



**BOARD OF TRUSTEES’  
RESEARCH AND ECONOMIC  
DEVELOPMENT COMMITTEE  
AGENDA AND MATERIALS**

**January 25, 2023  
1:00 – 3:00 p.m.**

AGENDA  
RESEARCH AND ECONOMIC DEVELOPMENT COMMITTEE  
January 25, 2023  
1:00 p.m. - 3:00 p.m.

**Regular Meeting:**

**Opening Remarks**

Chitnis

1. Update on Five State Consortium                      Chitnis
  - a. *AVP Farkas will update the committee on the progress made by WIP*
2. Update on the Ranch of the Future                      Rasco, Webster
  - a. *Dean Rasco and Eric Webster will present ideas about the ranch of the future to obtain feedback about the concept.*

**RED Project Presentations**

WIP DataHub projects

Jeff Hamerlinck

**DEVISE: Developing Value-Added Tools to Assist Wyoming Natural Resource Managers and Beyond**

*Jerod Merkle, an assistant professor in the Department of Zoology and Physiology, and Shannon Albeke, a senior research scientist with the Wyoming Geographic Information Science Center, were awarded funding to further develop Derived Environmental Variability Indices Spatial Extractor (DEVISE). The program helps land and wildlife managers organize, visualize, and synthesize large amounts of data to inform decision-making related to habitat restoration, how many animals to harvest and optimal placement of future development. The Wyoming DataHub funds will improve DEVISE with new web-based geoprocessing tools and on-demand data extraction and plotting.*

**Amplifying Community Voices: Profiles in Wyoming Resilience and Growth**

*Assistant Professor Jason McConnell and Professor Jean Garrison, both with the Malcolm Wallop Civic Engagement Program in the School of Politics, Public Affairs, and International Studies, were awarded funding for their “Amplifying Community Voices: Profiles in Wyoming Resilience and Growth” project. The funds from the Wyoming DataHub will be used to share data collected from a broad range of citizens and stakeholders through pictures and narratives. Data will be shared on an interactive website using geographic information system (GIS) technology to provide dynamic access to qualitative data about diverse community perspectives in Wyoming.*

**Building a Plant Data Hub: Enabling data sharing, enhancing resources and creating new tools for broad audiences to discover the flora of Wyoming**

*Professor David Tank, Assistant Research Scientist Ben Legler and Senior*

*Research Scientist Burrell “Ernie” Nelson, all in the Department of Botany and the Rocky Mountain Herbarium (RMH); and Associate Director Mark Andersen, Associate Research Scientist Bonnie Heidel and Director Gary Beauvais, all with the Wyoming Natural Diversity Database (WYNDD), were awarded funding to improve integration of knowledge of Wyoming plants that is gathered, synthesized and disseminated by [RMH](#) and [WYNDD](#). The integration will improve these UW-based resources that maintain large, core datasets, allowing both units to significantly enhance existing resources, reach broader audiences and make their data more discoverable and usable by both university and external user groups.*

### **Visually Searching 90 Years of Anaconda Co. Geological Research**

*Paul Flesher, American Heritage Center (AHC) director, and Ginny Kilander, Anaconda librarian and reference services manager at the AHC, received funding to support the creation of a map-based GIS display for the results of 90 years of minerals exploration of the Anaconda Co. The five tons of materials contain reports, geologic maps, and data from geologic, geochemical, drilling and assay exploration studies. This improved visualization of mineral exploration data will enable users to visualize patterns of distribution at the tens of thousands of Anaconda research sites.*

**RESEARCH AND ECONOMIC DEVELOPMENT COMMITTEE**  
**COMMITTEE MEETING MATERIALS**

**AGENDA ITEM TITLE:** Update on Five State Consortium, Chitnis

- PUBLIC SESSION
- EXECUTIVE SESSION

PREVIOUSLY DISCUSSED BY COMMITTEE:

- Yes
- No

FOR FULL BOARD CONSIDERATION:

- Yes *[Note: If yes, materials will also be included in the full UW Board of Trustee report.]*
- No

*Attachments/materials are provided in advance of the meeting.*

EXECUTIVE SUMMARY:

Opening remarks-VP Chitnis, then AVP Farkas will update the committee on the progress made by WIP and the signing of the MOU for the establishing the Mountains and Plains University Innovation Alliance which will improve members ability to leverage federal funds into lasting opportunities for innovation -led economic growth.

PRIOR RELATED BOARD DISCUSSIONS/ACTIONS:

WHY THIS ITEM IS BEFORE THE COMMITTEE:

Informational update

ACTION REQUIRED AT THIS COMMITTEE MEETING:

N/A

PROPOSED MOTION:

N/A



**Memorandum of Understanding  
Establishing  
the Mountains and Plains University Innovation Alliance**

This memorandum is entered into by and between the following listed research-focused universities from Idaho, Montana, North Dakota, South Dakota, and Wyoming:

**Idaho:**

- Boise State University
- Idaho State University
- The University of Idaho

**Montana**

- Montana State University
- Montana Technological University
- The University of Montana

**North Dakota**

- North Dakota State University
- The University of North Dakota

**South Dakota**

- Dakota State University
- South Dakota School of Mines and Technology
- South Dakota State University
- University of South Dakota

**Wyoming**

- The University of Wyoming

**Whereas**, scientific innovation will be central to the long-term prosperity and well-being of the peoples of rural states; and

**Whereas**, universities have and will be vital for the attraction and growth of innovation economies and high-tech industry to our region; and

**Whereas**, a consortium can serve as a collective partner which seeks to establish and foster relationships with other individual or collective partners and/or establish more comprehensive alliances with partners or partnership groups; and

**Whereas**, coordination among universities, regional economic development actors, and tribal and state governments across our region can improve our ability to leverage federal funds into lasting opportunities for innovation-led economic growth; and

**Whereas**, innovation-led economic growth can assist rural regions in accomplishing greater inclusion in the economic prosperity of the United States.

**Therefore, be it agreed** that the signatory institutions to this memorandum establish the Mountains and Plains University Innovation Alliance (“MPUIA”) to coordinate and advance initiatives leveraging university research and educational resources to develop innovation ecosystems and economic growth opportunities in the Idaho, Montana, North Dakota, South Dakota, and Wyoming region.

**Be it further agreed that** the signatory institutions will designate appropriate staff to serve on MPUIA committees to set and execute strategies that serve this mission.

**Be it further agreed that** the signatory institutions will advocate within their networks of economic development, industry, tribal and state actors to coordinate strategies for innovation led growth.

**Be it further agreed that** the signatory institutions will coordinate to increase the likelihood of the region being awarded federal funds that advance research and innovation activities.

**Be it further agreed that** the signatory institutions adopt the attached bylaws as a governing framework for the consortium.

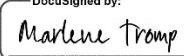
**Be it further agreed that** the signatory institutions agree to adhere to all applicable laws, including Title VI of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, the Age Discrimination Act of 1975, and the American with Disabilities Act of 1990.

**Be it further agreed that** this MOU will be effective from the date of the last signature below. The MOU will remain in effect for five years or until the signatory institutions enter into a subsequent written agreement, whichever occurs first.

**Be it further agreed that** this MOU may be terminated with the agreement of a majority of the signatory institution Presidents/CEOs. An individual institution may terminate its participation under this MOU without cause by providing sixty days written notice to the other parties.

The parties to this MOU, through their duly authorized representatives, certify that they have read, understood, and agreed to the terms and conditions of this MOU.

**Idaho**

DocuSigned by:  
  
2272E9595D240D  
Dr. Marlene Tromp, President  
Boise State University


11/1/2022 | 11:15 PM MDT

Date

DocuSigned by:  
  
9A70FB3973B0499  
Dr. Kevin Satterlee, President  
Idaho State University

11/8/2022 | 1:13 PM MST

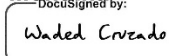
Date

DocuSigned by:  
  
9C40A0D9880401  
C. Scott Green, President  
The University of Idaho

11/8/2022 | 9:43 AM PST

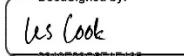
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**Montana**

DocuSigned by:  
  
70991C396C3F41A  
Dr. Waded Cruzado, President  
Montana State University

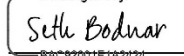
11/8/2022 | 6:07 AM MST

Date

DocuSigned by:  
  
3330E83C021E783  
Dr. Les Cook, Chancellor  
Montana Technological University

11/2/2022 | 7:48 AM MDT


Date

DocuSigned by:  
  
89C8207E7A2124  
Seth Bodnar, President  
University of Montana

11/4/2022 | 3:04 PM MDT

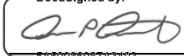
Date

**North Dakota**

DocuSigned by:  
  
BCA4EB720309DF  
Dr. David Cook, President  
North Dakota State University

11/3/2022 | 7:15 AM CDT

Date

DocuSigned by:  
  
5A3986067A3493  
Dr. Andrew Armacost, President  
University of North Dakota

11/3/2022 | 2:59 PM CDT

Date

**South Dakota**

DocuSigned by:  
  
4C86097D74025  
Dr. Jose-Marie Griffiths, President  
Dakota State University

11/2/2022 | 5:40 AM MDT

Date



DocuSigned by:  
*James Rankin*  
79898667D8F946A  
Dr. James Rankin, President  
South Dakota School of Mines and Technology

11/2/2022 | 7:52 AM MDT  
Date

DocuSigned by:  
*Barry H. Dunn*  
7F25533E610492  
Dr. Barry H. Dunn, President  
South Dakota State University

11/14/2022 | 8:12 AM CST  
Date

DocuSigned by:  
*Sheila Gestring*  
C018251A9782A1F  
Sheila K. Gestring, President  
University of South Dakota

11/1/2022 | 6:24 PM PDT  
Date

**Wyoming**  
DocuSigned by:  
*Edward Seidel*  
2861278F033998E  
Dr. Edward Seidel, President  
The University of Wyoming

11/8/2022 | 7:45 AM MST  
Date

## **Bylaws**

### **I. Description and Purpose**

The Mountains and Plains University Innovation Alliance (“MPUIA” or the “Alliance”), whose members are public research universities and their related systems and state agencies based in Idaho, Montana, North Dakota, South Dakota, and Wyoming, is dedicated to leveraging university research and educational resources to develop new innovation ecosystems and economic growth opportunities in the region. The alliance coordinates and guides the activities of its member universities and their economic development partners as they drive research and innovation, workforce development, and economic growth throughout the region via collaborative research, public-private partnerships, entrepreneurship, and educational and training programs.

### **II. Membership**

Upon ratification of these bylaws, MPUIA members will include:

#### **Idaho:**

- Boise State University
- Idaho State University
- The University of Idaho

#### **Montana**

- Montana State University
- Montana Technological University
- The University of Montana

#### **North Dakota**

- North Dakota State University
- The University of North Dakota

#### **South Dakota**

- Dakota State University
- South Dakota School of Mines and Technology
- South Dakota State University
- University of South Dakota

#### **Wyoming**

- The University of Wyoming

The President of each MPUIA member institution must appoint a representative to serve on the Member Council.

Voting in the Member Council will be by state, with each state allocated one vote. Each state's member institutions will determine the process by which they cast their vote. The

Member Council shall strive for consensus on all decisions. However, if consensus is not achievable within a reasonable period of time as determined by a majority of all member institution representatives, decisions will be made by majority vote of the states. No decisions, whether by consensus or by majority vote, can be made without a quorum. A quorum requires both a majority of all member institution representatives and at minimum one member institution representative from each state. Member institution representatives may send a proxy.

Additional members of the MPUIA may be added with majority consent of the Member Council states. MPUIA membership applicants must agree to and sign the foundational Memorandum of Understanding.

### **III. Officers**

A Stewardship Group (SG) will provide administrative leadership for the Alliance in lieu of individual officers. The Stewardship Group is composed of one representative from each state in the Alliance. Each state's member institutions shall decide its process for appointing the SG member to represent the state. The SG representatives will work collectively to administer the alliance in a collaborative, distributed model, providing strategic direction, setting agendas and presiding over Alliance meetings, and advancing the business and vision of the Alliance through the Member Council.

### **IV. Committees**

#### **Member Council**

The MPUIA shall have a Member Council composed of a representative of each member institution. The Member Council shall determine the strategic plan for the MPUIA, ensure the Alliance develops and executes good governance practices, and charter and oversee the work of any subcommittees the Council chooses to form.

Meetings of the MPUIA Member Council may be called upon agreement of the MPUIA Stewardship Group but must be held no less than biannually.

#### **Advisory Council**

The MPUIA Advisory Council guides and advises the Member Council in setting the MPUIA's strategy and aids in executing the MPUIA's goals.

Each MPUIA state appoints three members to the Advisory Council. These members are nominated by agreement among each state's Member Council members and confirmed through a majority vote of the Member Council. Appointees to the Advisory Council should be leaders from higher education, state or tribal government, venture capital, or industry associations with substantial influence in the state and/or region's innovation ecosystem.

The agenda for meetings of the MPUIA Advisory Council will be determined and prepared by the MPUIA Stewardship Group.

**Subcommittees**

The MPUIA Membership Council may appoint any subcommittee it deems necessary to undertake its work.

**V. Amendments**

Amendments may be made to the bylaws at any meeting of the Member Council by a majority vote of the states, providing suggested changes have been provided to Council members at least two weeks before the meeting. Amendments will go into effect immediately upon ratification.

**RESEARCH AND ECONOMIC DEVELOPMENT COMMITTEE**  
**COMMITTEE MEETING MATERIALS**

**AGENDA ITEM TITLE:** Update on the Ranch of the Future, Rasco, Webster

- PUBLIC SESSION
- EXECUTIVE SESSION

PREVIOUSLY DISCUSSED BY COMMITTEE:

- Yes
- No

FOR FULL BOARD CONSIDERATION:

- Yes *[Note: If yes, materials will also be included in the full UW Board of Trustee report.]*
- No

*Attachments/materials are provided in advance of the meeting.*

EXECUTIVE SUMMARY:

*Dean Rasco and Eric Webster will present ideas about the ranch of the future initiative to obtain feedback about the concept. Which will incorporate technologies to enhance management and sustainability of systems and prepare a new workforce. A quote- "Sustainable and resilient ranching enterprises are profitable, support a high quality of life for individuals and communities, and are environmentally sound. Our fundamental goal is to ensure that the Ranch of the Future includes Ranchers of the Future."*

PRIOR RELATED BOARD DISCUSSIONS/ACTIONS:

WHY THIS ITEM IS BEFORE THE COMMITTEE:

Informational

ACTION REQUIRED AT THIS COMMITTEE MEETING:

N/A

PROPOSED MOTION:

N/A



## Ranch of the Future

### **Ranch of the Future – A Vision for Wyoming Agriculture into the Next Century<sup>1</sup>**

The University is uniquely situated to develop knowledge, and advance innovation and economic development in agriculture, natural resources, wildlife management and migration are key sectors of the economy. In 2021, the agricultural sector added value added nearly \$2 billion to Wyoming's economy. Of that total, animals and animal products accounted for over \$1 billion. Wyoming has the largest farm size in the country with an average size of 2,417 acres. Many of its ranches are over 10,000 acres, with the largest ranch at 560,000 acres. Wyoming ranching involves management of operations over a combination of varied land ownership – private, federal and state with grazing upon land with the multiple uses of agriculture, recreation and energy development. Wyoming ranches provide grazing for 1,250,000 cattle and calves and 330,000 sheep and lambs. In the US, Wyoming ranks fourth in total sheep and second in wool production, and according to USDA-NASS is first in total value in terms of tonnage price per pound for wool.

In addition to the presence of large ranches, Wyoming's ranches are unique in other aspects. Many ranches are at high altitude (>4000ft) in semi-arid environments with livestock adapted to these conditions in terms of phenotype with the ability to thrive in extensive semiarid conditions. Interactions between domestic and wild herbivores is greater in WY compared many other states making disease transmission and competition for grazing a unique issue Wyoming ranchers need to address. Extensive, sometimes treacherous, terrain makes ranching a risk prone and strenuous profession. Ranching in the Wyoming environments can be extremely difficult, profit margins are low, and the labor force is difficult to maintain, making development of appropriate technologies important for future success.

Wyoming ranches authentically preserve world-class outdoor recreation, sustainable open spaces, energy reserves, and millions of acres of relatively undisturbed, native rangelands. These ranches also provide critical habitats and migration corridors for some of our nation's largest populations of wild ungulates including pronghorn, Rocky Mountain elk, and mule deer.

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<sup>1</sup> Parag Chitnis and Barbara Rasco would like to thank the following individuals for contributions to this review: Eric Webster, Kelly Crane, Andrew Kniss, Derek Scasta, Whit Stewart, Jonathan Fox, and Brian Mealor

The Ranch of the Future supports our goal to serve the state and region as a compelling forward-looking program placing Wyoming as a leader in agriculture, biological sciences, and natural resource management in an area where we have a competitive advantage<sup>1</sup>.

This Initiative infuses funding for faculty and staff hires with infrastructure improvements to make the University of Wyoming the destination for interdisciplinary education, research and Extension in high altitude environments; thereby embracing areas of inherent strengths in science and technology inspired by Wyoming's uniqueness working collaboratively across disciplines.

Our competitive advantage in sustainable agriculture production in high altitude semi-arid temperate environment(s) places UW in a unique position to develop science and technology appropriate for these regions. The University of Wyoming has unique expertise in rangeland management and animal sciences, computing and digital technologies, and energy engineering providing an opportunity to reimagine ranching for the future. This Initiative will take advantage of new advances in genetics and synthetic biology, animal and plant health, molecular and cell biology, physiology and reproductive biology, nutrition, animal behavior, engineering and material science, neuroscience, artificial intelligence, imaging and image analysis, data science, predictive modelling and bioinformatics to grow new knowledge and provide solutions for challenges facing agriculture and natural resource management.

Our College motto: ***'growing knowledge, people and communities'*** resonates across the State and aligns with university wide strategic initiatives, college strategic plan, and integrates the expertise of colleagues from across campus to address many of the important issues facing society today. The goals of entrepreneurship and corporate partnerships, inclusivity, digital science, and an interdisciplinary focus are incorporated into the Ranch of the Future Initiative. By leveraging our expertise in Engineering, Physical Sciences, the Science Initiative, School of Computing and other programs at the University of Wyoming in addition to agriculture and natural resources we will define a 21<sup>st</sup> Century land grant institution true to its Wyoming roots.

The Wyoming Legislature has demonstrated resounding support for the College of Agriculture and Natural Resources (ANR) now the College of Agriculture, Life Sciences and Natural Resources through provision of repeated matching funds for educational programs supporting production agriculture and targeted resources for animal health. Recent legislative funding explicitly identifies legislative funding for "teaching, research, and extension" in the areas of "ranch and range management". Evidence of this support has also been repeatedly conveyed during testimonies and resultant actions of the Joint Appropriations and Joint Agriculture, State and Public Lands and Water Resources Committee. Likewise, private donors have conveyed a keen interest in supporting Wyoming-relevant initiatives such as this one.

The Wyoming Ranch of the Future incorporates technology, data-driven decision tools, business analytics and socio-economic facets to create agriculture business sustainability for the long term.

A sustainable ranching operation in Wyoming has the following features:

- Increases farm income through diversified profitable operations in livestock with additional income streams as appropriate: energy production, tourism, soil health and environmental credits, wildlife management, and other farm-associated businesses.
- Diversification and enterprise stacking, enhanced production efficiency, adaptive and innovative management strategies, and technology that enables decision making-in real time, adapting to changing production dynamics (climate, markets, labor, regulatory) being critically important attributes.
- Understand the science of plant species selection and management on the range including irrigated and non-irrigated meadows, and their impact on forage quality and soil health. Understand plant protection including forest species and pest management and best grazing practices to maintain an extended grazing season, suitable and sustainable animal productivity including wildlife productivity, and high environmental quality.
- Drought and climate change are impacting ranch operations to an unparalleled degree. Environmental activism is affecting consumer perception about the carbon footprint and greenhouse gas emission from ranching. These challenges could spur innovation and adoption of precision measurement technologies that show the real impact and lead to mitigation strategies.
- Understand how sensing and data science-based technologies can be utilized to manage ranching operations and increase efficiencies.
- Improve the quality of life for ranchers, members of the ranching operation, and broader rural communities.
- Train the next generation of professionals through experiential learning and engagement with Wyoming stakeholders.

### Talking Points

- UW has expertise; new collaborations and new faculty lines are needed to support the convergence of science in sustainable ranching.
- UW Extension is a trusted educational resource in Wyoming communities. These established relationships and Extension's legacy of service through community-based education provide a ready-made network to implement science-based ranch management strategies and technological applications.
- UW plans to focus on new systems needed as well as on translation of the use-inspired research for innovative ranching operations. Associated changes in the education and workforce will be supported through existing and new programs.
- UW will submit extramural funding applications as well as work with the Trustees and the UW Foundation to raise state and private funding for research facilities and equipment. New infrastructure and technology will improve the Agricultural Experiment Station's Research and Extension Centers, provide for new and modern instrumentation, and provide for the personnel needed for the research and demonstration platforms to support the needs of agriculture and natural resources sectors in Wyoming.



## The Vision

Over the next 5 years, organize research, extension, and education to catalyze discoveries, new technologies and best management practices, workforce development, and community engagement to guarantee Wyoming ranchers remain agricultural leaders.

Sustainable and resilient ranching enterprises are profitable, support a high quality of life for individuals and communities, and are environmentally sound. Our fundamental goal is to ensure that the Ranch of the Future includes *Ranchers of the Future*.

Ranchers of the Future must –

- Be adequately compensated, appropriately incentivized to innovate, technologically adaptable, and globally aware.
- Be independent, able to retain their traditions and way of life.
- Be able to retain ranch assets and enterprises; transfer these assets to the next generation, with operations secure enough to encourage long-term sustainability.

The UW Ranch of the Future will utilize new technologies, management strategies, and workforce development for transforming Wyoming’s unique ranching industry by:

- **Integrating technologies with operational management and decision-making:** Employ and develop new technologies and tools that can be integrated into ranch management systems to improve operational efficiency. A factor of this is supply chain optimization to increase economic, environmental and social sustainability managing credence attributes. The Ranch of the Future could take advantage of blockchain models for marketing livestock and other commodities as components of new business models. The Wyoming Wool Initiative provides a model for the Ranch of the Future<sup>2</sup>. Aspects of technological innovation include:
  - Data-driven tools and approaches that can bridge the gap between point or field scale measurements and metrics and those available at larger scales (e.g., remote sensing data) would allow development and improvement of integrated datasets at multiple scales to assess the ability of rangeland resources to provide “staking” of ecosystem services that are of benefit to the State. Develop decision support tools that can aggregate important land-use and natural resource data at a range of scales (ranch to watershed to basin) can provide important information on the trade-offs and benefits (economic, environmental, etc.,) that can be used to assess the impacts of climate and

- 
- **Wyoming Wool Initiative.** This demonstration projects features genetics and Artificial Intelligence based nutrition studies to improve broodstock in addition to blockchain technology and evolved from fundraising efforts selling UW woolen products. It is a transformative approach to help Wyoming and regional producers access marketing and processing for their wool. Wyoming produces the largest and highest valued wool clip in the nation and this initiative is driving innovations that can harness “tech-data” to provide producers with alternatives to the volatile international commodity market.

- management practices on the long-term sustainability of Wyoming's rangelands and natural resources.
- Both timing of major production events like animal birth and marketing (*e.g.* meat and wool/hide) are subject to climatic and seasonal price volatility. Weather databases such as <https://crt-climate-explorer.nemac.org/> can provide valuable local information to inform decisions that reduce risk of infant mortality due to late spring weather events. Development of marketing tools from historic USDA price data that helps producers account for seasonal price increases and other economic drivers to better manage risks in a volatile market. The Ranch of the Future seeks to benefit from a suite of products broader than just food and fiber – including provision of ecosystem goods and services that a larger society agree to be important and to purchase in a market-based system.
  - Using “smart technologies” to enhance management and sustainability of animal agriculture production systems emphasizing user-friendly tools that enhance decision making in animal welfare, genetic improvement, and climatic resiliency.
  - Utilize technology to monitor and select for factors involved with sustainability critical to the overall success of an operation.
  - Collecting and summarizing field survey data on forage quality, water, animal grazing/behavior and location/movement to develop decision support tools in nutritional management and enterprise benchmarking particularly to determine nutritional deficiencies that animals may experience over winter months.

**Inspiring technologies and data analytics:** New technologies in genetics and synthetic biology hold promise for adapted livestock and crops in the harsh high altitude environment of Wyoming. Having sensors and data-based tools for monitoring animal biometrics, behavior, water intake, daily weights, as well as environmental factors such as soil chemistry, water, and local climate conditions will aid ranchers with decision making and improve profitability. Aerial surveillance and tools such as electronic fencing could improve both livestock and wildlife management programs.

- A large effort project such as Farm (or Ranch) of the Future with a focus on integrated sensor technology at a range of scales would be important tools for Wyoming ranchers and increasing the ability to manage Wyoming's rangeland resources for multiple uses. Wyoming's rangelands provide valuable natural resources to the state and region's agricultural economy and numerous ecosystem services including water resources, forage and plant species identification. Sensors can monitor animal movement and animal health parameters to better predict animal behavior including reproductive status, level of stress, exposure to pests or predators, malaise among other factors. Similar technologies can be used for wildlife management.
- Sensors for measuring carbon and nitrogen fixation or cycling in soils can lead to improved management of rangelands with appropriate predictive models. Rangelands have widely varying characteristics including soil type and measuring soil processes including carbon flux in real time is difficult for these diverse and spatially distributed resources.

- Drought mitigation may be offset by real-time moisture data (soil sensors) to manage animal movement and preserve riparian zones. Further, *in situ* moisture data sets from ranches provide the basis for regional drought monitoring models and systems.
  - Precision technologies for precisely applying pesticides to control invasive plants or to apply drug treatments (to control animal parasites for example) detecting affected areas or animal using remote imaging can improve operational efficiency and effectiveness.
  - Innovations for benchmarking animal welfare for electronic identification (EID) and blockchain systems using biometric sensors, accelerometers, electronic fencing, and radiofrequency identification tags, etc. are under development. Combinations of monitoring strategies can be used to guide animal movement, monitor animal behavior and provide real time assessments of animal behavior and health status.
  - Sensors to monitor production of carbon dioxide and methane emissions from animals and carbon dynamics on a ranch for “carbon neutral” beef in addition to carbon capture in soils resulting from grazing best practices provide the basis for credence attribute programs.
  - Drones and other tech that can monitor pasture lambing and calving operations and predation risks, and help ranchers make decisions for care interventions during these times. Some producers in Wyoming are taking advantage of drones and have shown improvements with increased production and saved significant time and labor by monitoring the flock and guard dogs improving animal well-being and overall health.
  - Energy production on agricultural lands. Coexistence of ranching and renewable energy production can add diversified income streams for the ranch. There are reports of synergy among wind and/or solar energy on ranching operations. The shade from solar panels provides comfort during adverse conditions and allows livestock to manage vegetation for grazing. However, this is dependent upon how these systems are constructed.
  - Automated handling systems that utilize EID (electronic identification) for facilitated genetic data collection and performance monitoring. Electronic identification is extensively used in “smart systems” for animal handling and traceability research. These applications need to be expanded to products downstream such as wool and particular cuts of meat (even ground meat) on a blockchain to the consumer level in a cost-effective manner.
- **Preparing a new workforce that is technically competent with appropriate soft skills:** Prepare a skilled workforce and use technology where appropriate to develop replace labor that is dangerous or difficult to find for example in: crop monitoring, spraying or pest control, wrangling or herding, ranch labor generally, or land surveying, etc. employing robotics and artificial intelligence.  
**Further, we need an educated workforce** that is creative, has excellent written and verbal communication skills, and can think in a synthetic way in addition to being technically competent.

## Organizational Structure

### Leadership

Dean, CALSNR (will lead the private and state support)

VP Research and Economic Development

Faculty Project Director (will lead the extramural funding efforts)

### Members:

- UW faculty/faculty scientists who have expertise in rangeland and ranch management, animal production, plant science
- UW faculty/scientists with engineering and computing expertise needed for developing technologies and tools
- Scientists from other institutions who will collaborate with the UW faculty and participate in activities

### UW Demonstration ranches

- Private ranches
- UW ranch and Research and Extension Centers
- These experimental ranches administered by UW will host demonstration projects that will be run like neighboring ranches but with the sole focus of testbeds for new technology and data tools. The objective will be to develop BMP to help producers adopt and implement new innovations including crop varieties, livestock breeds, agronomic and husbandry practices. This will involve a holistic model focused on “outcomes” that will have impact for the industry and stakeholders overall and not just a novel “output”.

### Partners

9H Foundation

UIUC- Kaiyu Guan <http://faculty.nres.illinois.edu/~kaiyuguan/>

ARS- USDA Cheyenne, Fort Collins; USDA Meat Animal Research Center (MARC),

USDA ARS Sheep Experiment Station

CSU- Fort Collins

Industry Groups/ Allied Industry- American Lamb Board, American Sheep Industry Association, Wyoming Stock Growers Association, Herddogg

SAGE <https://www.anl.gov/mcs/sage-a-softwaredefined-sensor-network>

### Intramural and Extramural Programs

- UW Programs
  - Seed grants
  - Agricultural Experiment Station support
- Extramural Programs
  - NSF Innovation Engine
  - NIFA Sustainable Agricultural Systems Program (AFRI)
  - NIFA Farm of the Future Program
  - Individual Faculty grants
  - NSF National Robotics Initiative
  - NSF Cyberphysical Systems
  - NSF Signals in Soil Program
- 9H Foundation

### UW Expertise

- Programs in: Animal Science, Veterinary Science, Molecular Biology, Plant Science, Botany, Ecosystem Science (Range Science), Agricultural Economics, Wildlife Science, Soil Science, Blockchain Center, Computer Science, Physiology, Bioinformatics, Genetics, UW Extension

**RESEARCH AND ECONOMIC DEVELOPMENT COMMITTEE**  
**COMMITTEE MEETING MATERIALS**

**AGENDA ITEM TITLE:** RED Project Presentations-WIP DataHub projects, Hamerlinck

- PUBLIC SESSION  
 EXECUTIVE SESSION

PREVIOUSLY DISCUSSED BY COMMITTEE:

- Yes  
 No

FOR FULL BOARD CONSIDERATION:

- Yes [Note: If yes, materials will also be included in the full UW Board of Trustee report.]  
 No  
 Attachments/materials are provided in advance of the meeting.

EXECUTIVE SUMMARY:

**DEVISE: Developing Value-Added Tools to Assist Wyoming Natural Resource Managers and Beyond**

*Jerod Merkle, an assistant professor in the Department of Zoology and Physiology, and Shannon Albeke, a senior research scientist with the Wyoming Geographic Information Science Center, were awarded funding to further develop Derived Environmental Variability Indices Spatial Extractor (DEVISE). The program helps land and wildlife managers organize, visualize, and synthesize large amounts of data to inform decision-making related to habitat restoration, how many animals to harvest and optimal placement of future development. The Wyoming DataHub funds will improve DEVISE with new web-based geoprocessing tools and on-demand data extraction and plotting.*

**Amplifying Community Voices: Profiles in Wyoming Resilience and Growth**

*Assistant Professor Jason McConnell and Professor Jean Garrison, both with the Malcolm Wallop Civic Engagement Program in the School of Politics, Public Affairs, and International Studies, were awarded funding for their “Amplifying Community Voices: Profiles in Wyoming Resilience and Growth” project. The funds from the Wyoming DataHub will be used to share data collected from a broad range of citizens and stakeholders through pictures and narratives. Data will be shared on an interactive website using geographic information system (GIS) technology to provide dynamic access to qualitative data about diverse community perspectives in Wyoming.*

**Building a Plant Data Hub: Enabling data sharing, enhancing resources and creating new tools for broad audiences to discover the flora of Wyoming**

*Professor David Tank, Assistant Research Scientist Ben Legler and Senior Research Scientist Burrell “Ernie” Nelson, all in the Department of Botany and the Rocky Mountain Herbarium (RMH); and Associate Director Mark Andersen,*

*Associate Research Scientist Bonnie Heidel and Director Gary Beauvais, all with the Wyoming Natural Diversity Database (WYNDD), were awarded funding to improve integration of knowledge of Wyoming plants that is gathered, synthesized and disseminated by [RMH](#) and [WYNDD](#). The integration will improve these UW-based resources that maintain large, core datasets, allowing both units to significantly enhance existing resources, reach broader audiences and make their data more discoverable and usable by both university and external user groups.*

**Visually Searching 90 Years of Anaconda Co. Geological Research**

*Paul Flesher, American Heritage Center (AHC) director, and Ginny Kilander, Anaconda librarian and reference services manager at the AHC, received funding to support the creation of a map-based GIS display for the results of 90 years of minerals exploration of the Anaconda Co. The five tons of materials contain reports, geologic maps, and data from geologic, geochemical, drilling and assay exploration studies. This improved visualization of mineral exploration data will enable users to visualize patterns of distribution at the tens of thousands of Anaconda research sites.*

PRIOR RELATED BOARD DISCUSSIONS/ACTIONS:

N/A

WHY THIS ITEM IS BEFORE THE COMMITTEE:

Informational

ACTION REQUIRED AT THIS COMMITTEE MEETING:

N/A

PROPOSED MOTION:

N/A