

Biological and Ecological Science for *Montana "The Treasure State"*

Montana is rich in minerals, energy, and soils, as well as prairies, forests, mountains, rivers, lakes, fish, and wildlife. Many enterprises that drive the economy are based on natural resources, including tourism, hunting, fishing, agriculture, and energy development. The outdoor-recreation economy alone supports 64,000 Montana jobs and generates nearly \$6 billion each year in economic activity.



The USGS Ecosystems Mission Area

The U.S. Geological Survey (USGS) Ecosystems Mission Area, the biological research arm of the Department of the Interior, provides science to help Montana achieve sustainable management and conservation of its biological resources and the ecosystems that sustain these resources. This work is done within the broader mission of the USGS — to serve the Nation with science that advances understanding of our natural resources, informs land and water stewardship, and helps safeguard communities from natural and environmental hazards.



Information gathered from over four decades of interagency research and monitoring, led by the USGS, was used to determine that grizzly bears in the Greater Yellowstone Ecosystem have recovered to the point that federal protections under the Endangered Species Act are no longer needed.



Wildlife Disease and Livestock

About 2.5 million head of cattle graze Montana pastures, an indication of the importance of the livestock industry to the State's economy. Brucellosis is a bacterial infection that has the potential to spread from wild ungulates to livestock and cause spontaneous abortions in infected bison, cattle, and elk. The USGS helps understand transmission possibilities from wildlife to livestock, including information about the presence of the disease in elk and possible spread to cattle.

An Energy Powerhouse

Montana's vast energy resources for bioenergy, coal, geothermal, hydroelectricity, oil, natural gas, and wind allow for production of significant State and regional supplies. The USGS supports this industry by providing the management tools, risk assessments, and scenario planning to help develop these energy resources in a manner that minimizes impacts to fish, wildlife, and other living resources while maximizing energy production.





Angling is a significant contributor to Montana's \$7.1 billion outdoor recreation economy.



In 2016, larvae of zebra or quagga mussels were initially detected in Montana in two reservoirs, resulting in emergency restrictions on boat and dock launching and other rapid containment responses.

Zebra and Quagga Mussels Have Arrived

The potential economic effect of a large infestation of zebra or quagga mussels in Montana is in the hundreds of millions of dollars, with negative repercussions for agriculture, hydropower facilities, drinking-water supplies, and recreation. The USGS develops and customizes tools for mussel detection, provides laboratory and field protocols for monitoring, and develops criteria to assess levels of risk.

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Small Parasites Can Have Big Fisheries Effects

In 2016, a closure of almost 200 miles of the Yellowstone River and its tributaries to recreation caused a significant economic impact to local river-dependent businesses. The closure happened because of a fish die-off caused by proliferative kidney disease (PKD) associated with a small parasite that damages fish kidneys. The USGS is developing techniques for early detection of the parasite, documenting the parasite's distribution, and helping managers predict the conditions that are likely to result in die-offs.

Informing Management of a Blue-Ribbon Trout Fishery

A 59-mile stretch of the spectacular Smith River in central Montana is so popular for trout fishing and boating that a lottery system is used to protect the fishery and recreational experience. USGS science, conducted in collaboration with State scientists, shows that major Smith River tributaries are important spawning and nursery areas for trout, and is guiding State efforts to identify and manage critical fish habitats.

Gray Wolf Watch

The USGS helped the State develop a program to monitor wolf abundance that produced information used in the decision to Federally delist Montana wolf populations. Wolf numbers are now managed in Montana with harvest. USGS helped the State adapt monitoring procedures to accommodate changes in wolf behavior once harvest began, as well as to account for the larger number and wider distribution of wolves in the State.



USGS science helps Montana manage wolves in line with the State's intention to balance multiple factors, including abundance of ungulates, livestock operations, and a viable wolf population.

Mixing Old and New in Tribal Forest Management

Tribal communities in Montana use both traditional knowledge and current scientific approaches to promote healthy forest ecosystems, sustain culturally important resources, and manage fire risks in a contemporary landscape. The USGS collaborates with Montana Tribes to understand the effects of fire, traditional management practices, other human influences, and climate in order to reduce fire risks now and predict future vulnerabilities.

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For more information: Ecosystems Mission Area

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