



**Executive Summary..... 3**

**Alaska's economy is based on knowledge. Research – the expansion of knowledge – can improve the state's resilience and competitiveness and contribute to human progress. While Alaska's vast size but**



**Developing Alaska's science and technology capabilities is critical to the state. Research is widely recognized as the most significant engine of economic growth, and also constitutes an economically significant "industry" in its own right. The University of Alaska, for example, conducted \$154 million in sponsored research in 2021-22, including \$136.5 million at the University of Alaska Fairbanks.**



**This report is a product of the Alaska State Committee for Research (SCoR), an advisory body created to function as the state committee for Alaska EPSCoR (Established Program to Stimulate Competitive Research) and EPSCoR-like programs. This responsibility includes**

**Oversight and guidance for EPSCoR and EPSCoR-like programs in Alaska as competitively funded by the National Science Foundation and other federal agencies**

**Promoting research and development as an enterprise and as an engine for economic development in Alaska**





## **Strategies**

**Alaska NSF EPSCoR has crafted a 5-year (2023-28), \$20 million research proposal, entitled "Glaciers to Gulf," to study how climate-induced landscape change is impacting marine resources critical to communities on the Gulf of Alaska. Members of impacted communities were extensively involved in crafting the proposal and will serve as advisors and collaborators throughout the project. Outcomes of the research will include valuable new data streams as well as web tools, reports and visualizations for communities to use in preparing for, and living for,**



***Introduction*** Oil has been the linchpin of Alaska's economy for a half-century, but Alaskan production is down significantly from its 1988 peak. However, according to the U.S. Geological Survey (USGS), Alaska still contains the largest undiscovered conventional oil and gas potential in the nation and also has significant unconventional resource potential in tight gas, shale oil, and coal reservoirs. Alaska also has large reserves of strategic minerals, which have received considerable recent attention at both the state and national levels. The state seeks to provide innovative solutions to extractive industries to improve efficiency, especially during financially difficult times.

### ***Research Initiatives***



economic security goals. The 2022-23 state budget also included specific appropriations for critical mineral and rare earth element research at the UA.

**The Alaska State**

The Food-Energy-Water (FEW) nexus is the intersection of three interdependent components that, together, are needed to sustain life. FEW research in Alaska focuses principally on the interrelated ways to provide these three necessities to the state's isolated towns and villages. These unique communities have ample supplies of clean water, electrical microgrids separated from larger grids, and a history of hunting and fishing but little agriculture.

**Agriculture.** Alaska's isolation and climate make it extremely "food insecure" and it is estimated that less than five percent of food eaten in Alaska is produced in the state. Alaska's short but highly productive growing season has strong potential for large-scale agriculture, but less than 1 million acres statewide are used for farming. There are also economic opportunities in certain high-value agricultural products for which Alaska's high latitude is an advantage, such as reindeer antlers, peonies, and goldenroot. Research into bolstering local food production and improving food security is thus critical to the state as a whole, as is continued study of the nexus of food, energy and water. (Mariculture is discussed in Arena 4)

**Renewable Energy.** Generating renewable energy is a primary focus of Alaskan FEW research. Energy prices in parts of Alaska, especially rural Alaska, are astronomical; more cost-effective methods of energy production and distribution are crucial to ensuring the future of the state's remote communities. In addition to conventional energy resources (see Arena 2), the state's landscape holds significant potential for alternative energy. Alaska contains abundant fossil fuel alternatives, including more than 50% of the nation's wave energy resources and over 90% of its river current and tidal energy resources. Renewable energy possibilities for Alaska include



projected changes to their communities' growing conditions, such as changes in growing season length, annual minimum temperature and hardiness zones. The state Division of Agriculture received a recent USDA award to increase its technical assistance capacity within the state, focusing primarily on the peony industry, which is one of the fastest growing and promising industries in Alaska agriculture.

In 2017 the Alaska Energy Authority (AEA) - an organization charged with coordinating state energy priorities - produced the Alaska Affordable Energy Strategy, which outlines ways to deliver cost-effective energy to rural areas of the state. The authoritative report identifies new infrastructure opportunities for delivering more affordable energy, and examines the efficacy of existing energy programs and of potential policy or regulatory changes that could contribute to more affordable and reliable consumer energy in rural communities. AEA more recently produced a Renewable Energy Atlas highlighting potential energy sources statewide, and also discussing energy efficiency.

In recent years, various state funds have been used for widespread biomass, geothermal, wind, hydropower, waste heat recovery, and energy efficiency projects, including capital funding in the 2022-23 state budget. Most significantly, a Renewable Energy Grant Fund established in 2008 has awarded \$275 million to 244 renewable energy projects. ACEP has been the central vector for renewable energy research, including recently funded projects focused on hydrokinetic turbine designs for tidal and riverine currents and on home heaters that store renewable





earning them recognition for their aesthetic and structural properties. Market research can also help in the development of value-added products. The state also works to facilitate wood energy, including the use of low-grade timber, wood waste and wood pellets for biomass projects. Field trials of alternative systems, including balers, forwarders, and in-field chipping systems, could help reduce biomass harvest and transportation costs.

## Strategies

UA has made recent strides toward becoming a world-class ocean change research engine, including establishing an Ocean Acidification Research Center and operating [the R/V Healy](#), a global-class ice-capable research vessel; the latter is slated for \$94 million in improvements to its homeport in Seward. In 2018, the Northern Gulf of Alaska Long-Term Ecological Research (LTER) was established to perform oceanographic observations to better understand climate change at established station locations in the Gulf of Alaska.

In 2016, the state created a Mariculture Task Force, which delivered a final report in 2021 with recommendations to boost Alaska's mariculture industry. This final report indicates that further maricultural research is needed to facilitate growth of the aquatic farm industry, including studies of maximizing growth rates, identifying innovations for efficiency, identifying and mapping natural limiting factors to production such as weather and water current exposure, and understanding genetic relationships among areas to ensure permitting of sustainable mariculture.

Alaska NSF EPSCoR's proposed "Glaciers to Gulf" project will directly address research needs indicated in the state mariculture plan. The five-year project would use remote sensing, modeling, environmental data, field surveys, and lab and field experiments to understand and quantify changes to freshwater and material export into the Gulf of Alaska, and how this impacts species critical to mariculture and subsistence harvests. The effort would materially improve the ability of marine harvesters and farmers to respond to climate-driven landscape change.

The state Mariculture Plan also led to the creation of an Alaska Mariculture Alliance and a number of legislative actions designed to foster development of the industry, including streamlining permitting processes and establishing a state revolving loan fund for mariculturalists. The state earmarked funds in its 2022-23 budget for mariculture research, industry support and workforce development. Another major development was a 2022 UA conference, "Mariculture for Alaska's Future: Status, Challenges and Opportunities," that brought together practitioners, regulators, policymakers and scientists to support expansion of the industry. A UA researcher also collaborated with Alaska Sea Grant and the Native Conservancy to develop a site assessment toolkit to help help farmers test locations for potential placement of their farms, which has since been licensed for production by a California company.



Alaska's 586,412 square miles encompass a wide array of terrestrial and marine ecosystems, which support diverse wildlife and abundant commercial, recreational, and subsistence resources. The Alaskan environment, to a large extent, defines the people of Alaska, and ensuring the health and sustainability of this environment is crucial to the state as a whole.

**Monitoring Environmental Change.** High-quality climate observations over extended periods are the only way for researchers to tease out natural versus human-induced change, an essential element of understanding and predicting climate patterns. The state seeks to facilitate this

**environmental monitoring resource assessment, autonomous underwater vehicles and small satellites**

**Fire and Earth Science**

**Fire research in Alaska is spearheaded by the Alaska Fire Science Consortium, an interagency group headquartered at UAF's International Arctic Research Center. The mission of the consortium is to coordinate fire science delivery efforts and to facilitate communication between scientists and resource managers. The current NSF EPSCo**

**“One Health” refers to integrated research into the interrelated subjects of human, animal and environmental health - a critical area of research, education and outreach that has seen increased emphasis in Alaska. Major Alaskan health issues include environmental contaminants and infectious diseases, as well as chronic maladies like heart disease, cancer, and diabetes, and preventable conditions like obesity and substance abuse. Alaska’s location on bird migration routes makes it susceptible to avian-borne pathogens, while climate change may increase the distribution, spread, and**





**Alaska has less transport and communication infrastructure than any other state. The state has potential for pioneering approaches to land and sea transport, aviation, aerospace, and information technology. In addition, improved telecommunications through the Arctic would place Alaska at the crossroads of global telecommunications, data, and financial networks and position the state for economic growth and new technology industries.**

**Shipping. Alaska is heavily involved in addressing safety, environmental and**

Thus, scalable networks taking advantage of microwave, optical fiber cable, and satellite technologies will offer a variety of new opportunities. An important technology in this context is low earth orbiting (LEO) communication satellites, which can enable a wide range of data speeds in unpopulated areas. This technology can be improved by research aimed at solving problems of space debris, light pollution, and satellite-to-satellite radio interference. Also important will be research aimed at techniques for laying optical fiber cable over permafrost soil, through river crossings, and in riverbeds.

### **Strategies**

Alaska's priorities for the Arctic entail promoting economic and resource development, including facilitating new port systems and improving marine infrastructure to strengthen Alaska's capacity to

orbit using a privately-owned rocket, which has staged five launches at the facility.

Alaska Governor Mike Dunleavy established a Governor's Task Force on Broadband in 2021, which issued a final report in December 2021. The panel identified communities most in need of upgraded or new infrastructure, recommended a buildout plan for bringing high-speed broadband to all Alaskans, evaluated broadband technologies, identified hurdles to deployment, and provided recommendations for state participation and funding. As a result, the Alaska Legislature established

The most significant way for the state of Alaska to contribute to S&T innovation is through ensuring quality K-12 and university educations, especially in science, technology, engineering and math (STEM) fields. The contributions of engineers, scientists, and other STEM workers are critical to the state, as they solve pressing problems and bolster the economy.

K-12 Education. Alaska's biggest educational challenge is K-12 teacher retention, especially in rural areas. At issue is not just retention in general, but t— Ú ‡ K







Improving Alaska's S&T landscape requires cooperation between leaders in government, academia, research groups, business, and organizations. Perhaps the most important way state and local agencies can foster increased S&T development is to provide entrepreneurs with support to cross the "valley of death," the challenging step between developing a product and actually producing and marketing it. This support can take the form of instruction and business connections, or the more direct form of venture capital. Several programs already exist in Alaska that provide financial support and other services to inventors hoping to establish a market for their innovations.

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**Center ICE runs an Innovation Accelerator to support the development of academic research into real-**



