

Research at Wind Cave: Big News from a Small Park

By Kirsten Krueger

At a time when NPS science is receiving widespread public scrutiny and criticism, the research program at Wind Cave NP, South Dakota, is a notable success story. To those few who have even heard of the park, Wind Cave may not epitomize the image of a research haven. Indeed, some might think of it as "just another hole in the ground." Established in 1903 to protect and preserve the many unique cave formations, the park was soon recognized for the additional significance of surface resources above and around the cave. Today the relatively small 11,335 ha (28,060 acre) park is known for its compact association of rolling mixed-grass prairie – the "sea of grass" – and the Black Hills ponderosa pine dominated forest.

Because of its location and rich flora and fauna (including bison, elk, pronghorn, mule deer, prairie dogs, coyotes, eagles, turkeys, sharp-tailed grouse, bobcat, and mountain lion), Wind Cave has numerous unstudied natural and earth science resources. The potential for both basic and applied research is enormous, and the need for critical baseline and management-oriented data is persistent and growing. Small parks have small operating budgets, but a number of factors have worked simultaneously since about 1970 to support a growing research program at Wind Cave.

Before 1970 the park had no research staff or support funds. Records indicate research efforts that were scattered and periodic. Only three major studies, two on prairie dogs and one on ungulate range carrying capacity, had been completed since park establishment. While a number of cave and surface studies were proposed in the 1960s, none was funded. Those proposals included only basic inventory, survey, and mapping work.

Enter Al Lovaas

With the arrival of Wind Cave's first research biologist Al Lovaas (now Alaska's Regional Chief Scientist) in 1970, the situation changed. Lovaas encouraged university scientists to work in the park and initiated several projects of his own. Jack O'Brien, chief naturalist at the time, began assisting volunteer cave researchers. When Lovaas left Wind Cave in 1975, cave exploration and mapping projects were well underway and surface research had expanded to include studies of pronghorn behavior; prairie dog town expansion; prairie dog energetics, densities, and diet; elk population dynamics, distribution, herd organization, and range use; and baseline studies of grassland ecology and the use of prescribed fire in grassland management. NPS contract funding was secured for a number of these studies and Lovaas was able to provide limited lab facilities and equipment for park researchers.

Since the arrival of Wind Cave's current research biologist Rick Klukas in 1976, both NPS and independent research activities have continued to grow. As indicated in Figure 1, the NPS studies underway in 1976 (4) have become 15 in 1986. Most NPS studies are directed toward either accumulating baseline data and monitoring, or studying the effects of management activities. Ongoing studies by Klukas include investigations of natural mortality in bison and elk, effects of fire on dog town expansion rates, effectiveness of diethylstilbestrol (DES) as a prairie dog control agent, differences in vegetation within and outside the park's grazing enclosure, predator activities on prairie dog towns, dis-

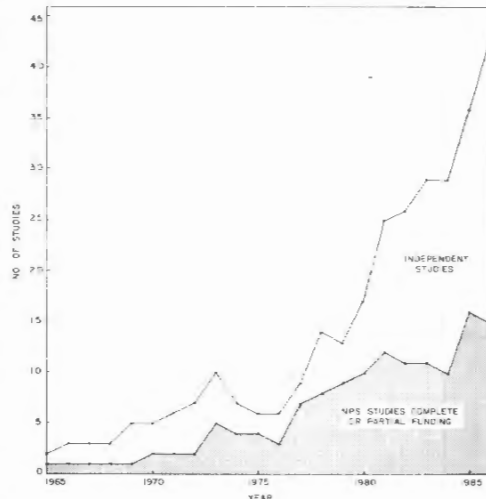


Figure 1. Growth of research at Wind Cave National Park, 1965-1986.

tribution of uncommon woody plants, dynamics of Canada thistle, and expansion of the Wind Cave flora and herbarium collection. Cooperative studies include paleoecology of White River deposits, taxonomy of bison and elk, and an isotopic analysis of C_3 - C_4 (major plant photosynthetic groups) use versus availability on major range site types in the park. These studies represent a substantial Wind Cave research effort at low cost to the Park Service.

Independent Research

Independent researchers have contributed 15 Ph.D. dissertations, 22 Master's theses, and numerous publications. Independent research support has increased to an estimated \$550,000-\$600,000 for the 28 studies ongoing in 1986. Scientists have come to work at Wind Cave from as far as the University of Calgary, City College of the City University of New York, Argentina's Universidad de mar del Plata (CONICET), and many places in between. A few are supported by personal funds; many are university-funded faculty or graduate students, and some are on National Science Foundation (NSF) grants.

Individual researchers have worked in the cave, studying hydrology, climate, paleontology, and continuing exploration and mapping, and on the surface, where studies have ranged from developmental behavior of bison, and prairie dog sociobiology to description of riparian vegetation, and grazing pressures on individual grass species. Research groups from Iowa State, Michigan Tech, South Dakota State, and the University of Colorado, through students, faculty, and funds, have completed studies on bison and elk food habits, prairie dog dispersal, DES as a prairie dog population control agent, and the effects of fire on ponderosa pine regeneration, grassland bird and small mammal populations, and grassland vegetation and soils.

Since the late 1970s, the most substantial independent contribution has been from the Natural Resource Ecology Lab (NREL) at Colorado State University, led by Dr. Jim Detling. With several large NSF grants, NREL has studied plant-animal interactions in the park and intensification of biological activity and control of ecosystem change by grassland herbivores. A dozen graduate students have been involved in projects related to the grant topics. Research subjects include: the effects of grazing by prairie dogs and bison on grasshopper populations, bison grazing patterns and nutrient transport in a mixed-grass prairie system, the effects of bison and prairie dog grazing on vegetation and soils, the

benefits to bison from feeding on prairie dog towns, the role of native herbivores in selection of grazing-adapted plants, the effects of root-feeding nematodes on primary production, the role of herbivores in mediating plant competitive interactions, the ecophysiology of some grass species on an adjacent to prairie dog towns, bison-prairie dog-plant interactions, the effects of fire on bison movements, and the structural stability of grazed versus ungrazed grassland.

Theories Prove Practical

Unlike NPS-funded research, which is directed toward applied science or management problems, independent studies usually are for contributing to theory or the general body of knowledge. In spite of their theoretical orientation, independent researchers often produce recommendations for park managers that directly address portions of the park's resources management plan. A number of studies have produced results of direct use. With close cooperation between resource managers and the research biologist, these results form a basis for management action and have application in the day-to-day functioning of the park. Examples include the grass and woodland fire studies, which showed a need for certain fire frequencies and intensities in the park and undergird the current Wildland Fire Management Program. Results of 7 elk and bison studies contributed directly to current Bison and Elk Management plans, including population regulation levels, typical versus atypical herd distributions and habitat use levels, and heterozygosity in herd genetics. The park's Prairie Dog Management plan was developed in conjunction with DES population control studies and was heavily influenced by a decade of prairie dog sociobiology research.

Various factors account for the success of research at Wind Cave. Foremost is the simple fact that research results generate interest in additional research. Scientific journalism and word-of-mouth have greatly influenced the growth of interest in Wind Cave in the independent scientific community. Second is a genuine interest among the park staff in research and a willingness to assist researchers. Wind Cave biologists have been persistent and aggressive in initiating and carrying out their own research projects, as well as in promoting and facilitating independent research. The research environment is favorable and attractive; the Maintenance and VP and RM divisions, led by Lowell Butts and Steve Bone, respectively, have consistently provided assistance to past and current research projects, and Supt. Ernest Ortega and Chief Naturalist Bill Swift, recent arrivals at the park, have pledged continued support. Klukas' attitude allows researchers freedom to pursue current ideas, hypotheses, and methods.

Independent scientific interest in the park will doubtless continue and funding sources other than the NPS will contribute to the advancement of chiefly non-applied research at Wind Cave. Demands for NPS-funded research from within the park will rise. Increasingly sophisticated management and management-generated questions will contribute to demand for research that exceeds the current capabilities of personnel and funding. Continued progress in NPS research and closely-related resource management at Wind Cave are thus tied to a commitment by the Service to research support. The need for such a commitment and the urgency of that need grows daily.

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