

**Arizona Higher Education Enterprise
Technology and Research Initiative Fund (TRIF)**

**Five-Year Project Plan Summary
July 1, 2016 through June 30, 2021**



NORTHERN ARIZONA UNIVERSITY

Contents

| | Page |
|---|-------------|
| <i>Executive Summary</i> | 3 |
| <i>Outline of University mission/goals/values</i> | 5 |
| <i>Outcomes</i> | 6 |
| <i>Budget Summary</i> | 7 |
| <i>Marketing/Communication overview</i> | 7 |
| <i>University Administration of TRIF</i> | 8 |

Executive Summary

Northern Arizona University (NAU) has long been recognized for impactful research in forest management and environmental sciences, astronomy and planetary science, and biosciences and biotechnology. The work done in these fields provides a strong research foundation to advance creativity and collaboration, and enhance NAU's leadership position within the Northern Arizona community.

The establishment of the Technology and Research Initiative Fund (TRIF) has helped the university expand on these key research strengths—driving innovation and discovery, and creating new knowledge that improves life quality in the region and beyond. The implications are far-reaching, affecting workforce and economic development, social welfare, environmental stewardship, and more.

Northern Arizona University's proposed Five Year TRIF Project Plan continues to build on the impact and successes of the past 15 years of the program. In addition to continuing programs in *Access and Workforce Development*, *Improving Health (iHealth)*, and *Water, Environmental and Energy Solutions (WEES)*, this Plan includes significant investments in two new initiatives—*Exploring Planetary Systems* and *National Security Systems*, addressing all five research areas under the Arizona Higher Education Enterprise Technology and Research Initiative Fund.

The addition of these two new initiatives is possible due to our success in generating returns on investment across WEES and iHealth, and their precursors, over the past fifteen years, and based on increased research capacity recently acquired and developed in cybersecurity and computational sciences, and in Astronomy. This increased capacity is demonstrated through the recruitment of a significant number of new research-intensive faculty, and through the development of interdisciplinary PhD programs in Informatics, Astronomy and Bioengineering. We will apply proven strategies for investing TRIF funding across all four research initiatives, generating external funding, commercializing research outcomes, and training large numbers of undergraduate and graduate students. By producing a skilled workforce, we will help to attract and retain businesses in the state, while innovating for the creation of new business endeavors led by our graduates and faculty.

Under all of its FY17 – FY21 TRIF initiatives, Northern Arizona University will pursue scientific discoveries and cutting-edge technology developments that will (a) train undergraduate and graduate students for a knowledge-based workforce in Arizona, (b) transfer new knowledge and technology to Arizona companies to improve their economic competitiveness, and (c) continue to increase external funding to support our mission and stimulate the Arizona economy. In addition, we will serve rural and urban communities throughout Arizona, providing opportunities for all Arizona citizens to reach their educational goals.

Water, Environmental, and Energy Solutions (WEES). Northern Arizona University's programs under the WEES initiative are based on the understanding that Arizona's natural resource base drives the viability of key economic activities of tourism, farming, ranching and recreation. WEES supports rigorous scientific research, sound scientific and technical assistance, and information transfer to landowners, managers, and stakeholders. NAU's efforts under the WEES initiative help to minimize the risks of catastrophic wildfires and

rebuild a strong forest products economy in Arizona, maintain affordable and secure water resources across the state, and resolve multiple-use conflicts through collaborative planning and analysis.

Improving Health (iHealth). Northern Arizona University's efforts under the *Improving Health (iHealth)* initiative expands Arizona's biosciences economy by building increased research capacity in the biosciences/bioengineering and health research areas. Our research programs in health and the biosciences directly affect Arizonans through hospitals and healthcare institutions, medical technology industries, and by addressing healthcare disparities for underserved populations (Native American, Hispanic, and rural poor). The resulting solutions and discoveries are translated into economic activity through healthcare practice, workforce development, and technology transfer.

National Security Systems. Banking, health care, energy, travel, and manufacturing are just some of the industries that require (a) increasingly more secure means of protecting data and thwarting deliberate attempts to disrupt computer networks, (b) ever more sophisticated approaches to safeguarding computing systems operations, and (c) a more cyber-savvy workforce. We see this growing need as a core national security priority that will affect thousands of Arizona businesses in the coming decade. Cutting edge research in this area will be needed in real time, and a highly qualified and dynamic workforce will be necessary to meet these challenges.

Exploring Planetary Systems. Northern Arizona University's investment in *Exploring Planetary Systems* will leverage the state-of-the-art astronomical resources found in Northern Arizona to prepare a workforce with unique skills that will strengthen Arizona's stature as a worldwide leader in astronomy and planetary science research. Institutions in Arizona employ approximately 2,000 people in this field, with a payroll exceeding \$84 million. Under this initiative, NAU post-docs and graduate students will develop cutting-edge skills that will prepare them for high-paying positions in Arizona. A key aspect of our program under this initiative will include a specialization in the development and commercialization of customized instruments that will be sought after by astronomers and planetary sciences worldwide for use on Cubesats—miniature satellites now used for many aspects of space research.

Access and Workforce Development. The Northern Arizona University Access and Workforce Development (A/WD) initiative addresses the needs of Arizona employers and their current and future employees in the areas of Education and Health Sciences in response to the 2025 ABOR Strategic Goals. The initiative includes the development and delivery of courses and degree programs to support health and education fields, and the use of technologies to increase student achievement, accelerate student progress through degree completion, and enhance efficiency across university courses and programs.

Investments from Proposition 301, passed by the voters in 2000, through the Technology Research Initiative Fund have had a dramatic impact on Northern Arizona University's Extended Campus and research enterprise—providing direct economic benefit through advances in science, workforce training, and access to a higher education for all Arizonans.

University mission/goals/values

Mission

Our academic programs, research, public service, and creative endeavors enrich lives and create opportunities in Arizona and beyond. We develop solutions to challenges and drive innovation in a supportive, inclusive, and diverse environment.

Vision

Rigorous programs and pioneering research with substantial community impact provide the foundation for transformational student opportunities that prepare graduates to excel in creating a sustainable future, nationally and globally.

- NAU is distinguished for its quality of teaching, focusing on student-centered learning experiences in creative environments and for its dynamic research. We challenge students to adapt and respond to evolving social pressures and global issues.
- NAU is celebrated for its personal and transformational relationships that enhance educational opportunities. We empower students to succeed by ensuring accessibility and inclusiveness of diverse experiences and backgrounds.
- NAU is renowned for its national and global leadership and service as our graduates guide the world toward a vibrant future, creating cultural vitality, superior education, improved public health, and positive economic outcomes throughout our communities.

Strategic Goals

- Student Success: Promote high levels of student access, engagement, achievement, and affordability.
- Nationally Recognized Research Excellence: Expand the boundaries of knowledge to improve lives.
- Global Engagement: Advance the internationalization of the university to prepare students for global citizenship.
- Diversity, Civic Engagement, and Community Building: Promote issues of diversity, civility, democracy, citizenship, and community engagement and collaboration.
- Commitment to Native Americans: Become one of the nation's leading universities serving Native Americans.
- Sustainability and Effectiveness: Exemplify a sustainable, innovative, and effective university community.

Institutional Values

- Excellence in Education—Offer a rigorous, high-quality education to all students

- Student Success—Place learner needs at the center of our academic and service planning, policies, and programs.
- Educational Access—Provide all qualified students with access to higher education.
- Diversity—Achieve multicultural understanding as a priority of educational and civic life.
- Integrity—Operate with fairness, honesty, and the highest ethical standards to sustain a community of trust.
- Civility—Support a civil, engaging, and respectful campus climate.

Outcomes

The goal of the Technology and Research Initiative Fund is to stimulate Arizona’s knowledge-based economy by supporting innovation, entrepreneurship, research and development, and workforce development, as well as the infrastructure needed to advance in these areas. The capacity of TRIF activities to accomplish this goal is measured through the generation of a set of deliverables in three primary areas:

Financial Impact: Sponsored awards; gifts and external funds from other sources; intellectual property income. TRIF funds are leveraged to attract external funds from the Federal government, industry and other public and private sponsors from outside of the State of Arizona. These funds are spent by the university on local goods and services needed to conduct the work, and to pay wages to students and employees who pay income and sales taxes, thereby stimulating the local economy. Over the past 9 years (2007 – 2015) that financial impact of TRIF research initiatives has been measured in leveraged funding, Northern Arizona University has generated more than \$1.50 for every TRIF dollar spent on research, or \$94.6 million dollars in external grants, contracts and gifts.

Technology Transfer Activity: Invention disclosures transacted; U.S. patents issued; licenses and options executed; start-up companies. The four technology transfer deliverables represent stages of technology commercialization and are among the major goals envisioned by the TRIF program. These outcomes have the potential to generate economic activity, create jobs, and benefit Arizonans through the introduction into the commercial marketplace of new devices, drugs and other innovations that improve lives. In addition, the revenue received by the university through licensing of new technologies is invested back into the university research enterprise.

Workforce Contributions: Post-doctoral scholars; graduate students; undergraduate students. Many activities funded by TRIF at NAU enable faculty to engage post-docs, graduate and undergraduate students in advanced research and development activities that enhance their technical skills and make them more competitive job seekers. Thousands of NAU students, K-12 teaching professionals, community college students, tribal professionals and other community-based stakeholders have received advanced training and valuable professional and technical skills through the university’s TRIF programs in research and workforce development.

Other important outcomes of NAU's TRIF activities are partnerships and collaborations with public and private organizations. Under this five-year plan, we aim to build new and stronger relationships across all four Research initiatives. Under *Improving Health*, we will build upon growing partnerships with Northern Arizona Healthcare (parent company of Flagstaff and Verde Valley Medical Centers), North Country Health Care and its Cancer Center, the Northern Arizona Regional Behavioral Health Authority Institute, and others to increase research collaborations and build capacity to conduct clinical trials. Under *Water, Environmental and Energy Solutions*, long-term partnerships with federal government entities such as the USGS, National Park Service, U.S. Forest Service and the Bureau of Land Management will continue to generate environmental, economic and social wellbeing improvements for stakeholders across the rural portions of the State. Under *Exploring Planetary Systems*, we will partner with Lowell Observatory, the USGS, United States Naval Observatory, the Naval Research Laboratory, the Naval Precision Optical Interferometer, and the Discovery Channel Telescope to study the origin and evolution of planetary systems through telescopes. Finally, under NAU's *National Security Systems* initiative, we will build upon existing partnerships with our sister institutions as well as develop collaborations with industry partners to conduct and translate cutting-edge research and build a highly-skilled workforce that can address the computing and cybersystems challenges of the 21st Century.

Budget Summary

NAU has been allocated 20% of the total TRIF fund, or approximately \$76.3 million during the FY17-FY21 Plan period. NAU's TRIF operating and capital budgets align with the ABOR Enterprise Strategic Plan and the 2025 Enterprise metrics supporting that plan. The budgets are planned to dedicate an increasing amount to one-time capital throughout this five year plan as a way to build NAU's research and program capacity within these key initiatives through the renovation and construction of new labs and facilities. These capital investments will support NAU's continued growth in research and public service expenditures and in further expanding key program areas in the high demand fields of Health Professions, STEM, and Education. The specific investment decisions as whether to renovate, versus add new space will be made in context of maximizing the impact of these investments within the context of NAU's overall space management strategy.

Marketing/Communication overview

As part of the outcomes that we generate from the five TRIF initiatives outlined in this introduction, we will develop and execute marketing and communications strategies to raise awareness of TRIF initiatives and outcomes. All marketing and communications materials will report our progress toward each goal, returns on investments from external grant funding, describe new discoveries and their translations through commercial use, highlight workforce training successes, and emphasize associated economic growth across the State.

We will carry out this communications and marketing activity with the goal of reaching Arizonans and demonstrating how the TRIF money is being used wisely for the good of the citizens of State. We will demonstrate the effectiveness of our TRIF investments in the following ways:

- We will create a TRIF website at NAU that will provide regular updates on TRIF successes and progress toward major goals. These updates will cover research discoveries, technology innovations, workforce growth, economic developments, and new metrics that will be readily accessible for viewers coming onto the website. We will promote the website through different tactical efforts to drive visitors to the website to learn more about the work. This will include using publications, social media, news coverage, and other mediums as appropriate. In addition, we will track website visits to measure the success of communications efforts and make adjustments according to the findings.
- We will provide stories for news outlets that highlight TRIF supported successes that impact the region and state economy. We will track the success of these placements using analytics and make adjustments as needed to ensure the message is being successfully distributed.
- We will incorporate these stories in specialty publications and presentations, targeting a broad audience of influencers including potential financial partners, government and business leaders, community advocates and citizens, and more as appropriate. Specific venues may include NAU Campus Forum presentations, ABOR updates, NAU Annual Reports, Alumni or other specialty magazines, etc.
- We will use social media to create excitement and present information on how TRIF investments are leading to economic growth and new jobs. These updates will be aligned with other university marketing and communications efforts to ensure the greatest impact in the marketplace.
- We will report regularly to ABOR and other venues on TRIF supported discoveries and new workforce training initiatives that improve the quality of Arizona's workforce.

University Administration of TRIF

Research. Northern Arizona University's five Research-focused TRIF initiatives are coordinated through the Office of the Vice President for Research. As the institution's senior administrator with primary responsibility for research, the Vice President for Research (VPR) has overall administrative responsibility for developing, facilitating and stimulating research activity at NAU, for enhancing and managing external funding, and for determining the strategic direction of the university's research enterprise. In that capacity, the VPR is well-positioned to provide leadership in the planning and implementation of this Plan.

The Office of the VPR provides the necessary infrastructure to manage and allocate TRIF funds and coordinate programs through numerous investment mechanisms across the four initiatives. Senior staff, including the Associate Vice President for Research and Director of Technology Transfer, share responsibility for managing the TRIF program by providing direct oversight of the use of TRIF funds by research centers and individual faculty, providing technical and administrative assistance to the recipients of TRIF-funded awards, and by monitoring and reporting on outcomes annually.

TRIF budgetary oversight is provided by the Office of the Vice President for Research and the NAU Office of Budget and Planning.

Access and Workforce Development. Programmatic oversight for A/WD is in the Extended Campuses division with the Vice President for Extended Campuses directly responsible for the activities. By integrating the initiative into ongoing Extended Campuses operations, sustainability is ensured. For FY17 the Extended Campuses enterprise has a proposed budget of \$37M, including \$3.6M in TRIF dollars.

Programmatic responsibility for the e-Learning Center is in the Office of the Provost reporting to the Vice Provost for Academic Affairs. The e-Learning Center provides expert learning design, educational graphics and creative design, learning technology implementation and services, and training support for all faculty members at NAU, regardless of location.