



Wyoming Agricultural Experiment Station 2015 SELECTED RESEARCH IMPACTS



Novel Insect-Based System for Producing Pharmaceuticals

Agriculturalists are well aware that insects can be huge pests or highly beneficial organisms. In our cross-disciplinary research program, we utilize modern molecular biological approaches to exploit insect and insect cell systems for biotechnological applications. Specifically, we have developed new platforms that can be used to produce medical products including: vaccines; therapeutic antibodies against cancer, arthritis, virus infections, and strokes; and biomaterials such as recombinant silk-worm/spider silk fibers with novel applications in biomedicine and textiles. Our work has spun out three new biotech companies (including one in Wyoming), and has generated millions of research dollars from federal and private sources helping to diversify the economy and create new jobs.

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Multiple Dose RB51 Vaccination Reduces *Brucella abortus* Infection and Abortion in Beef Cattle

Infection of cattle with the bacteria *Brucella abortus* can induce abortions and have direct economic impact on ranching operations in or near the greater Yellowstone area. Our study strongly indicates that vaccination of cattle with more than one dose of RB51 will reduce the impact of *Brucella abortus* infection, prevent infection-induced abortion, and that vaccination of pregnant cattle will not induce abortion during pregnancy. Vaccinating cattle with multiple doses of RB51 vaccine will likely prevent or significantly reduce transmission of *Brucella abortus* from wildlife or within herds, and therefore reduce the costs associated with quarantine and culling. Our findings provide a scientific basis for veterinarians to use a risk-based approach to determine the timing and application of multiple RB51 vaccinations for at-risk cattle herds.

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Impacts to Ranchers from Sage-Grouse Management on Public Lands

The greater sage-grouse is being considered for listing as a threatened or endangered species on the Endangered Species Act. Environmental Impact Statements developed by the Bureau of Land Management have contained only cursory evaluations of the economic impacts this decision will have on ranchers that use public land grazing allotments. Using a base of \$112,895, representative ranch models were developed for Wyoming to explore how changing grazing seasons or amount of grazing permitted impacts ranchers. When the early season, late season, and both were lost for the Wyoming representative ranch, profits decreased by \$9,399, \$9,396, and \$18,736, respectively. When the grazing permit was reduced by 25, 50, 75, and 100 percent, profits decreased by \$14,032, \$38,188, \$48,127, and \$80,914, respectively.

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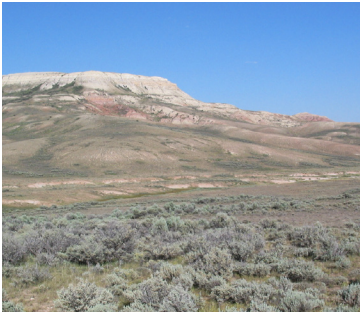


The Role of Parasitic Wasps in Mountain Pine Beetle Outbreak

The current bark beetle epidemic in Wyoming is part of a large-scale historical event that may affect biodiversity well into the foreseeable future. Parasitoid wasps and other beneficial natural enemies associated with the mountain pine beetle are economically and ecologically important insects, but comparatively little is known about bark beetle/natural enemy associations in Wyoming forests. Understanding the role of natural enemies in bark beetle population dynamics begins with knowing which natural enemies are present. Better information about beneficial parasitoid insect species will help to predict future outbreak risk and improve management decisions.

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Economics of Federal Land and Resource Policy in Wyoming

Management of Federal lands has become more contentious as interest groups with divergent concerns are increasingly involved in the planning process. One important area of debate for Wyoming communities is the economic implications of alternative Federal land management decisions. The working team for community economic development assesses economic impacts of Federal land planning in Wyoming. By providing solid economic information regarding management of Federal lands, emotionalism is reduced during discussions and decision making processes are improved.

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Improving Profitability and Sustainability of Sheep Production

Feed efficiency is a trait of economic importance to livestock producers because improvements can translate to lower feed inputs and/or enhanced stocking rates. Identification of feed efficient animals is time- and cost-intensive hampering trait improvement. Our research suggests that rumen microbial populations can be used to identify the most feed efficient ewe lambs. Development of a “microbial index” to predict or infer feed efficiency would enable producers to better select feed efficient breeding stock and ultimately potentially improve profits.

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Cost vs. Value of Retained Heifers to Be Bred

Current cattle prices are stimulating national expansion. Many producers are considering retaining additional heifers to sell next summer as bred heifers. An analysis was conducted to determine the costs of over-wintering and breeding heifers to meet the summer bred heifer market. Results showed that given the high value of calves this fall, a far less risky and almost as profitable option was to sell all calves not needed by the ranch for replacements this fall.

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Crop Rotation to Manage Herbicide-Resistant Kochia

Kochia is a troublesome weed that is well-adapted to both irrigated and dryland cropping systems. Over time it has evolved resistance to many herbicides making control difficult. Glyphosate-resistant kochia has not yet become a widespread problem in sugarbeet fields in the region, so a series of proactive field studies were conducted to develop management strategies to minimize the economic impact of this weed in sugarbeet rotations. Using conservative estimates, our data has demonstrated that by spending an additional \$35 per acre for kochia control in corn, growers could save up to \$66 per acre in the subsequent sugarbeet crop planting for a net economic gain of \$31 per acre.

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Precision Breeding Techniques Improve Grape Production in Wyoming

Grape production in Wyoming evinces strong interest from producers seeking viable alternatives to traditional crops, and from homeowners with backyard plantings. Grapevine evaluation trials were established at Sheridan and Powell to find cultivars that will perform well under diverse conditions of soil and climate. Improvement of existing cultivars and rootstocks via precision breeding will enhance genetics without potentially altering existing desirable characteristics. The final result will be the development of improved genetic resources and a package of production practices for grapevine cultivation in Wyoming.

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Wetlands and Climate Change—Importance of Surface Water Availability

The length of time water is available in wetlands is sensitive to changes in precipitation, temperature and timing. Our project classified wetland location and length of time water is available in the Plains and Prairie Pothole Region using a combination of field-based and remotely sensed data. With the ability to monitor wetland habitat change and climate variability over time, this research will better inform conservation management decisions and improve the accuracy of climate change predictions in the Plains and Prairie Pothole Region.

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