



NSF ASCEND Engine
in Colorado and Wyoming

Strategic Plan Executive Summary Years 3-5

A national model for place-based
innovation in environmental
intelligence and resilience

THE OPPORTUNITY

A regional response to national challenges

The challenge is urgent—and the market is massive. Communities across the American West are struggling to predict, prepare for, and respond to increasingly frequent and severe wildfire, drought, and extreme weather events.

ASCEND, which stands for Advanced Sensing and Computation for Environmental Decision Making, describes the data value chain that the Engine seeks to create.

The U.S. National Science Foundation ASCEND Engine in Colorado and Wyoming is a federally funded Regional Innovation Engine that harnesses advanced sensing, computational modeling, and AI-powered decision support to deliver scalable, real-world solutions to these challenges.

Headquartered along the I-25 Innovation Corridor—one of the densest concentrations of federal laboratories, research universities, and innovation-driven companies in the nation—the

ASCEND Engine is building the research infrastructure, partnerships, and talent pipeline necessary to make our region a global leader in environmental intelligence.

The ASCEND Engine is targeting multi-billion-dollar market opportunities in the areas of wildfire detection and prediction systems, water modeling software, and soil monitoring.

Beyond meeting market demand, advancing U.S. environmental intelligence is a national security imperative. U.S. leadership in ASCEND technologies is not assured.

China now accounts for over 80% of global ASCEND-related patent filings.¹

Colorado-Wyoming ranks in the top five US regions for overall ASCEND invention volume, and is poised to challenge Chinese dominance in this area.

1. Denizens LLC, 2025, Strategic Positioning in ASCEND Technologies: Why Colorado-Wyoming Matters Now, Brooklyn, NY.



ASCEND Engine's project team at the University of Colorado - Boulder leads cutting-edge AI/ML modeling to quantify the financial impact of wildfire risk in the built environment (PI: Virginia Iglesias, PhD).

THE FIRST TWO YEARS

The ASCEND Engine's impact

\$48M in GDP

ESTIMATED CONTRIBUTION (VALUE ADDED)

690 new jobs

CREATED WITHIN THE ECOSYSTEM

\$34M

IN R&D AND COMMERCIALIZATION LEVERAGED RESOURCES

\$4.8M awarded

TO 17 STARTUPS IN R&D AND COMMERCIALIZATION GRANTS

500+ students and interns

ENGAGED IN SKILL-BUILDING AND OUTREACH PROGRAMMING

130 internships

SYSTEMS ENGINEERS PLACED

22 startups

GRADUATED FROM THE DIGITAL TWINS AND THE
EARTH & SPACE SYSTEMS ACCELERATORS

4 ASCEND-related companies

RECRUITED TO THE REGION

ANTICIPATED LENGTH OF FUNDING

Total 10 year impact

\$3B¹

GDP BOOST

\$2B¹

CAPITAL RAISED

18K¹

NEW JOBS

2,500

UPSKILLED INDIVIDUALS

145

STARTUPS ACCELERATED

1. Projections provided by Metro Denver
Economic Development Corporation.

A nationally unique coalition for environmental intelligence

The ASCEND Engine's ecosystem-building strategy follows a proven framework for regional economic transformation.¹ Our approach moves through five progressive stages:





- 1** **Connect** - build cross-sector networks to solve challenges.
- 2** **Orient** - align stakeholders around a unified vision and priorities.
- 3** **Activate** - provide targeted programs, resources, and funding.
- 4** **Integrate** - coordinate projects and efforts into one connected system.
- 5** **Mobilize** - collect resources through sustainable and varied financial models to maintain long-term momentum.

1. Ecosystem approach credited to and adapted in partnership with Ryan Donahue and Francie Genz.

Most innovation ecosystems struggle to advance beyond the “connect” phase. The ASCEND Engine is already operating at the “orient” and “activate” stages, a distinction validated by **Brookings Metro, which has selected the ASCEND Engine for a national research series on top-performing innovation ecosystems.**

The ASCEND Engine currently has 40+ partners spanning research universities, federal laboratories, corporations, startups, investors, workforce organizations, and civic institutions.

Over the next three years, the ASCEND Engine will:

-  **Build** a resilient ecosystem that connects researchers, entrepreneurs, communities, businesses, and policymakers.
-  **Launch** large-scale, cross-disciplinary programs that integrate sensing, analytics, and decision tools.
-  **Strengthen** pathways, from discovery to deployment.
-  **Develop** a generation of workforce talent anchored in the Colorado–Wyoming I-25 Innovation Corridor.

OUR TECHNICAL FOCUS

Three technical areas powering a scalable innovation pipeline

ASCEND investments increase the interoperability, scalability, and operational readiness of a broad constellation of advanced sensing assets within the ASCEND ecosystem. With these assets, the ASCEND Engine has created a data pipeline for physics-informed AI and deep-learning models that can produce actionable insights for decision makers.

ADVANCED SENSING AND DATA GENERATION

Capturing the world as it is

The ASCEND Engine invests in innovation that supports cost-effective, high-quality, and easily deployed environmental sensing assets. This includes aerial and space-based remote sensing, field-based dual-comb spectroscopy, and distributed in situ sensor networks. Importantly, the ASCEND Engine also plays a critical role in shaping standards, validation, promoting interoperability, and incentivizing competition through massive, open datasets.

COMPUTATIONAL ANALYTICS

Turning data into understanding

The ASCEND Engine believes that blending physics-based and data-driven approaches is critical for advancing trustworthy AI that can extract insight, predict risk, and explore future scenarios at scales relevant to real-world decisions. The ASCEND Engine invests in key areas such as physics-informed machine learning, surrogate modeling, and edge-computing techniques that transform large amounts of sensing data into usable intelligence. The ASCEND Engine resources our ecosystem with unprecedented high-performance computing and hosts hackathons and trainings to infuse our portfolio with deep learning expertise.

DECISION SUPPORT

Putting science to work

The “last mile” of the ASCEND value chain, this technical area closes the loop by transforming research into decision-support tools, commercial products, and public services for wildfire preparedness, water management, soil health monitoring, and air quality using multi-layer digital twins. These simulation environments combine real-time sensing data with physics-informed AI to establish predictive, adaptive decision-making for critical infrastructure and natural systems—serving both commercial markets and public sector needs.



The ASCEND Engine's investments connect and bind a complex value chain that enables next-generation environmental intelligence that is trustworthy, faster-than-real-time, and offers multi-layer decision support.

Over the next three years, the ASCEND Engine will focus this innovation pipeline on the defining challenges of wildfire and drought through our flagship investment platforms of ARID and SHIELD (see page 6).

Dual-use strengths

The same sensing, modeling, and AI capabilities that protect communities from wildfire have direct applications in national security—from autonomous navigation and geospatial intelligence to critical infrastructure protection. The ASCEND Engine serves in a leadership role for the first-of-its-kind Homeland Defense and Resilience Framework, led by the Colorado National Guard, which operationalizes and scales these technologies for resilience at the state and national level.

Virridy, a spinout of the University of Colorado - Boulder supported by the ASCEND Engine, develops low-cost sensors for continuous, passive water quality monitoring (PI: Evan Thomas, PhD).

THE NEXT PHASE

Scaling innovation through investments in testbeds and pilot environments

The **ASCEND Engine** is shifting from ecosystem discovery and early-stage investments to large-scale, integrative programs using an industry consortium model designed to serve as foundational infrastructure for continuous commercial activity. Using this approach, the ASCEND Engine has launched two flagship programs in 2026 with plans to launch a third in 2027.

ARID

Asset Resilience through Intelligent Digital Twins

ARID will create transformational impacts for power and water utilities facing the growing threat of wildfire.

The program provides a simulation platform for the integration and validation of high-resolution wildfire-relevant weather conditions, fuels monitoring, and built environment to inform proactive and real-time utility risk management.

Target beneficiaries: Power and water utilities, insurance/reinsurance firms, state and local government partners.

SHIELD

Soil Health Innovation, Evaluation, and Demonstration

SHIELD will establish an operational scale living laboratory to incubate soil health measurement technologies in a rigorously validated testbed environment. The program accelerates scalable measurement technologies, unprecedented soil health characterization, and adaptive management capabilities powered by environmental digital twins.

Target beneficiaries: Land managers, AgTech innovators, agricultural producers, state and local government partners.

Moonshot Prize XPRIZE™

As part of the SHIELD program, the ASCEND Engine will launch a large-scale Moonshot Prize competition in 2027, focused on the soil health measurement scalability challenge. The prize will be a competitive, global competition and will be run in partnership with XPRIZE and will leverage the ASCEND Engine's access to infrastructure, stakeholders and potential testbed sites.

Extreme Weather Prediction

Launching in 2027

A third program will concentrate on the cross-cutting area of high-resolution weather prediction applied to critical economic challenges such as hail and wildfire smoke forecasting. Phasing projects allows the ASCEND Engine to mature promising early investments before scaling. Throughout 2026, the ASCEND Engine will seek input from our partners to shape this program.

Target beneficiaries: Transportation and logistics operators, outdoor recreation and tourism leaders, health and public safety managers.

Moving ASCEND technologies from the lab to the market

The ASCEND Engine's commercialization strategy is designed to ensure that scientific advances move efficiently from discovery to deployment.

Every ASCEND program is built with commercialization as a design requirement.

Within the three programs (ARID, SHIELD, Extreme Weather Prediction), there are numerous support opportunities for startups.

Program-specific accelerators

Getting ASCEND technologies off the ground

The ASCEND Engine runs accelerator programs paired with each flagship program, ARID and SHIELD.

A dedicated Client Director is assigned to each startup, with tailored programming, one-on-one coaching, and mentorship. Monetary prizes are awarded to a subset of participating companies through competitive end-of-cohort "pitch days" focusing on readiness and scaleup.

Accelerator participants gain direct access to the program's enabling infrastructure, research teams, and pilot environments—allowing them to **test and refine their commercial products within a real-world research context.**

CEO matching for startups

Connecting innovations with expert entrepreneurs

The ASCEND Engine will implement a Technology-to-CEO matching program that **pairs promising R&D projects with experienced executives to form new startup companies as a dedicated commercialization pathway.** This approach recognizes that many breakthrough technologies emerging from research teams lack the entrepreneurial leadership required to reach the market. The ASCEND Engine aims to match CEOs to ASCEND technologies through our R1 partner universities.

Venture capital

Investing in the region's future

Innosphere will launch Innosphere Fund III to address the early-stage capital gap affecting regional innovation.

This venture fund will support companies advancing ASCEND technologies: advanced sensing, AI-driven analytics, and digital twins—along with other critical U.S. technology areas.



National Ecological Observatory Network (NEON) is leveraging its data collection capabilities alongside compute power and additional data provided by ASCEND Engine partners to develop digital twins of specific environments and ecosystems relevant to wildfire, drought, and water quality use cases (PI: Mike SanClements, PhD).

Open innovation

Strategically aligned innovation

The ASCEND Engine works with corporate partners to identify opportunities for co-investment that can **extend their internal R&D investments, thereby reducing costs, lowering risks, and shortening innovation cycles** by linking companies to novel solutions from a broader ecosystem. This process also helps innovators from startups, universities, and federal labs identify scalable channels for commercial adoption.

Scaleup program

Supporting later-stage commercialization

The ASCEND Engine is launching a **stage-specific scaleup program to serve companies that have graduated beyond the accelerator stage** and require targeted support for the next stage of growth. The program provides resources calibrated to each company's level of maturity, industry focus, and critical scaling needs.

Commercialization postdocs

Support Research to Entrepreneurship

Postdoctoral fellows interested in commercializing breakthrough technologies from their lab **can apply to receive financial support and mentorship from the ASCEND Engine.** This support is intended to help with the formation of new startups built upon university or federal lab IP.



The ASCEND Engine supports the Wind River Tribal Buffalo Initiative through the SHIELD program.

BUILDING THE TALENT PIPELINE

Educating, training, and launching the next generation

The ASCEND Engine is building career pathways from K–12 through mid-career, focusing on the fields where talent shortages most constrain regional growth in ASCEND: systems engineering, environmental sensing, and computational analytics.

K-12 STEM engagement

Reaching 6,000+ students per year

Early investments through mobile learning labs, expanded 4H robotics and drone programs, and the University of Wyoming Extension program **introduce thousands of students annually to real-world environmental technologies.** These experiences build early awareness, spark career interest, and lay the foundation for long-term participation in high-demand fields.

Key beneficiaries: Primary educational institutions, students in K-12, future employers.

Non-degreed pathways

Upskilling partnerships serving 100+ non-degreed workers per year

For adults and emerging professionals,

the ASCEND Engine **expands accessible career pathways through targeted upskilling and stackable credentials.**

Programs are co-designed with employers and workforce agencies to ensure training leads directly to jobs, wage gains, and long-term retention—creating immediate value for both workers and regional industries.

Key beneficiaries: Career-changers, workers interested in upskilling, regional industries seeking workers with specialized skills.

Post-secondary level

Alternative Education Pathways

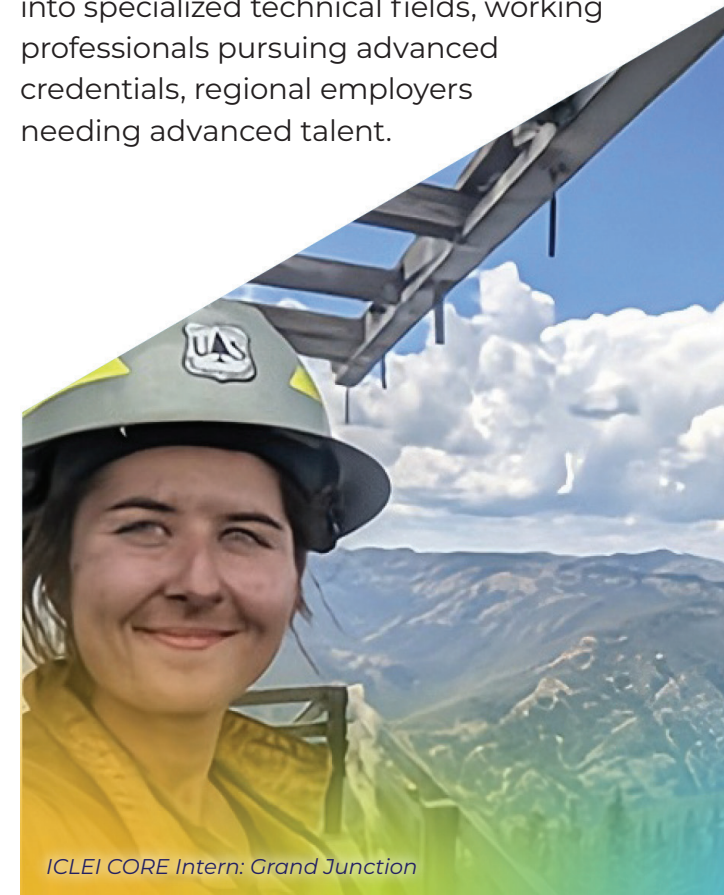
In partnership with community colleges and universities, the ASCEND Engine offers access to a range of internships and apprenticeships. A new systems engineering pathway **addresses critical talent gaps with supported internships** at ASCEND-focused or systems engineering employment opportunities.

Competitions focused on developing in-demand skills in ASCEND technologies prepare students for roles essential to

environmental intelligence, community resilience, and data-driven decision making.

Workforce opportunities will also be embedded into the ARID and SHIELD programs through dedicated employment and education internships.

Key beneficiaries: Learners advancing into specialized technical fields, working professionals pursuing advanced credentials, regional employers needing advanced talent.



ICLEI CORE Intern: Grand Junction

OPPORTUNITIES

Shape what's next

Regardless of who you are, you can help the ASCEND Engine guide our region's response to natural hazards while creating a strong innovation ecosystem, developing regional economic growth, and creating high-paying jobs.

RESEARCHERS AND ENTREPRENEURS INTERESTED IN:

Getting involved

- Participate in workshops, hackathons, competitions, and other ASCEND Engine events

Joining an accelerator

- Apply to accelerator cohorts aligned with ARID, SHIELD, and future programs—with direct access to enabling infrastructure and potential pilot customers

Accessing funding

- Apply for access to non-dilutive funding, mentorship, high-performance computing, and pilot opportunities

Accessing workforce

- CEO matching for promising projects
- Commercialization post-doctoral opportunities
- Co-design talent pipelines aligned to ASCEND focus areas (wildfire, water, air quality, soil health), including systems engineering, advanced manufacturing, and computational analytics

INDUSTRY OR PHILANTHROPIC LEADERS INTERESTED IN:

Getting involved

- Serve as an industry champion—senior executives who advise on strategy, co-develop projects, and connect the ASCEND Engine to broader industry networks

Sponsoring

- Co-invest in ARID, SHIELD, or future programs through industry consortium models, gaining access to breakthrough technologies
- Engage in open innovation with ASCEND Engine startup portfolio companies

Shaping workforce training

- Fund or host interns, apprentices, and project-based learners through Engine-supported programs
- Participate in workforce advisory groups to define in-demand skills and shape curriculum

INVESTORS INTERESTED IN:

Getting involved

- Participate in Investor Forums and ASCEND Accelerator demo days
- Refer companies to the ASCEND Engine
- Connect founders to potential customers and strategic partners
- Mentor startups participating in ASCEND programming

Investing in Venture Capital

- Invest through Innosphere Fund III, which aligns with ASCEND technology, and leverages ASCEND Engine support

Other investment

- Invest in mission-aligned revolving loan funds or other financial initiatives



Engage with the NSF ASCEND Engine

Partnering with the ASCEND Engine means joining one of the nation's most distinctive innovation ecosystems, purpose-built to commercialize breakthrough advances into deployed solutions for the environmental and infrastructure challenges that define U.S. competitiveness.

Innosphere

NSF ASCEND Engine
in Colorado and Wyoming



Connect with us

Mike Freeman

CEO / Principal Investigator
engage@innosphere.org

 320 East Vine Drive, Suite 101
Fort Collins, Colorado 80524

 innosphere.org

Powered by Innosphere | Fort Collins, Colorado.

This material is based upon work supported by the U.S. National Science Foundation under Award No. 2315760. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Colorado State University's CHILL radar team leveraged ASCEND Engine funding to develop transformational nowcasting models for hail to improve insurance affordability (PI: Chandra Venkatachalam, PhD)