



## Wayne D. Spencer, Ph.D.

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Dr. Spencer is a wildlife conservation biologist with over 40 years of professional experience in biological research and conservation planning. He specializes in the practical and collaborative application of science to resources management, design and management of nature reserves, and recovery of endangered species. He has conducted numerous studies on rare and sensitive mammals, with particular focus on forest carnivores (martens and fishers) and endangered rodents (Pacific pocket mouse and Stephens' kangaroo rat). Dr. Spencer has prepared habitat conservation plans (HCPs), habitat management plans (HMPs), and natural community conservation plans (NCCPs) for numerous sensitive species in California, including the first NCCP plan ever permitted (Poway Subarea NCCP/HCP). He also uses ecological expertise to guide large-scale efforts to conserve ecological connectivity and wildlife movement (such as the [South Coast Missing Linkages Project](#) and the [California Essential Habitat Connectivity Project](#)) as well as to restore and sustain resilient forest conditions in the face of changing climate and wildfire regimes (such as the [Sierra Nevada Forest Resilience Initiative](#)). Because he combines ecological research with real-world planning experience, Dr. Spencer is often asked to lead science advisory processes for regional conservation and recovery plans, such as the [Desert Renewable Energy Conservation Plan](#) and the [Sacramento-San Joaquin Bay Delta Conservation Plan](#). He currently leads teams working to recover the endangered population of fishers in the Sierra Nevada and the endangered Stephens' kangaroo rat in southern California.

### EDUCATION

**Ph.D., Ecology and Evolutionary Biology**, University of Arizona. 1992. Highest Honors.

**M.S., Wildland Resource Science/Wildlife Ecology**. University of California, Berkeley. 1981. Honors.

**B.S., Biology and Wildlife Management (double major)**. University of Wisconsin, Stevens Point. 1978. Highest Honors.

### RECENT AWARDS

**2026 Raymond F. Dasmann Professional of the Year**, Western Section of The Wildlife Society

**2011 Special Recognition Award**, Desert Tortoise Council

**2011 Special Contributions Award**, Desert Tortoise Preserve Committee

**2008 Conservationist of the Year Award**, Western Section of The Wildlife Society

## SELECT PROJECT EXPERIENCE

**Southern Sierra Nevada Fisher Conservation Strategy - Sierra Nevada Conservancy, US Forest Service, California Department of Fish and Wildlife, and US Fish and Wildlife Service.** Dr. Spencer leads the Fisher Technical Team, a multi-agency group of experts that guides conservation and recovery planning for the endangered population of fishers (*Pekania pennanti*) in the southern Sierra Nevada. He served as first author and editor of a fisher Conservation Assessment (Spencer et al. 2015b) and Conservation Strategy (Spencer et al. 2016) for the population (Versions 1.0), and is currently preparing Versions 2.0, a 10-year update following extreme environmental changes due to climate change and severe wildfire.

**Range-wide Conservation Plan for Stephens' Kangaroo Rat – Riverside County Habitat Conservation Agency and Bureau of Land Management.** Dr. Spencer serves as the lead scientist in a partnership of various resource management, regulatory, and research organizations to prepare a comprehensive, range-wide management and monitoring plan for the endangered Stephens' kangaroo rat, an endemic species of open grasslands in southern California. The plan uses new habitat value maps creating using satellite imagery that allow for regular updating of kangaroo rat habitat quality and distribution over the range, which can also be used to help track population status and trends. The plan will serve as a foundation for a US Fish and Wildlife Service endangered species recovery plan for this rare and interesting species.

**Sierra Nevada Forest Resilience Initiative – Numerous Partners.** Dr. Spencer led a team of experts that developed metrics and models to define, map, and track changes in forest resilience in the Sierra Nevada and to guide management actions to restore and sustain more resilient conditions in the face of climate change and increasingly severe droughts and wildfires. Sustaining more resilient habitat conditions is essential to conserving rare forest species, including the endangered Pacific fisher and California spotted owl, as well as reducing risks to human communities and other high-value resources, such as giant sequoia groves.

**Paradise Nature-based Fire Resilience – City of Paradise and The Nature Conservancy.** Dr. Spencer served as lead scientist for studies to help the City of Paradise and its neighbors, Magalia and Concow-Yankee Hill, rebuild more wisely after the devastating Camp Fire of 2018. The concept was to incorporate strategies to increase resilience of human communities to fire and climate change, enhance the safety and well-being of residents, and successfully steward the surrounding natural areas. The project included a comprehensive literature review of the science justifying defensible space zones to safeguard both human and wildland communities, and it modeled the risks of structure fires as a function of how wildfires spread from natural areas into human communities. These models were used in a decision-support system to prioritize where specific parcels could be managed for resource values that reduce risks of ignitions in human communities, provide strategic staging areas for escape from fire and to provide fire-fighters with safe battle zones, while also providing additional amenities for human recreation and wildland values.

**Orange County Corridor Planning – Laguna Greenbelt, Inc., and Terrell Watt Planning Consultants.** Dr. Spencer assembled and managed a team of wildlife biologists, connectivity scientists, and stakeholders to design a wildlife corridor plan for the Irvine Land Company in Orange County. This regionally significant corridor connects coastal preserves in the Laguna Hills to inland public lands and wilderness in the Santa Ana Mountains across a highly developed landscape and one of the most heavily traveled transportation corridors in California (Interstate 5 in Irvine). Completing this extremely challenging endeavor will likely involve a cutting-edge engineering design to allow large mammals, such as bobcats and deer, to cross over what is currently an absolute barrier to wildlife movement. A detailed mitigation plan on either side of the freeway crossing has been developed and is being implemented as the crossing structure is in development.

**Science Facilitator and Lead Advisor for Regional Conservation Plans – Numerous Agencies.** Dr. Spencer has served as science facilitator and lead science advisor for a wide variety of large-scale HCPs and NCCPs throughout California, including the Desert Renewable Energy Conservation Plan, the Sacramento-San Joaquin Bay Delta Conservation Plan, the Altamont Pass Wind Resource Area Conservation Plan, and NCCP/HCP plans for the counties of Butte, Santa Clara, San Diego, Merced, Yuba, Sutter, and Yolo, and the city of Santa Cruz. These plans cover hundreds of listed and sensitive species in diverse habitats and ecological communities, usually under severe pressures from human development or other threats to biological integrity. The process includes selecting and leading groups of independent science advisors to reach consensus on scientific principles and solutions, reviewing extensive technical information, organizing questions and issues for advisors to address, compiling and editing inputs from the advisors, and usually serving as first author and editor of a science advisory report. The advisory reports serve as foundations for planning ecological reserve systems and developing adaptive management and monitoring plans to sustain biological diversity, native habitats, and the species inhabiting them.

**Principle Investigator for California Mammal Species of Special Concern – California Department of Fish and Wildlife.** Led a Technical Advisory Committee and other contributors in a comprehensive update of the Mammal Species of Special Concern (MSSC) in California. The team developed and applied a systematic scoring procedure to rank mammal species, subspecies, or distinct population segments for their relative degree of conservation concern within California. They compiled mammal locality data and other pertinent information concerning the status and distribution of nominee taxa, and prepared species accounts for most species on the final list of MSSC. The results are to be used to update the California Department of Fish and Wildlife list of sensitive taxa.

**Principle Investigator for California Essential Habitat Connectivity Project California Department of Transportation, California Department of Fish and Game, and Federal Highways Administration.** This project was a highly collaborative effort to identify and characterize areas important to maintaining a functional network of connected wildlands throughout the state of California (Spencer et al. 2010). The project produced three primary products: (1) a statewide Essential Habitat Connectivity Map, (2) a database characterizing areas delineated on the map, and (3) guidance for mitigating the fragmenting effects of roads and for developing and implementing local and regional connectivity plans. The essential connectivity

network consists of 850 relatively intact and well-conserved natural landscape blocks larger than 2,000 acres and 192 essential connectivity areas for maintaining wildlife movement and other ecological flows among them. The final report provides detailed guidance for considering ecological connectivity in transportation and land management planning, preparing finer-resolution regional and local connectivity plans and linkage designs, and siting and creating road-crossing improvements for wildlife to improve ecological connectivity and reduce vehicle-wildlife collisions. All products were produced using cutting-edge GIS modeling methods in a highly collaborative, transparent, and repeatable process that could be emulated by other states. The project received the 2011 Exemplary Ecosystem Initiative Award from the Federal Highways Administration.

**Lead Scientist for Pacific Fisher Baseline Assessment and Cumulative Effects Analysis in the Sierra Nevada, California – US Forest Service, Region 5.** Led a comprehensive compilation and analysis of data on the Pacific fisher (*Martes [Pekania] pennanti*)—which was found to be “warranted but precluded” for endangered species listing in 2004—to assess the species’ historic, current, and future habitat and population status in the Sierra Nevada, and especially to assess the cumulative effects of wildfires, fuels management, timber harvest, and other threats to this isolated population. The project included extensive coordination with state, federal, and local agencies and stakeholder groups (e.g., conservation organizations and timber industry representatives), and facilitation of an independent science advisory body to ensure application of best available science. Cutting-edge spatial-analytical tools were used to forecast changes in fisher habitat and population size under various forest management and fire scenarios, and to forecast resulting effects on population viability. This involved coupling landscape-level models of fire and vegetation dynamics with fisher habitat suitability models and spatially explicit population dynamic models (Spencer et al. 2008, 2011; Syphard et al. 2011, Scheller et al. 2011).

**Project Manager/Lead Biologist for Habitat Conservation Plans and Natural Community Conservation Plans – Numerous Agencies.** Managed the design, analysis documentation, public involvement, and permitting processes for a variety of regional HCP/NCCPs in California pursuant to the Endangered Species Act and the California NCCP Act, including the following:

- *Poway Subarea HCP/NCCP – City of Poway, California.* The first plan successfully permitted under the NCCP Act of 1991, this wildlife conservation plan was designed to sustain populations of 42 sensitive species in an interconnected habitat network within a 25,000 acre planning area.
- *Multiple Habitat Conservation Program (MHCP) – San Diego Association of Governments (SANDAG).* Managed design and documentation of this HCP/NCCP covering 7 incorporated cities and over 186 square miles in north San Diego County. Oversaw development and use of a comprehensive GIS database to design a biologically defensible plan that balances conservation and economic concerns. Included a public policy development and coordination component to ensure consensus between all pertinent organizations and agencies, as well as economic and financing analyses for plan implementation.
- *City of Carlsbad Habitat Management Plan (HMP).* Helped the City of Carlsbad complete a citywide HMP that also serves as a multiple species HCP/NCCP. Met with

affected property owners and agencies to negotiate preserve areas within the 25,000-acre planning area; managed biological surveys, GIS analyses, and document preparation. The plan covered nearly 100 sensitive plant and animal species, while preserving reasonable economic growth and private property rights throughout the city.

- *City of Oceanside HCP/NCCP*. Managed preparation of the City's subarea HCP/NCCP, which covered 27,000-acres. Tasks included managing field surveys, GIS database development and analyses, public outreach, and plan documentation.

**Framework Monitoring Plan for the Channel Island Fox – US Navy and The Nature Conservancy.** Served as project manager, science facilitator, and lead author on a project to review existing monitoring data and methods across all populations of the endangered Channel Island fox (*Urocyon littoralis*) and develop statistically robust monitoring methods to address population status, trends, and threats. Working closely with a panel of experts on fox biology, wildlife monitoring, and statistics, the team developed a statistically robust approach to monitoring population status and threats to the San Clemente Island fox (*U. l. clemente*) that met diverse operational and biological goals of the US Navy, which owns and operates San Clemente Island as a live-fire and special-operations training area. Based on this model, we developed a framework monitoring plan that could also be used on the other 5 islands supporting island fox populations (each island supports a unique subspecies and has different ownerships, management issues, and environmental conditions).

**Research on Effects of Fire Severity and Distance from Unburned Edge on Mammalian Community Post-fire Recovery- U.S. Forest Service, Joint Fire Science Program, Riverside Fire Lab.** Served as Principle Investigator for a 4-year study of how mammal species and communities recovered following the largest wildfire in California in over 100 years (the October 2003 Cedar Fire in San Diego County). Oversaw a crew of field biologists from the San Diego Natural History Museum that sampled mammal communities and vegetation at numerous plots inside and outside the fire perimeter, at varying distances from the edge and in areas of differing fire intensity (Diffendorfer et al. 2012, Schuette et al. 2014).

**Pacific Pocket Mouse Studies Program – Transportation Corridor Agencies, U.S. Fish and Wildlife Service, and California Department of Fish and Game.** Served as Principal Investigator for studies designed to further recovery of the critically endangered Pacific pocket mouse (*Perognathus longimembris pacificus*). Tasks included studying dispersal characteristics and other pertinent biological information on the species; performing detailed field studies of a surrogate subspecies to perfect field methods and design monitoring programs; determining the feasibility of a translocation or reintroduction program for the species, determining baseline measures of genetic diversity within and between extant (using live-captured specimens) and historic (using museum specimens) populations and developing genetic goals for the recovery program; and coordinating ongoing monitoring studies at extant population sites to maximize the value of the monitoring data for both scientific and preserve management goals (Spencer 2005).

**Stephens' Kangaroo Rat Studies at the Ramona Airport, San Diego County, California – KEA Environmental.** Verified a new population of the endangered Stephens' kangaroo rat in the Santa Maria Valley, Ramona California, by trapping and reconnaissance surveys. Mapped the density and extent of this new, southern- most population, and performed GIS habitat

modeling to predict other potential habitat throughout the Santa Maria Valley. Prepared a biological technical report and sections of the Biological Assessment for the Ramona Airport expansion project. Participated in a Section 7 consultation and prepared a Habitat Management Plan for the Stephens' kangaroo rat on the airport property. Prepared and oversaw implementation of a translocation program to salvage kangaroo rats prior to construction, house them in captivity, release them to release sites in improved habitat areas, and monitor success of the translocated population and the overall population in the area for several years.

**Basewide Survey for Pacific Pocket Mouse** – U.S. Marine Corps Base Camp Pendleton. Managed an intensive field survey to determine the distribution of the endangered Pacific pocket mouse on base. Developed detailed survey protocols in consultation with other mammalogists and the USFWS. Coordinated a team of 15 biologists performing reconnaissance and trapping surveys over all previously unsurveyed habitat for the species on base (over 6,000 acres). Managed development of a GIS database that summarizes all data for the species on base, including results of previous surveys. Analyzed habitat relationships of PPM using GIS and statistical models.

**Studies on the Community Ecology of the Chihuahuan Desert – National Science Foundation.** Studied the community ecology of desert rodents with Dr. James H. Brown, University of Arizona. Captured, identified, measured, and marked individuals of 15 species of rodents, including three species of kangaroo rats and three species of pocket mice, in over 20,000 trapnights in the Chihuahuan and Sonoran deserts. Trapped, marked, measured, and radio-tracked various species of kangaroo rats with Dr. Peter Waser, Purdue University, for a study of kangaroo rat behavior and ecology. Studied effects of foraging by javelina on native plant species. Performed microhabitat analyses and censuses and intensive foraging studies on wintering sparrow flocks while studying ecological interactions between desert rodents, birds, and ants in the Chihuahuan Desert (Thompson et al. 1991).

**Pine Marten Ecology Studies in the Pacific States** – U.S. Forest Service. Studied the ecology and behavior of pine martens in the Sierra Nevada and Cascade mountain ranges using trapping, radio-tracking, snow-tracking, smoked track-plate plots, and intensive habitat analyses (Spencer 1981; Spencer 1982; Spencer et al. 1983; Spencer and Zielinski 1983; Zielinski et al. 1983; Spencer 1987).

**Studies of Space-use Patterns, Behavior, and Brain Evolution in Heteromyid Rodents – National Science Foundation and National Institute of Health.** Researched space use patterns, memory, navigation, and spatial cognition in various species of kangaroo rats, pocket mice, and grasshopper mice (Spencer 1992). Collaborated with Dr. Lucia Jacobs on the evolution of spatial cognition and the hippocampus of the brain in kangaroo rats and pocket mice (Jacobs and Spencer 1991, 1994).

**Mount Baker Geothermal Energy Development Biological Resources Assessment – Seattle City Light and Power Company.** Led a team that studied the impacts of geothermal energy development on sensitive wildlife in old-growth forests on Mount Baker, Washington. Radio-tracked pine martens and performed trapping and other surveys for various rare carnivore

species, including lynx, fisher, and wolverine. Coordinated with biologists studying northern spotted owls and mountain goats.

**Assessment of Impacts of Free-roaming House Cats on Native Wildlife Populations at Saguaro National Monument and Tucson Mountain Parks – National Park Service, Western Region.** Performed a study involving the impacts of free-roaming house cats on wildlife populations for the design of buffers around nature preserves in Arizona. Radio-tracked 14 free-roaming house cats and analyzed their movements, food habits, home ranges, and behaviors.

## PUBLICATIONS

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## SELECT PRESENTATIONS

Reconciling habitat quality – resilience “conflicts” for dense forest species. Invited Keynote Address, Western Section of The Wildlife Society Conference, February 2016.

California’s Desert Renewable Energy Conservation Plan: A case study in use of independent science advice. Invited Keynote Address at annual conference of Northern California Conservation Planning Partners: Habitat Conservation Planning from Tahoe to the Bay. November 2012.

Planning for ecological connectivity from statewide to local scales. Invited Presentation, Caltrans Biologist Connectivity Training Workshop, Los Angeles, California. October 2011.

Potential effects of large-scale algal biofuels production on wildlife. Invited Presentation to National Academy of Sciences Committee on Sustainable Biofuels Production. August 2011.

Independent science advice for the California Desert Renewable Energy Conservation Plan: Background, Recommendations, and Future Directions. Invited Keynote Address at annual conference of the Desert Tortoise Council, Las Vegas, Nevada. February 2011.

Trends in independent science advice for NCCP/HCPs. Invited presentation at annual conference of the Western Section of The Wildlife Society, Riverside, California. February 2011.

Why mammals use home ranges: The value of spatial information. Invited Special Symposium Presentation, American Society of Mammalogists, Fairbanks, Alaska. June 2009.

Roles for science-based NGOs in wildlife management and conservation. Invited Plenary Talk at annual conference of the Western Section of The Wildlife Society, Redding, California. February 2008.

Managing landscape linkages to conserve desert wildlife during climate change. Invited presentation and panel discussion. The Climate & Deserts Workshop: Adaptive Management of Desert Ecosystems in a Changing Climate. Laughlin, NV, April 2008.

Improving science delivery for regional conservation plans: Lessons from science advisory processes in California. Invited presentation. Society for Conservation Biology, San Jose California, June 2006.

The science advisory process for regional NCCPs and HCPs. Invited presentation, Continuing Legal Education (CLE) workshop on regional conservation planning. San Francisco, California. December 2005.

Bioethical meanderings of a fur trapper to game biologist to ivory tower ecologist to bioslut to NGO conservation scientist convert. Invited talk at Special Session on Ethics in Wildlife Biology, Western Section of The Wildlife Society, February 2003.

Salvage translocation of endangered Stephens' kangaroo rats in a small, satellite population. Society for Conservation Biology, Duluth, Minnesota. 2003.

The role of consultants in conservation science delivery. Invited presentation at Regional Conservation Planning (NCCP/HCP) Workshop. Western Section of the Wildlife Society. Sacramento, California. 2001.

The science component of regional conservation plans. Invited presentation at Regional Conservation Planning (NCCP/HCP) Workshop. Western Section of the Wildlife Society. Sacramento, California. 2001.

Designing a translocation program to recover the critically endangered Pacific pocket mouse (*Perognathus longimembris pacificus*). American Society of Mammalogists. Missoula, Montana. 2001.

Status of mammals in near coastal habitats, with emphasis on the endangered Pacific pocket mouse. Invited Symposium Presentation. Planning for Biodiversity: Bringing Research and Management Together. Pomona, California. 2000.

U.S.-Mexican cooperation in the conservation of rare mammals: Workshop Introduction. International Theriological Congress IV. Acapulco, Mexico. 1997.

Does the extremely endangered Pacific little pocket mouse exist in Baja, California, Mexico? International Theriological Congress IV. Acapulco, Mexico. 1997.

Linkage planning under severe constraints: gnatcatchers and the Oceanside stepping-stone hypothesis. Interface Between Ecology and Land Development in California. J.E. Keeley, ed. Southern Calif. Acad. Sci., Los Angeles. 1997.

Threatened and endangered species of California: a regional overview. CLE International Conference on the Endangered Species Act. San Diego, California. 1995.

Impacts of free-ranging house cats on wildlife at a suburban-desert interface. Society for Conservation Biology. Guadalajara, Mexico. 1994.

Resource dispersion, information, and space-use patterns of vertebrates. Animal Behavior Society. Binghamton, New York. 1990.

Statistical moments for analyses of two-dimensional distributions in ecology. Southwest Association of Biologists. Portal, Arizona. 1988.

Spatial learning and models of foraging movements. Southwestern Association of Biologists. Flagstaff, Arizona. 1987.

Multiple central-place foraging in small carnivores. American Society of Mammalogists. Albuquerque, New Mexico. 1987.

On cognitive maps and the optimal use of home range. Animal Behavior Society. Tucson, Arizona. 1986.

An evaluation of the harmonic mean measure for defining carnivore activity areas. Invited Paper: International Theriological Congress. Helsinki, Finland. 1982.

Selection of resting and foraging sites by *Martes americana*. International Theriological Congress. Helsinki, Finland. 1982.

Rest-site selection by pine martens at Sagehen Creek, California. Western Section of The Wildlife Society. Reno, Nevada. 1981.