



In recognition of the unique role of public university research and development (R&D) in driving and diversifying private sector growth, 25 years ago our state's Legislature established the Maine Economic Improvement Fund (MEIF).

Through this targeted ongoing investment in commercially promising University of Maine System R&D, we've been able to build strategic statewide capacity to support hundreds of small businesses here to grow and create thousands of high-paying Maine jobs through new products and processes, while attracting new companies and opportunities to our state. Three-quarters of MEIF dollars are focused at the flagship University of Maine, which has expanded the external R&D funding it attracts annually to Maine from just $25 million when MEIF was born from bipartisan legislative action in the 1990s to nearly $150 million in 2022.

Today, university researchers are at work in our labs and field sites and in your districts helping our heritage industries — including farming, fishing, forestry and manufacturing — innovate for the future through new technologies and talent. At the same time, we are fostering the formation of promising new technologies, like clean energy and biomaterials development for applications ranging from health care to affordable home and highway construction.

We've also established world-class expertise essential to Maine's policymakers and always available to its people, including in climate science, rural public health and education, and most recently, forever chemicals like PFAS.

The hands-on engagement of students in all of our research activities — including undergraduates — distinguishes our state's public universities, and ensures our graduates are well-prepared to be leaders, problem-solvers and innovators in the Maine workforce and in our communities.

Given this incredible impact, it should come as no surprise that the private sector has consistently called for increasing Maine's economic competitiveness by boldly increasing public investment in UMS R&D through MEIF, which in 2022 had a 6:1 rate of return and accelerated UMaine's ascension to the top-tier of America's research universities by achieving R1 Carnegie Classification.

Doing so, they say — and our track record shows — will create more value-added Maine jobs and products, grow wages, catalyze private sector innovation and investment, and recruit and retain talent to our campuses and your communities — all while sustaining the state's abundant natural resources and special quality of life.

The University of Maine System is proud of what we have accomplished together with our students and business partners and your MEIF investment, including the success stories showcased in this year's reformatted annual report. We look forward to continuing to work with you to ensure we realize the full potential of public university R&D and of Maine's economy.

Thank you for your support,

Dannel Malloy
Chancellor, University of Maine System

Joan Ferrini-Mundy
Vice Chancellor for Research & Innovation, University of Maine System
President, University of Maine and University of Maine at Machias

Our goals:

Generate co-investment

For every $1 in MEIF funding, the University of Maine System leverages $6 in co-investment for projects in the seven sectors.

Establish and grow partnerships

University of Maine System R&D initiatives partner with Maine companies and communities to support the economy statewide.

Focus on workforce development

MEIF project funds support undergraduate and graduate students in hands-on, real-world problem-solving in career pathways.

For more information, contact Samantha Warren (samantha.warren@maine.edu) or visit umaine.edu/meif

"Boldly increasing investment in University of Maine System R&D is **essential to achieving a vibrant and sustainable economy for Maine**, and consistent with the Growth Council's long-standing recommendation to triple Maine's R&D spending by 2030."

Stephen Von Vogt
Co-Chair, Maine Economic Growth Council

R1 — UMaine is in the top 146 of research universities nationwide	Maine spends 1% of GDP on R&D, compared to 3% nationwide and 4.8% in New England	"State government can double its investment in R&D annually without running out of viable projects." Making Maine Work (2022)
Maine ranks 44th of the 50 states for R&D spending as percent of GDP	MDF Measures of Growth has set a goal of Maine tripling its R&D spending by 2030	

On the cover

The 75-foot single-span Grist Mill Bridge in Hampden, constructed in fall 2020, was the first in the nation to use fiber-reinforced polymer girders called GBeams™, designed at UMaine's Advanced Structures and Composites Center, led by executive director Habib Dagher. The UMaine-patented technology is licensed to Advanced Infrastructure Technologies in Brewer, which ships girders for bridge replacement and construction projects nationwide. With U.S. Department of Transportation funding through the Transportation Infrastructure Durability Center at UMaine, undergraduate and graduate students — tomorrow's workforce leaders — were involved in the research.

The University of Maine System is an equal opportunity/affirmative action institution.



Maine Economic Improvement Fund Report 2022

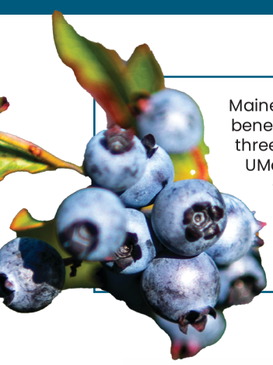


"This symbiotic relationship between the lab and industry is a differentiator for Maine, and **the perfect example of how industry, academia and the state can work together** to create nationally leading industries."

Sean Sullivan
Executive Director, Maine Brewers' Guild

Harnessing collective strengths for statewide impact

The Quality Control Collaboratory (QC2) Lab creates unique educational opportunities for University of Southern Maine science students through its quality control services to Maine's growing craft beverage industry. QC2 supports this important economic sector while educating both students and the industry on the science of their craft. With QC2, not only do Maine brewers have a world-class lab to test their beers, but the lab is staffed by students who gain hands-on experience that yields real-world results. Coupled with an internship program, this helps Maine's brewing industry develop a future workforce.



Maine's land grant university has a long history of research to benefit the wild blueberry industry statewide. Now, a one-of-a-kind, three-acre research and education site has been established at UMaine. The new Wyman's Wild Blueberry Research and Innovation Center features plots controlled for genotype, akin to research traditionally conducted in orchards or row crops. The center will provide opportunities to develop innovative production techniques and the next generation of wild blueberry industry leaders.

"Our collaboration with UMaine over the last two years has allowed Tanbark to **better understand the fiber processing we will need to meet our customer needs** and produce prototypes to enable us to move more quickly to market."

Melissa LaCasse
CEO, Tanbark Molded Fiber Products



Prototyping eco-friendly packaging

Tanbark Molded Fiber Products in North Yarmouth is a new company that is introducing packaging to replace plastic materials with innovative and custom solutions made from plant fiber, with a focus on Maine wood fiber. Tanbark reached out to UMaine and the Process Development Center (PDC) to access expertise and equipment for testing molded fiber recipes. In addition, PDC has helped support the growth of Portland's LaCasse & Weston, a producer of molded fiber machinery.



"Having the hatchery seed is way more sustainable than wild seed, as well as the perks of selecting and introducing a new gold mussel to the markets. Can't wait to see **what's next for the whole Maine mussel industry** with hatchery seed."

Evan Young
Owner, Blue Hill Bay Mussels LLC

Sustainably growing for gold

Downeast Institute in Beals, the marine science field station for the University of Maine at Machias, has worked with Blue Hill Bay Mussels to develop methods to supplement Maine mussel farms with hatchery seed to maximize production, making the farms more resilient. Ropes can be seeded either with traditional blue mussels or the distinctive gold-striped mussels that Downeast Institute selectively bred to create a unique Maine product. Investment in hatchery-based mussel seed has had major implications for farms, allowing them to provide more product for a growing market without depleting the wild fishery.

Innovative technologies in a heritage industry

Sappi North America and UMaine biomedical engineer Caitlin Howell and her research partners are collaborating to link Maine's strength in papermaking technology with the cutting-edge needs of the biotechnology industry. The result is "a new set of tools" for the bioscience sector and potential markets for a heritage industry. The paper-based innovations, which are lightweight and cost-effective, and can be rapidly mass produced, include a microfluidic water purification system, diagnostic microfluidic devices at the microdroplet scale, and surface contamination detection instruments.

"Collaboration with UMaine on innovative, paper-based solutions brings **fresh insight, providing critical technical validation and access to market-demanded applications** that leverage the nanoscale texturing capability of Sappi's Ultracast® paper manufacturing process."

Mark Hittie
Sappi Director of Release Business Strategy

Rumford native Liza White knows the importance of paper mills to rural communities. As a UMaine undergraduate, she heard about associate professor Caitlin Howell's research with Sappi North America to explore new, innovative uses of paper to meet biomedical needs. Finding next-gen products to help the pulp and paper industry was important to the first-generation university student from a Maine mill town. White plans to turn her years of industry-related R&D research as an undergraduate and now a Ph.D. student into a career when she graduates in 2025.





In the past decade, the UMaine potato breeding program, in partnership with the Maine Potato Board, has released five new varieties — Easton, Sebec, Caribou Russet, Pinto Gold and Hamlin Russet — that had the competitive yield and quality attributes necessary to move them from the laboratory to market shelves. Nationally, varieties released by UMaine and its eastern regional collaborators were grown on 7,369 seed acres during 2021 with an approximate seed value of $25.8 million and potential ware production value of $239.4 million.

MEIF Small Campus Initiative

The Small Campus Initiative (SCI) is an MEIF competitive grant program that helps to build capacity for research and development in the state at the Universities of Maine at Augusta, Farmington, Fort Kent, Machias and Presque Isle, and Maine Maritime Academy.

Funded projects:

- Statewide mapping of intertidal seaweeds using drones (MMA)
- ME MADE: Makerspaces for Abilities Driving Entrepreneurship (UMF)
- Using remote sensing data to assess forest health (UMFK)
- Applied R&D to promote shellfish aquaculture (UMaine Machias)
- Distributed machine learning approaches for big data analysis (UMPI)
- Modernization the medical laboratory technologist program (UMA)
- Developing the "next-generation environmental scientist" through eDNA community-based biomonitoring (MMA)
- Using high-frequency sensors to track water clarity and seasonal change in Maine lakes (UMF)
- Cybersecurity range and scenario builder (UMA)