominican Republic last year, to expand their coral reef monitoring to include mangroves and seagrasses. The collaboration will help local communities develop strategies for coastal resilience and climate change adaptation.

"If we don't understand how our ecosystems function and how they might shift in the future, we're unable to make plans to conserve and protect them. We can't do this alone or with only short-term projects."

Genevieve Noyce SERC senior scientist

Conservation from the land...

SERC science is all about connections: between land and sea; between predators and prey; between people and nature. By conserving species and their habitats, SERC scientists aim to keep those connections strong.

At SERC, ecologists study how to help both individual species and their habitats. Justin Nowakowski, head of SERC's Spatial Ecology and Conservation Lab, has zeroed in on the benefits of protected areas. He also helped publish the Amphibian Conservation Action Plan in 2023, to help Earth's most endangered vertebrates. In the plant world, SERC leads the North American Orchid Conservation Center — nearly 50 organizations preserving North America's 200-plus native orchids. Launched by Dennis Whigham in 2012, Melissa McCormick assumed leadership in 2024. Besides studying orchids and the pollinators they need, the center has identified essential fungi that more than half of native orchids need to grow.

SERC scientists are especially interested in forest habitats. In SERC's ForestGEO plot – part of a global forest network – scientists track how trees adapt to change. The ForestGEO team measured over 38,000 trees twice this decade, in 5-year censuses led by Jess Shue, Sean McMahon, Jess Parker and several interns and technicians. And in BiodiversiTREE, a restoration experiment led by John Parker and Jamie Pullen, scientists have watched a new forest grow for 13 years. They've discovered that diverse forests are generally better for people, climate and wildlife.

SERC's conservation work on land has a direct benefit for life in the water, as forests and wetlands help protect marine habitats from the dangers of pollution.

Looking forward

SERC is making new inroads in the ecology of cities. A series of projects in Baltimore look more closely at urban forests and green spaces, to explore how they can cool down heat waves and shape biodiversity.

"Nothing in nature stands alone, and the species that we think have no direct benefit to humans may have a critical function that we can't see."

Melissa McCormick SERC senior scientist





Top row, left: Tuberous grass pink orchid, *Calopogon tuberosus.* PHOTO: GLENN BERRY

Top row, right: Justin Nowakowski, head of SERC's Spatial Ecology and Conservation Lab. PHOTO: KRISTEN GOODHUE

Second row: John Parker walks through the BiodiversiTREE forest restoration experiment he founded. PHOTO: STEPHEN VOSS

Third row: Hourglass treefrog, Dendropsophus ebraccatus. PHOTO: JUSTIN NOWAKOWSKI

Fourth row: Aerial view of BiodiversiTREE, SERC's forest restoration experiment with roughly 17,000 trees. PHOTO: MICKEY PULLEN





Land-dwelling vertebrates are



safer inside protected areas than outside them, with amphibians and birds seeing the biggest benefits.







Children in Mesoamerica are

1/2

as likely to suffer stunted growth if they live near a marine protected area.

sustaining our food Oyster cameras

Do oyster sanctuaries work? Chesapeake oysters have plummeted to 1% of historic levels, jeopardizing a beloved seafood and way of life. Oyster sanctuaries, where harvest is limited or prohibited, remain a popular but controversial solution.

Matt Ogburn, Keira Heggie and the Fisheries Conservation Lab developed an efficient, low-cost way to measure oyster reef health: by lowering GoPro cameras into the water. A few minutes of footage allows them to quickly determine the status of restorations, sanctuaries and harvest areas. They've also recruited local riverkeepers and volunteers to help, in a project called "Oyster Cam." Together, they've discovered that active restoration in oyster sanctuaries increases the health of oyster reefs and attracts more fish and other wildlife.



Top row, left: Former SERC intern Michelle Edwards holds a bull shark on a tagging expedition with SERC's Fisheries Conservation Lab. PHOTO: JAY FLEMING

Top row, right: Cownose ray, Rhinoptera bonasus. PHOTO: JAY FLEMING

Second row: SERC dive officer Emily Anderson in Carrie Bow Cay, Belize. PHOTO: LEAH HARPER

Third row: Oysters in Maryland's Harris Creek Sanctuary. PHOTO: SERC FISHERIES CONSERVATION LAB



...to conservation in the <u>sea</u>

As a coastal research center, SERC lives in the transition zone: at the shore's edge, where the land meets the sea. SERC's marine scientists follow life underwater, to understand what truly works to protect the ocean and the resources it provides for life on land.

Marine protected areas can help people and nature. Communities near them can enjoy greater health and prosperity. But more than 90% of U.S. marine protected areas are in the central Pacific – leaving thousands of species vulnerable.

SERC scientists are busy studying some of those species and their habitats. They're tracking sharks, cownose rays and river herring migrating along the Atlantic coast. In Florida, they're studying coral reef communities. In Alaska, they've discovered the crucial role wetlands and alder trees play for juvenile salmon. And in Maryland, Katrina Lohan and the Coastal Disease Ecology Lab investigate how river otters could offer clues for human health.

SERC leads regional and global efforts as well. In 2016, in response to falling ocean oxygen, Denise Breitburg became a founding member of the United Nations' GO2NE network ("Global Ocean Oxygen Network"). In 2020, Matt Ogburn and Kim Richie took over leadership of the Atlantic Cooperative Telemetry network, which has tracked nearly 80 species along the North American Atlantic coast. And SERC is the headquarters of the Marine Global Earth Observatory led by Emmett Duffy, with partners in over 55 countries cooperating to understand the health of coastal life and ecosystems.

Looking forward

The new Mid-Atlantic MBON project is helping create more informed fisheries strategies, by assembling data from along the coastal zone environmental DNA, animal tracking, soundscapes and remote sensing – and making it accessible to everyone. Nationwide, a new collaborative initiative on America's Living Ocean launched in 2025, co-led by SERC's MarineGEO team. The initiative works with communities, indigenous groups, nonprofits, governments, scientists and fishers to implement a national-scale strategy to sustain a healthy living ocean.

Combating pollution

Runoff from sewers and farms. Mercury from power plants. Plastic in the ocean. At SERC scientists study pollution right at its source, to understand where it comes from and how to stop its spread.

In 1984, SERC ecologists made a groundbreaking discovery: Streamside forests absorb nutrient pollution from cities and farms, keeping it out of streams – and out of Chesapeake Bay, where it creates harmful algal blooms and low-oxygen zones. Since then, emeritus scientists Don Weller and Tom Jordan have uncovered more links between land use and water quality in the Bay, leading to rigorous nutrient pollution standards for the Bay's 64,000-square mile watershed.

Meanwhile Rebecca Hale, head of the Watershed Science Lab, works to combat stream pollution. Thanks to the Technology in Ecology Lab, she has a suite of automated sensors that can measure water quality every 15 minutes. She also works with cities across the U.S. studying urban stream life.

Emeritus scientist Cindy Gilmour spent her career investigating mercury. Her lab tracked how power plant regulations created cleaner air and water, and what conditions generate the toxic methylmercury contaminating seafood. In the ocean, SERC scientists are tackling plastic pollution. They've partnered with volunteers and colleagues worldwide to identify regions where oceanic plastic arrives, potentially bringing non-native species to local coasts. MarineGEO's Martin Thiel founded "*Científicos de la Basura*" ("Litter Scientists") in Chile, where volunteers sample beach litter in 11 Latin American countries. Thiel brought SERC into the project in 2022. With their international collaborators, SERC biologists trace the journeys plastic pollution makes, to generate the knowledge to combat its spread.

Looking forward

Working with the Anacostia Riverkeeper, SERC ecologists are searching for the sources of bacteria across the Anacostia watershed and testing whether on-site sensors can accurately measure water safety.

Rebecca Hale, head of the Watershed Science Lab



If all cropland in the Chesapeake watershed had streamside buffers, that could keep

54%

of the nitrogen pollution they generate out of the Bay.

Resisting invasive species

The Smithsonian has been at the forefront of tracking invasive species – and curbing their spread – for three decades. Since the 1990s, SERC research has helped revolutionize how the global shipping industry stops invaders before they arrive.

When Congress passed the 1996 National Invasive Species Act, they called on SERC and the U.S. Coast Guard to track one of the most common ways invaders spread — in the ballast water massive ships carry for stability. That act created the National Ballast Information Clearinghouse, co-led by Whitman Miller, where every commercial ship entering the U.S. reports how they treat their ballast water for potential invaders.

The past decade has witnessed astounding progress. Today, 97% of overseas vessels and 80% of coast-voyaging ships treat their ballast water. Most use on-board treatment like ultraviolet light or electrolysis rather than exchanging ballast water at sea.

SERC scientists have made gains on other fronts as well. In San Francisco, scientists with the Living Seawall Pilot Project tested ways to make the city's seawall more friendly to native life. On land, ecologists are cracking the code on how the invasive reed *Phragmites australis* spread so quickly across the mid-Atlantic. They've found some pockets where eradication is possible.

But new discoveries have upended old ideas. In 2017, Greg Ruiz and the Marine Invasions Lab helped detect

Monaca Noble, research technician, sampling ballast water



nearly 300 species that crossed the Pacific on plastic – an unprecedented voyage from Japan to Hawai'i and the U.S. West Coast. The Galápagos Islands, a UNESCO World Heritage Site, have over 50 non-native marine species: 10 times more than scientists thought. And microscopic invaders, including parasites and disease-causing organisms, have flown under the radar.

SERC's invasion scientists continue scanning the horizon, to detect and limit biosecurity threats.

Looking forward

In 2024, the Marine Invasions Lab welcomed new managing director Amy Freestone, who now co-leads the lab with Greg Ruiz. That year also saw the launch of a new pan-Americas network led by SERC. Called "COMBINA" (Coastal Ocean Marine Biosecurity International Network of the Americas), it will advance and coordinate marine biosecurity across 14 nations in North, Central and South America.

To prevent the spread of invasive species

97%

of overseas vessels treat the ballast water in their hulls for potential invaders. "Science alone doesn't solve problems. People solve problems.... People and communities are the ones who actually need to implement solutions and develop policies to sustain change."

Alison Cawood SERC Associate Director of Public Engagement

For science to make a difference, it needs to go beyond the lab. Students, educators, policymakers and concerned residents all play a part in bringing science to their communities – and deciding what issues matter most to them. The last 10 years have seen a redoubling of efforts to meet people where they are. SERC's engagement specialists are taking science beyond the SERC campus into cities, classrooms and religious centers. And in some cases, community questions are shaping the science we do.

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Our engagement

1

2400+

students have collected data in their classrooms that can help conserve orchids in the wild.

Top row, left: Teachers Elijah Moore, Candace Taylor and Jennifer Collins on a seining survey as part of the Research Experiences for Teachers program.

Top row, right: Portable bog for orchids to grow at the end of the Classroom Cultivation experiment. PHOTO: SHATIYANA DUNN

Second row, left: Shatiyana Dunn, coordinator of the Classroom Cultivation project. PHOTO: HAMPTON BRIDWELL

Second row, right: Students from Gwynn Park Middle School in Maryland prepare their orchid experiment. PHOTO: DELONTA DAVIS

Third row: Hooded ladies' tresses Spiranthes romanzoffiana, one of the orchids Alaska students are growing for Classroom Cultivation. PHOTO: SCOTT YARGER

Partnering with <u>schools</u>

True science is about asking questions and making discoveries. SERC educators are committed to bringing students and their teachers into that journey.

SERC inspires thousands of students a year through on-campus field trips led by staff and volunteers. Their education specialists also equip teachers with hands-on research activities they can bring to their classrooms.

Nowhere is this clearer than in the Research Experiences for Teachers (RET) program. First invited to SERC in summer 2022, RET teachers do science in the field or lab alongside SERC researchers. They also receive professional development sessions from Karen McDonald, Haley Jackson, Alison Cawood, and Anna Davis. At the end of the summer, the teachers design activities tailored for their students. The experience sticks: Many RET teachers continue including new research practices in their classrooms years later.

Students take part in SERC research as well. Shatiyana Dunn leads Classroom Cultivation, a participatory science project where students become orchid conservation scientists. Each classroom cares for 32 orchids under different soil conditions. Their data give SERC scientists vital clues for helping endangered and threatened orchids thrive in the wild. The project – and its predecessor, Orchids in the Classroom – has reached over 2,400 students in five states and the District of Columbia.

Looking forward

First begun in Maryland and the District of Columbia, Classroom Cultivation has expanded to schools in Alaska, Delaware and Minnesota. As each region discovers ways to help conserve its own native orchids, new opportunities emerge. In the near future, SERC hopes to open this framework to more informal education institutions, like museums, aquaria and parks.

"Teaching science is about helping others discover nature and their science identity. It's not about memorization or sitting inside four walls. We go to seek nature where it is and find ourselves."

Karen McDonald SERC education director

Partnering with <u>communities</u>

Environmental science works best when it makes people's lives better. To be truly relevant, SERC science needs input from community leaders.

When COVID-19 struck, SERC worked with libraries to bring science into people's homes. SERC staff created thousands of "Science To Go" kits, which libraries gave families for free. Each kit contained materials for a simple science activity, which families could do during a virtual meeting with a SERC scientist. The program continued for two years.

Some of SERC's newest partnerships are in Baltimore. In 2023, Rylee Wernoch began the Science and Faith Initiative. After connecting with religious leaders across the city, two major issues emerged where SERC science could help: studying how environmental restoration on faith-based properties could benefit the city, and offering educational opportunities for youth. Since the program began, 50 Baltimore high schoolers have completed paid weekend internships with SERC and Temple X. They collected microclimate and biodiversity data at church green spaces, learned to find stories within data and explored environmental issues in their city.

Nearby, Breathe Baltimore seeks to address air pollution, especially in South Baltimore. A community-inspired project, the idea emerged when the non-profit EJJI learned residents wanted access to better air quality data. SERC is setting up 15 real-time air quality sensors designed by the Technology in Ecology Lab. Conversations with community members help determine locations for the sensors. Nine sensors are already in place. These data help pinpoint which communities are most in danger – a small step toward rectifying a history of inequity.

Looking forward

The Breathe Baltimore team aims to have all 15 air quality sensors set up by the end of 2025. SERC's public engagement team continues to build relationships with local communities. Through open conservations, they're uncovering new areas where SERC science can support communities and help meet their needs.

SERC's education team sent over

8K+

Science To Go kits to schools and libraries during the pandemic.

Top row, left: High school interns collect samples in test tubes as part of the Science and Faith Initiative.

Top row, right: High school interns with the Science and Faith Initiative measure "wet bulb globe temperature" at Liberty Grace Church of God in Baltimore.

Second row, left: Air quality sensor in West Covington, part of the Breathe Baltimore project. PHOTO: ANNA HEDINGER

Second row, right: The Breathe Baltimore team beside one of 15 air quality sensors installed for the project. PHOTO: ANNA HEDINGER

Third row: Ulysses Archie, Jr., shows a high school intern an egg at his urban farm in Baltimore. PHOTO: ALISON CAWOOD

Engaging <u>volunteers</u> in science

Science belongs to everyone – and everyone can play a part in how it's done. Volunteers and students help make discoveries on scales scientists couldn't achieve alone.

Bird is the word

SERC has three participatory science projects devoted to birds. Project Owlnet, run every fall by Melissa Acuti, bands saw-whet owls at night. Each spring, volunteer Ann Johnson tracks nests and bird boxes on SERC's Bluebird Trail. SERC's newest bird project, led by Brian Evans of the Smithsonian Conservation Biology Institute, began recruiting volunteers in fall 2024 to band songbirds.

"So much of SERC science and research would not be possible without your help, and your perspective, experience, and input make everything that SERC does better. The questions we ask, the data we collect, and the stories we tell are all made better when you all are a part of it."

Rachael Mady Participatory science coordinator

Environmental Archaeology Lab

Meet the only lab at SERC made of 100% volunteers! SERC's archaeology team has grown from two to over 160 volunteers exploring Maryland history. Recent projects include the lost shell button industry in Delmarva, a 19th-century blacksmith shop, and excavating historic sites on the SERC campus. Lab members share their findings in peer-reviewed journals and professional conferences. At SERC, volunteers have worked alongside researchers for decades. But there was no organized support system for them until 2014, when Alison Cawood joined. Cawood created SERC's first Citizen Science Program, now called the Participatory Science Program. The last decade has seen an explosion of volunteer science at SERC.

Hundreds of volunteers join SERC for in-person research annually. Thousands have participated online, in SERC's virtual project Invader ID. They band owls, count plants and search for parasites. Some even use smart phones to track water quality, as part of the Chesapeake Water Watch project run by Pat Neale and Rachel Terracina.

Sometimes volunteers bring new expertise. SERC has no staff insect biologist. But in 2018, retired entomology duo Charles and Sue Staines began beetle surveys in SERC forests. They found SERC's 1,000th beetle species in 2024.

SERC also has one all-volunteer lab: the Environmental Archaeology Lab. Led by archaeologist Jim Gibb, lab members explore sites at SERC and throughout southern Maryland. The Woodlawn History Center, a 1735 house at SERC that is open to visitors, contains over 200 artifacts discovered and curated by the lab's volunteers.

Now run by Rachael Mady, SERC's Participatory Science Program continues to flourish. The last four years have seen a new focus: working with communities, riverkeepers and faith-based organizations, to ensure SERC science meets people's needs where they are.

Invader ID

SERC's first virtual participatory science project, Invader ID, engaged over 8,000 volunteers during its 4-year run. Participants submitted over 29,000 identifications of marine life on underwater panels, using photos from SERC's Marine Invasions Lab.

Looking forward

SERC's participatory science continues to expand its community focus. Urban heat islands cause problems for many city residents. Having already begun exploring urban heat and green spaces with faith-based partners, they're now looking to include data from parks and homes.

VICTORIA ROSENCRANZ

Chesapeake Water Watch

Could scientists track Chesapeake Bay water quality from space? Chesapeake Water Watch, launched by SERC photobiologist Pat Neale, wants to make it so! By collecting water samples or making measurements with smart phones, volunteers led by Rachel Terracina "train" satellites to get more accurate readings. To date they've submitted over 3,500 data points.

Parasite patrols

The Chesapeake Bay Parasite Project - a.k.a. "zombie mud crab project" - is entering its 12th year. Led by Monaca Noble, volunteers inspect tiny mud crabs for an invasive parasite that forces crabs to produce and nurture parasite offspring. Meanwhile, Rhode River Parasite Survey volunteers hunt for parasites in grass shrimp with SERC's Coastal Disease Ecology Lab.

Welcoming visitors

Every year, thousands of visitors explore SERC's campus on Chesapeake Bay near Annapolis, Maryland.

Most are already avid nature lovers. But some are tentative, or even fearful, about getting up close with the natural world. SERC staff and volunteers are dedicated to helping everyone feel at home in the outdoors, wherever they are on their journey with nature.

STEM program coordinators Karen McDonald and Haley Jackson host hundreds of school field trips every year. They're joined by a team of roughly 40 volunteers. The volunteers run stations for each group: sorting through oyster baskets, hiking through wetlands, peering through microscopes or catching fish in the Rhode River (and carefully returning them afterward). Many visiting students don't have access to green spaces. These trips can often be their first time walking through a forest, touching a fish or standing on a dock.

SERC runs a wide array of additional programs for visitors, from archaeology dig days at the Java Mansion Ruins to teen and family programs at the Reed Education Center. Since the pandemic, SERC's science webinars have attracted thousands of viewers. And in 2022 SERC opened the Woodlawn History Center, turning a historic 1735 house into a place to share stories of enslaved and free people who once lived here.

Visitors to SERC come from all over the world. International scientists and students come to collect data from SERC's long-term and large-scale experiments. Policymakers, natural resource managers and business leaders hold workshops to brainstorm solutions to the latest environmental issues. The SERC campus is committed to providing an open space not only for research, but for collaboration and problem solving.

Looking forward

SERC's newly christened Fox Creek Nature Trail (formerly the Java History Trail) will soon host a series of new trail signs, highlighting the wildlife and habitats along the path. SERC also began opening the campus to visitors on Sundays and most federal holidays in fall 2024. Thanks to the dedication of SERC's security team, 2025 will be the first full year SERC is open to visitors seven days a week.

Since reopening after the pandemic, SERC's annual visitors have grown

27%

from fiscal years 2021 to 2024.

Launching careers

Interns have walked SERC's grounds for 55 years.

The first interns arrived in 1970, just five years after the organization was born and transformed from an abandoned dairy farm into a research center. They slept in a dormitory that in a previous life was a hayloft.

In 1970, internships were a bonus. Today, they are all but essential for finding work after graduation. But many students cannot afford the luxury of unpaid internships. Since the 1970s, SERC has maintained a commitment to paying interns, ensuring equal access to these life-changing opportunities.

Over the last decade, SERC provided nearly 550 paid internships to students and recent graduates. The majority are Research Experiences for Undergraduates (REU) internships, funded by the National Science Foundation.

Even during the pandemic, SERC remained committed to providing these opportunities. Nearly all internships in 2020 – and many in 2021 – were remote. Interns performed backyard experiments, crunched data on their laptops and designed curricula for school field trips that would one day return. SERC also provided 68 paid fellowships in the last decade. Master's students, Ph.D. students and postdoctoral fellows all received funding to pursue their projects. Interns and fellows alike have published their findings in peer-reviewed journals.

These opportunities do more than open doors for individuals. By training new scientists, they move society closer to a healthier, more resilient future.

Looking forward

SERC is preparing to welcome approximately 50 interns in 2025, under the guidance of new internship and fellowship coordinator Heather Richardson. In addition to traditional full-time internships, SERC's Science & Faith Initiative has also begun working with high school interns in Baltimore, providing paid opportunities on Saturdays.

Intern Amanda Martinez, SERC Fisheries Conservation Lab

"Early-career opportunities at SERC are so valuable for people to explore their interests, connect with the environment and grow their professional confidence."

Heather Richardson SERC internship and fellowship coordinator

Reimagining a climate-friendly <u>campus</u>

Roughly 30% of greenhouse gas emissions in the U.S. come from buildings. Since 2014, SERC has led the Smithsonian in cleaner, energy-efficient construction that puts renewables at the center.

The Charles McC. Mathias Laboratory

Completed in 2014, the Mathias Lab was the first building in the Smithsonian to achieve LEED-Platinum status – the highest rating for green building at the time.

The lab relies heavily on renewables, with solar panels on its roof and above the parking lot. A field of 250 geothermal wells helps power the lab's HVAC system. Energy efficiency also receives a boost from its open passive solar design, automated lighting controls and strong insulation.

Outside the lab, a 4.5-acre wetland captures stormwater runoff and provides wildlife habitat through a series of terraced pools.

Visitor Cottages: Beyond net zero

Net-zero energy buildings make up for the energy they use, by generating equal amounts of clean energy. SERC's six LEED-Platinum Visitor Cottages go further. They produce 100% more energy than they consume and send the surplus back into the grid.

Each cottage can host up to five people, enabling visiting scientists and educators to attend multiday conferences or workshops.

Dating back to

the Woodlawn History Center is the oldest building in the Smithsonian still in its original spot.

Looking back

In 2022, SERC restored the historic 1735 Woodlawn House – the oldest building in the Smithsonian still in its original spot. Renamed the Woodlawn History Center, the house contains a walk-through exhibit on the first floor with over 200 artifacts unearthed and curated by SERC's volunteer archaeology lab.

Looking forward

A new Collaboration Commons will enable SERC to host large seminars and intimate workshops, with rooms for 20 to 175 people. Like the Visitor Cottages, it will create more energy than it consumes. And it will join the Living Building Challenge, a sustainable certification for buildings that benefit both the environment and their communities.

In memoriam

The Smithsonian Environmental Research Center lost two long-time staff members in the last decade. Both died while still employed at the Smithsonian and at the peak of their careers. Many of our accomplishments would not have been possible without their efforts, and we honor them as part of our 60th anniversary.

Paul Fofonoff leads visitors on a nature hike through a SERC forest.

Paul Fofonoff Ocean Scientist (1952-2024)

Over 500 aquatic species have entered the U.S. from abroad – and Paul Fofonoff could name almost all of them. He could also name nearly every tree, animal or flower on one of his hikes or paddling trips. During his three decades at the Smithsonian Environmental Research Center (SERC), he earned a reputation as a walking encyclopedia for wildlife.

Fofonoff joined SERC's fledgling Marine Invasions Lab in 1994.

"Paul's rare talents and immense passion for natural history were immediately evident to everyone at SERC and beyond," said Greg Ruiz, the lab's director who hired Fofonoff.

Bob Gallagher at the SERC holiday party in 2018.

last the rest of his career: NEMESIS, an online database

One year later, Fofonoff began a master project that would

Bob Gallagher Executive Officer (1954-2020)

Half the buildings at the Smithsonian Environmental Research Center would not exist without the efforts of Bob Gallagher. Nor would its most popular volunteer program. For 16 years, Gallagher served as the center's executive officer and transformed the campus.

Gallagher joined SERC in 2004, one year before director Tuck Hines would take the helm. One of his first projects – creating a new Facilities Master Plan – included a new laboratory, six Visitor Cottages, a Collaboration Commons and an Environmental Leadership Center. He lived to see one of those buildings completed: The Charles McC. Mathias Laboratory, the Smithsonian's first building to achieve LEED-Platinum for green construction. Six Visitor Cottages, also LEED-Platinum, were finished in 2023 after his death.

He also secured funds for SERC's first citizen science coordinator. Now called the Participatory Science Program, the program draws hundreds of volunteers every year to join active research projects.

for hundreds of nonnative marine species in the U.S. Fofonoff researched, fact-checked and updated profile pages detailing how a species arrived, its spread and any negative impacts. The database even included dozens of unsuccessful invasions.

"Failed species can tell you about vectors, factors affecting establishment, etc.," Fofonoff wrote of the project in 2023. "And when a species is eradicated... that's a big story."

Outside the Smithsonian, Fofonoff led a second life as an outdoors guide. For decades he led hikes, backpacking treks and paddling trips with the Appalachian Mountain Club – including an annual hiking tour of SERC. He is survived by three siblings (Stephanie, Timothy and Nicholas David Fofonoff), a niece Rebecca and nephew Alexander.

"He was the advocate behind-the-scenes, to engage key people in central Smithsonian to support our ambitions to transform our facilities and programs," Hines said. "The Mathias Lab is a miracle of his commitment. And most importantly, Bob was a good friend with a sensitive respect for SERC's community values."

Gallagher passed away from cancer in 2020 while still SERC's executive officer. He had guided the center through three presidential administrations, two government shutdowns and the first months of a global pandemic. He is survived by his former wife Tatiana Gallagher, children Larisa and Chris Gallagher and siblings David Gallagher, Anne Murphy and Eileen Witkowski.

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Every dollar fuels groundbreaking research, education and solutions for our planet's most pressing challenges.

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On the cover: Automated chambers in SERC's GenX project, measuring how global warming impacts methane emissions on coastal wetlands. PHOTO: ROY RICH

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