

## Science for Now and the Future: USGS Wildlife Research Key for Management and Policy



*Bumble bee over a cone flower. Photo courtesy of Michael W. Tome, USGS*

A well-functioning biological infrastructure is crucial for the well-being of the nation. Functioning biological systems provide ecosystem services that we may not notice, but that we rely on every day for food, clean water, crop and plant pollination, insect control, health and recreation. Impartial and high-quality USGS science is key to helping managers and policy-makers make informed and balanced decisions about natural resources that have economic, social, ecological and cultural importance to multiple stakeholder communities and that are cost-effective and have potential for success.

### Research Examples:

#### **Balancing Wind Energy Development with Wildlife**

**Conservation:** Domestic wind power has many benefits, including diversification of the nation's energy portfolio, new jobs and reduction of greenhouse gas emissions. But we have also collected data demonstrating that wind turbines also affect birds, bats, mammals and their habitats from direct mortality to habitat fragmentation. And recent USGS and academic research revealed that bats are worth billions (from \$3.7 to \$53 billion a year) to agriculture because of the pest-control services these animals provide. USGS scientists are assisting federal and state governments and the wind energy industry to accurately estimate fatalities and other impacts to identify the best siting and operational conditions that allow development to occur while ensuring sustainable wildlife populations.

For example, over the last 10 years, the number of operating wind turbines has increased dramatically in the West, posing risks to golden eagles. Because these birds are protected under the Bald and Golden Eagle Protection Act and other statutes, development of wind facilities can be delayed or even canceled if certain risks to these eagles and their habitats do not meet mandated standards for permitting. The USGS works closely

with federal managers and the wind industry to provide necessary technical information, such as mapping golden eagle locations and scientifically predicting the likelihood that developing a proposed site poses risks to eagles.

Likewise, to address impacts to bats, ongoing USGS research is investigating if bats are attracted to turbines, if mating or feeding behaviors play a role in fatalities, and how risk to bats might be predicted before turbines are built. Our efforts to accurately estimate fatalities and to identify locations, behaviors or weather conditions in which birds and bats are at highest risk may lead to solutions to reduce impacts while minimizing costs to the wind energy industry. Adaptive management processes and appropriate monitoring will ensure that future decisions are the best ones for society and wildlife.



*Insect-eating bats, such as these Brazilian free-tailed bats in Texas, provide a great pest-control service to agriculture and natural ecosystems. Photo courtesy of Paul Cryan, USGS*



*Elk are an important part of western ecosystems, and USGS research helps land managers deal with disease, predator, and other issues. Photo courtesy USGS*

**Chronic Wasting Disease:** Management efforts to control or eliminate this contagious and always fatal neurological disease of North American deer, elk and moose cost state and federal governments tens of millions of dollars a year. The disease, first described in 1967, is now documented in free-ranging populations in 15 states and 2 Canadian provinces -- and it continues to spread, sometimes infecting 40 or more percent of a population. CWD, recognized as a national emergency in 2001, can remain in the environment for years. USGS scientists are at the forefront of national CWD planning efforts, working with states to help them develop and implement management plans and actions. We are also identifying how the disease spreads, ways to prevent its spread and methods to help reduce or eliminate it from the wild. This research is essential to DOI's mission to protect and manage the nation's natural resources.

**Brucellosis: A Disease of Cattle, Elk and Bison:** Brucellosis is a bacterial infection of cattle, elk and bison that causes infected animals to abort pregnancies. Livestock infections result in additional testing requirements and trade restrictions, while the presence of the disease in bison limits efforts to move some bison in thriving populations to start new populations elsewhere. Our research suggests that recent increases in cattle infections may be due to increasing elk populations in Wyoming, Idaho and Montana, and are unrelated to bison, contrary to popular belief. USGS is investigating alternative disease-management strategies in elk and bison, how the disease is spread, and developing tools to protect human, domestic and wildlife resources.



*Plains bison in winter at Yellowstone National Park. Photo courtesy of Jim Peaco, National Park Service*

**Coral Reef Ecosystem Health:** Coral reefs are an essential component of many tropical and subtropical economies because they serve as a source of tourism revenue and fisheries. Unfortunately, many coral reefs are declining, in part due to diseases of unknown cause. The USGS is working collaboratively with academic, governmental and non-governmental organizations to increase our scientific understanding of coral reef ecosystem health. In the Virgin Islands and Florida, we are investigating the role of African dust and invasive species as promoters of disease while in the Pacific, the USGS has developed much needed standardized biomedical methods to investigate coral disease -- methods now being used globally. Because of USGS's unique expertise in coral disease, this research complements but does not duplicate the mission of other organizations or federal agencies.



*Many coral reefs are declining, in part due to diseases of unknown cause. The USGS is working collaboratively with other organizations to increase our scientific understanding of coral reef ecosystem health. Photo courtesy of Kevin Lafferty, USGS*

**Horseshoe Crabs, Red Knots and Fisherman: A Balanced Solution:** Since 2007, USGS has worked with the Atlantic States Marine Commission, other agencies and stakeholders such as commercial fishermen to develop a management plan for a sustainable horseshoe crab harvest. Horseshoe crab blood is used for fishing bait as well as for critical medical diagnos-



*Horseshoe crabs congregate annually at Delaware Bay. Photo courtesy of Greg Breese, USFWS*

tic testing. Yet increasing crab harvest in the last two decades resulted in steep declines of crabs on Delaware Bay beaches. At the same time, a small shorebird called a red knot also experienced significant declines. Red knots and many other shorebirds rely on these crab eggs for food as they rest during migrations. In response to declines, the ASMC enacted strict crab harvest regulations. Now, because of USGS adaptive management and other work, the group has developed a harvest and monitoring strategy with the goal of allowing enough eggs to be available for red knots to eat and for a viable crab fishery to exist.

**At-Risk Species:** USGS research on species at risk has captured the public's and policymakers' attention for its objectivity and relevance. Science is the cornerstone for making the best public policy decisions and it drives innovation that can create more opportunities for people and wildlife. USGS science on at-risk species does just that in support of balanced implementation of the Endangered Species Act. The ESA was



*Two grizzly bear cubs in Alaska playing in the water. Photo courtesy Steve Hillebrand, USFWS*

designed to protect imperiled species from extinction because of human activities yet managing, adding and removing species from the ESA list can have serious economic, ecological and public resource impacts that lead to intense debate. To ensure the U.S. Fish and Wildlife Service has the best independent, peer-reviewed information available, USGS scientists are called to the task. USGS is unique among federal agencies in having

multiple scientific disciplines under one roof. This interdisciplinary science is routinely used in research, combining our agency strengths in species and population ecology, life history, biology, mapping, satellite/radio tracking, genetics, geology, hydrology and other disciplines. We can – and do – assess species' population viability and calculate the impact of different management scenarios on a species' future welfare. For example, we help assess what habitat is most critical for a species' survival and what is less important, allowing strategic decisions to be made.

We also work on species that are at risk but not yet listed to allow managers to take actions that might help prevent endangerment and eventual regulations if nothing is done. Keeping species from needing ESA protections is less costly to the American public. Our data and information have enabled managers to recover species, even to the point of being removed from the endangered species list (e.g., bald eagles, alligators, grizzly bears). Some of the species we work on include polar bears, sea otters, manatees, sage-grouse, elkhorn and staghorn corals, Karner blue butterflies, desert tortoises, pikas, loggerhead and other sea turtles, whooping cranes, and a suite of critically endangered Hawaiian birds.

**Wild Duck, Geese and Waterbird Migration and Population Science:** From John James Audubon's historic art to annual rites of bird dogs and duck hunts, Americans have a deep connection with waterbirds and wetlands. Waterfowl connect the



*A male spectacled eider following implantation of a satellite transmitter in Alaska. Potential risks to eiders, whose numbers have plummeted, include being subjected to increased exposure during storms in winter, changes in foods because of declining ice, and warming temperatures in the Bering Sea. Photo courtesy of USGS*

nation by living in all ecosystems, from open oceans, to coasts and shorelines and to the Great Plains and the vast prairies. In close coordination with other federal, state and local agencies and NGOs, USGS science centers across the country provide key tools, data and information that help ensure the future of our waterbirds, including information to set yearly hunting regulations. USGS mapping and satellite tracking expertise has been used to conduct comprehensive studies in areas as diverse as avian influenza pathways; northern pintail, sandhill crane and shorebird migration routes and habitat use; post-oil spill effects on various bird species; and the effects of contaminants such as mercury on waterbirds.

**An Emerging Bat Disease:** The sudden emergence of white-nose syndrome (WNS), a devastating disease of hibernating bats, demonstrates the importance of a national and international infrastructure to investigate and respond to emerging wildlife diseases and their ecological and societal threats. Since 2008, when scientists first began investigating this unknown disease in bats of the northeastern U.S., WNS has spread to 16 states and 4 Canadian provinces. WNS has caused precipitous declines of some bat species. Since the USGS first identified the



*A USGS scientist takes samples from a cave to test for *Geomyces destructans*, the hallmark fungus of white-nose syndrome in hibernating bats.*

WNS fungus, our ongoing research has provided critical information about the fungus and the disease, guiding state, federal, NGO and tribal disease-response activities. Land-management agencies rely on our research and disease investigations to support on-the-ground actions, to help develop the WNS National Plan, and to assist with other national disease management plans.

**National Amphibian Research and Monitoring Program (ARMI):** They are icons of the American childhood — from the classic pages of Mark Twain to idyllic afternoons at lakeside summer camps. But imagine our creeks and wetlands without frogs, toads and salamanders. Led by USGS, ARMI is providing the first national assessment of the distribution and



*In 2010, USGS scientists found this adult mountain yellow-legged frog; it is a rediscovered population of this endangered frog in the San Jacinto Wilderness, San Bernardino National Forest, California. Photo courtesy of Adam Backlin, USGS*

status of amphibian populations on DOI lands. USGS is also examining the scope, severity and causes of amphibian declines throughout the U.S. Countries around the world are conducting similar research to shed light on this ongoing global amphibian extinction crisis.

**Plagued by Plague:** Better protection of prairie dogs against plague would minimize the risk of disease transfer to endangered black-footed ferrets, aid in prairie dog conservation and protect public health. USGS scientists at the USGS National Wildlife Health Center have developed a highly effective laboratory-tested oral plague vaccine for prairie dogs as a pre-emptive method of combating plague. USGS is working



*USGS has developed a vaccine against plague, which is a disease that afflicts people and animals alike, including endangered black-footed ferrets. Photo courtesy of USFWS.*

in collaboration with numerous state and federal agencies and tribes to obtain approval for field trials with vaccine-laden, peanut-butter flavored baits and evaluate the safety and effectiveness of the vaccine in grasslands. The ultimate goal is to use this oral vaccine as a management tool in targeted areas where black-footed ferrets are living or are released as part of their recovery program.

### **For more information,**

**visit or contact <http://ecosystems.usgs.gov/water/> or contact**

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