# Wyoming Agricultural Experiment Station
# 2023 SELECTED RESEARCH IMPACTS

Since 1891 the Wyoming Agricultural Experiment Station (WAES) has been providing support for fundamental and applied research on agricultural, natural, and community resource issues related to the needs of Wyoming, the region, the nation, and the world. WAES operates four Research and Extension Centers located in Laramie, Powell, Sheridan, and Lingle. As the research branch of the University of Wyoming College of Agriculture and Natural Resources, WAES funds and actively promotes research with emphasis on areas identified through stakeholder input and national priorities. The following impacts represent a small sample of the research we support. Learn more at www.uwyo.edu/uwexpstn.

## Targeted nutrition benefits sustainable sheep and wool production

The demand for lamb and wool continues to increase in the United States with Western ranchers supplying more than 50% of production. Targeted nutrition management could increase economic savings for producers and prevent significant economic losses related to nutritional deficiencies. UW researchers designed a study to evaluate the nutritional quality of sheep diets on winter range, sampling grazing sites on 27 sheep ranches with over 90,000 head of sheep. Results showed that diets including more shrub species contained more nutrients compared to grass alone. Recommendations compiled from on-site nutritional data provided ranchers with management practices adapted to the grazing resources available at each site. Additionally private companies that provide nutritional supplements were able to fine tune their formulations using these research findings. This research highlights the ability of sheep to graze land unsuitable for other agriculture while meeting most of their nutritional needs, and the advantage of targeted nutrition to manage dietary shortfalls for economic benefits.

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## Research into 'water bears' reveals new ways to stabilize pharmaceuticals

Many life-saving pharmaceuticals currently require production, transport, and storage in refrigerators and freezers in what is known as the cold-chain. While the cold-chain can be effective, it is also extremely costly, requires extensive infrastructure, and is prone to failure making medicine less accessible in remote or developing parts of the world. UW scientists have discovered that by applying mechanisms used by 'water bears' to survive extreme environments, important protein-based pharmaceuticals, such as blood clotting factors, can be stored without the need for the cold-chain. Water bears, or tardigrades as they are known scientifically, are a group of microscopic animals. Water bears are extremely tough—able to withstand being frozen, heated above the boiling point of water, dried out for years, or even exposed to the vacuum of outer space. After their initial success with stabilizing protein-based pharmaceuticals, UW scientists have set their sights on using similar tricks from water bears to develop new preservation methods for cells and cell-based therapeutics.

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## Untangling mechanisms for crop yield loss due to weeds

For decades it was thought that the primary reason weeds reduced crop yield was because the weeds depleted resources needed for crops to flourish. But mounting research has shown that even when adequate resources are available for optimal crop growth the presence of weeds can still reduce yields. Plants have the ability to sense the presence of neighboring vegetation through changes in reflected light, and our previous research showed light reflected from neighboring weeds can dramatically reduce sugar beet yield potential. Field research was conducted to determine the extent of sugar beet yield loss due to plant-reflected light compared to below ground resource competition. Results showed that sugar beet yield loss observed in the first two months after planting is likely attributable to shade avoidance rather than water or nutrient depletion. Our work indicates that optimizing yield may need to focus on preventative weed management such as very early season weed removal.

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## No-drill method for determining subsurface structure and hydraulic properties

A good understanding of the hydrological connections between mountains and basins is important for water management in the Western United States to ensure access to safe drinking water, provide irrigation water for agriculture, and to limit flood risk. In mountainous regions the subsurface is generally varied, with soil depth, weathered bedrock thickness, and depth to intact bedrock mostly unknown. This lack of knowledge about subsurface structure and hydraulic properties limits our understanding of below-ground water storage capacity, and our ability to predict subsurface water dynamics and streamflow that together determine water availability in basins and plains. We developed a modeling framework for mountain hillslopes using surface-based measurements to determine subsurface structure, hydraulic properties, and water flow without the need for expensive and time-consuming drilling. With climate change, altered snowpack dynamics, shifting forest fire regimes, and increased potential for extreme weather, our research can provide important data to county, state, and federal agencies tasked with land and water management and public safety.

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## Identifying native plants for restoration success

While demand for native seeds is growing, availability has limited reclamation and restoration efforts for over 50 years. In that time, there has been surprisingly little research about revegetation requirements and reseeding outcomes for many native plant species. Compounding this difficulty, commercial seeds of native plants are frequently scarce, resulting in a focus on relatively few species available through cultivation. To investigate revegetation success, a UW Ecosystem Science and Management associate professor and her collaborators collected and analyzed a roadside dataset representing 73 sites along 12 Wyoming highways. On average, only 36% of seeded species were still present between 5 and 20 years later. Despite this result, higher numbers of seeded plants corresponded to fewer invasive weeds. This result illustrates the utility of reseeding natives despite challenges. By identifying the species that did and did not reseed successfully over twenty years, this project provides road managers with information needed to adjust reseeding programs to improve restoration project outcomes in the future.

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## Understanding how parenting influences teen eating behaviors

According to the Center for Disease Control, only two percent of U.S. adolescents meet vegetable intake recommendations and seven percent meet fruit intake recommendations. Understanding how parenting behaviors influence adolescent independent eating behaviors is critical to developing successful interventions to improve adolescent fruit and vegetable intake. A UW Family and Consumer Sciences assistant professor ran analyses that show male parents are more likely to have a child who consumes more sugar sweetened beverages and more fruits and vegetables, compared to a female parent. Further, parenting practices such as monitoring or indulging their child appear to influence these relationships. Interestingly, marital status also appears to play a role: male parents only report higher monitoring if they are married; single parent households did not show any difference in adolescent sugar sweetened beverage or fruit and vegetable intake. Together this indicates that family status may be an important part of adolescent healthy (or unhealthy) eating. This research will be used develop a mobile phone app to help parents and adolescents choose healthier foods.

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to learn more about these research projects and other WAES programs.

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