As the nation develops its renewable energy capability, USGS provides key science to minimize impacts on wildlife.

The Western Ecological Research Center (WERC) is a USGS Ecosystems Mission Area center serving primarily California and Nevada. This region is at the forefront of expansions in renewable energy development and scientific understanding for decision support.

As solar, wind, and wave energy projects expand on western land- or seascapes, managers need the best-available science to minimize effects on wildlife or habitat. Disruption of migration corridors, collision with wind turbines, incineration at solar facilities, and loss of habitat are among key factors that affect wildlife and plant populations. With renewable energy development on the rise, WERC long-term projects in desert, sagebrush, chaparral, mountain, and oceanic habitats have become even more relevant. WERC conducts research on the biology and ecology of species of concern, working closely with Federal, State, academic, and non-profit collaborators to provide resource managers with information necessary to sensibly plan for our Nation’s energy needs, while maintaining the ecological stability of iconic American landscapes. Partners or resource managers include the U.S. Fish and Wildlife Service, Bureau of Land Management, Bureau of Ocean Energy Management, National Park Service, California Department of Fish and Wildlife, California Energy Commission, Nevada Department of Wildlife, Southern California Council of Governments, multiple branches of the U.S. Department of Defense, and others.

Here, you’ll find the latest information on WERC projects that span ecologically important habitats across the Mojave and Sonoran deserts, Great Basin, and North Pacific Ocean. These habitats include conservation refuges and preserves, military installations, and other Federal or State lands; and National Marine Sanctuaries; State and Federal waters; and designated marine protected areas. WERC scientists are spearheading research on species under Federal responsibility that include the threatened desert tortoise; the federally protected golden eagle and other migratory birds; rare, threatened, and endangered native plants; and the listed California sea otter and seabirds.
WERC Projects on Wildlife and Renewable Energy

**WERC Science and Desert Energy**
- Amy Vander gast, Todd Esque and Robert Fisher mapped the population genetic structure for 17 animal species across the Mojave Desert, and determined overlap between geographic hotspots of genetic diversity and current and future renewable energy development.
- Kathleen Longshore and Todd Esque study habitat use, food habits, prey availability, and nesting of golden eagles in relation to renewable energy sites in the Mojave Desert.
- Lesley DeFalco investigates the life history and genetics of native Mojave Desert plants to identify varieties most appropriate for desert restoration projects, including those associated with renewable energy.
- Todd Esque and Amy Vander gast are incorporating genetics, demography, gene transcription, and desert tortoise movements to determine appropriate habitat corridor size and connectivity in relation to renewable energy developments.
- Kristin Berry’s research on desert tortoise populations, health, and human impacts models assists in identifying appropriate sites for renewable energy projects and informs managers of projects’ potential negative effects.
- Kathleen Longshore studies desert bighorn sheep to understand movement patterns and genetic connectivity, helping map optimal conservation corridors that link sheep populations in the eastern Mojave Desert.
- Todd Esque and a team of scientists developed a species distribution model in relation to current and future solar energy development and climate change. They are modeling habitat of many reptile and amphibian species across three deserts to provide decision support to five states, federal agencies, Tribes, and Mexico for renewable energy development.

**WERC Science and Wind Energy**
- WERC scientists led by Peter Coates, Mike Casazza and Matt Brooks are investigating the NV sagebrush-steppe ecosystem altered by wind energy development and transmission.
- Tracking greater sage-grouse to create detailed maps of distribution and movement throughout NV to provide information to minimize impacts of wind turbines and energy transmission.
- Studying ravens that are a major predator of sage-grouse eggs and young. Ravens use transmission towers for nesting and scouting; their density increased by 600% in an area of new towers.
- Understanding altered vegetation and fire regimes. Clearing land for energy infrastructure facilitates invasive plants that promote unnatural wildfire frequency and intensity in sagebrush ecosystems.
- Robert Fisher and biologist Jeff Tracey are using population surveys, genetic sampling, and 3-D mapping techniques to understand golden eagle demographics, nesting, and foraging behavior. These studies inform resource managers responsible for siting renewable energy development in southern CA.
- WERC statistician Julie Yee provides independent oversight of project data and analyses of wind turbine raptor mortality and mitigation success at the Altamont Pass Wind Resource Area near Livermore, CA.
- Julie Yee also provides expert oversight of data analyses of raptor mortality due to wind turbines and mitigation strategies. She has provided extensive review of a National Renewable Energy Laboratory publication that provides the framework for testing the effectiveness of bat and eagle impact-reduction strategies.

**WERC Science and Offshore Wind and Wave Energy**
- Kevin Lafferty is investigating whether wave energy facilities could alter existing dynamics between wave energy and the nearshore environment.
- Josh Adams conducts research on the at-sea behaviors of seabirds in the Pacific to help resource managers assess potential interactions between these animals and renewable energy infrastructure. His research program aids in:
  - Mapping the distributions and abundances of seabirds off CA, OR, WA, and HI.
  - Tracking the at-sea movements and behaviors of multiple seabird species and quantifying their habitat use patterns and overlap with proposed offshore wind energy infrastructure.
  - Evaluating existing knowledge of seabird flight and diving behavior, conservation status, and threats to rank each species’ vulnerability to renewable energy infrastructure.
- Tim Tinker studies sea otters in the coastal ecosystems from California to the Aleutian Islands. Research on this flagship, keystone species is vital to those engaged in nearshore wind and wave energy planning and siting.

WERC partners in wildlife-renewable energy research include: U.S. Fish and Wildlife Service • National Park Service • Bureau of Land Management • Bureau of Ocean Energy Management • National Oceanic and Atmospheric Administration • U.S. Army • U.S. Forest Service • Department of Energy • California Energy Commission • California Department of Fish and Wildlife • Hawai’i Department of Land and Natural Resources • Nevada Department of Wildlife • University of Nevada, Las Vegas; Reno • University of California, Riverside; Santa Barbara; Santa Cruz • Idaho State University • Hawai’i Pacific University • Denver University • Desert Landscape Conservation Cooperative • Desert Managers Group.