

# Achieving Ecosystem Management in the Borderlands of the Southwestern United States Through Coordinated Research/Management Partnerships

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**Abstract**—This paper provides a brief overview of the Southwestern Borderlands Ecosystem Management Research Project. Much of the research program was described in more detail, along with results thus far, in a conference presented in January 1999. Conference proceedings are documented by Gottfried and others (1999). The focus of the project is research on restoring natural processes, improving the productivity of grasslands and woodlands, providing wildlife habitat, and sustaining an open landscape, viable rural economy, and social structure.

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The Southwestern Borderlands Ecosystem Management Research Project was initiated in 1994. The project was the result of a successful proposal by Dr. Leonard DeBano (retired, Rocky Mountain Research Station) and Larry Allen (Malpai Borderlands Project Coordinator, Coronado National Forest). One of the major factors in the success of the proposal was the support of the Coronado National Forest, the Malpai Borderlands Group, the Animas Foundation, The Nature Conservancy, the Natural Resources Conservation Service, the Bureau of Land Management, and The University of Arizona, School of Renewable Natural Resources.

The Borderlands project area of southeastern Arizona and southwestern New Mexico is a unique, relatively unfragmented, landscape of nearly one million acres containing exceptional biogeographic diversity in a series of natural communities ranging from semidesert grasslands and woodlands to mixed conifer forests. Maintaining the health and productivity of these natural communities is of critical importance in maintaining viable local rural economies. The geographic area of focus for the Borderlands Ecosystem Research Program is the San Bernardino Valley, San Simon Valley, southern Peloncillo Mountains, Animas Valley, and the Animas Mountains of southeastern Arizona and southwestern New Mexico. The project area is under multiple ownership and administration with 53 percent being in private ownership, 23 percent in state ownership (Arizona and New Mexico), 17 percent Coronado National Forest land, and 7 percent Bureau of Land Management land.

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In: Smith, Helen Y., ed. 2000. The Bitterroot Ecosystem Management Research Project: What we have learned—symposium proceedings; 1999 May 18-20; Missoula, MT. Proceedings RMRS-P-17. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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Much of the information gained from this project can be extended to the management of the larger Madrean Archipelago biogeographical region located in southern Arizona, southwestern New Mexico, and northeastern Sonora and northwestern Chihuahua, Mexico.

Results from the project contribute to the scientific basis for developing and implementing a comprehensive ecosystem management plan for the Borderlands area. In this plan, strategies are included for restoring natural processes, improving the productivity of grasslands and woodlands, providing wildlife habitat, and sustaining an open landscape, viable rural economy, and social structure.

Problem areas for the research project are:

1. To provide the scientific basis to establish the desired future condition for the planning region based on the highest quality biological science integrated with desired future social and economic conditions within the context of private and agency partnerships.

2. To plan and implement a long-term systematic program of basic and applied research and coordinated monitoring to integrate past and future research findings and contribute to developing guidelines for sustaining a viable rural economy and open landscapes.

## International Conferences

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In collaboration with the University of Arizona, the Borderlands Research Program conducted a conference on the biodiversity and management of the Madrean Archipelago in September 1994. The purpose of the conference was to bring together scientists and managers from government agencies, universities, and private organizations to examine the biological, cultural, and physical diversity and management challenges of the region to provide a basis for developing the research program. International regional conferences on fire effects and management strategies, March 1996, and the future of arid grasslands, October 1996, were also held in collaboration with the University of Arizona and the University of Sonora, Mexico. Proceedings of these conferences have been published as General Technical Reports RM-264, RM-289, and Proceedings RMRS-P-3.

## Research Strategy

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The strategy for accomplishing the research program has been to develop a comprehensive, multi-disciplinary synthesis of the status of our knowledge, identify research and

monitoring needs and priorities, and define critical studies and field experimentation. The results of these analyses provide the basis for future research activities and also provide managers with a comprehensive reference of our current best available knowledge.

A series of initial investigations have been completed which summarize and synthesize information on topic areas having significant management and research planning applications. These efforts include:

1. Status of knowledge on the role and importance of human and natural disturbances on plant communities in the Borderlands of the United States and Mexico.
2. Status of wildlife information in the Borderlands ecosystem project area and proposed experimental design to address research and management needs.
3. Prehistory and early history of the Borderlands ecosystem: archeological synthesis and research recommendations.
4. Comparative research on integrated watersheds at Walnut Gulch, Arizona; the Gray Ranch, New Mexico; and other southwestern watersheds.
5. Development of an annotated bibliography for the northern Madrean biogeographic province.

A second program focus is the development of a comprehensive landscape inventory and monitoring system to serve research and management needs. Studies ongoing or being concluded include:

1. Mapping current vegetation of the Borderlands ecosystem management area using thematic mapper satellite imagery with intensive ground validation.
2. Delineation and interpretation of geomorphic surfaces of the southwestern Borderlands area. This study, along with vegetation mapping and soils mapping by the Natural Resources Conservation Service, will provide the basis for developing vegetation management strategies.
3. Land use history, historical landscape change, and photographic monitoring of the Borderlands region.
4. Contributing to development of a digital archive for studies at the Santa Rita Experimental Range. This project will create a geo-referenced archive of research records for the oldest range experiment station and will provide a basis for data management in the project area.

A third program focus is specific research studies identified as having high priority in filling knowledge gaps. These studies include:

1. Fire regime reconstruction in the southwestern Borderlands.
2. Effects of fire frequency on nutrient budgets of grasslands in the Borderlands area.
3. Understanding the spatial pattern of fire regimes and fire behavior at landscape scales, including comprehensive fire regime reconstructions. These studies are regional in scope and in cooperation with the Coronado, Cibola, Gila, Santa Fe, and Lincoln National Forests.
4. Effects of prescribed fire on birds and vegetation and selected endangered species in the Borderlands area. These studies are being conducted in landscape scale management areas on the Baker Burn area of 1995 and the Maverick Burn area of 1997 in the Peloncillo Mountains. Additional studies

include effects of prescribed burning on Palmer agave (*Agave palmeri*) and foraging interactions with lesser long-nosed bats (*Leptonycteris curasoae*), survival and behavior of montane rattlesnakes (*Crotalus* spp.), remote sensing and GIS techniques for mapping and analyzing fuels, fire behavior, and effects on plant communities in the burn mosaic.

5. Cultural and environmental history of the Borderlands. This study provides the implications of past land use history for future management.

6. Experimental treatments, including mechanical treatments and prescribed fire, to investigate various vegetation and livestock management strategies. The objectives of these treatments are to improve composition and productivity of perennial native grasses, reduce shrub encroachment, and to improve soil properties and wildlife habitat.

7. Archeological implications of revegetation treatments.

8. Techniques for fuels visualization, mapping, and fire spread modeling in selected areas of the Chiricahua and Huachuca sky island mountain ranges.

9. Developing riparian ecosystem recovery priorities for the Southwestern Region.

Future efforts will expand development of monitoring efforts and investigations of the effects of prescribed burning at the landscape scale on vegetation, wildlife, and soil properties; relating vegetation condition and response to soils and site conditions; adapting predictive models of fire behavior to prescribed burning in grasslands and woodlands; and continuing experimental treatments in restoring grassland savannas.

## Partners

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In addition to the Rocky Mountain Research Station, research partners include Agricultural Research Service, U.S. Geological Survey Desert Laboratory, The Nature Conservancy, New Mexico Natural Heritage Program, Arizona Nature Conservancy, Audubon Society, Desert Botanical Garden, University of Arizona School of Renewable Natural Resources, Laboratory of Tree-Ring Research, Departments of Geosciences and Geography and Regional Development, Arizona State Museum, Office of Arid Lands Studies, Arizona State University, New Mexico State University, University of New Mexico, California State University, Indiana State University, University of Oklahoma, Arizona Geological Survey, Society for Ecological Restoration, and Arid Lands Project. Private and management agency partners also include the Malpai Borderlands Group, the Animas Foundation, Coronado National Forest, Douglas Ranger District, Natural Resources Conservation Service, U.S. Fish and Wildlife Service, Bureau of Land Management, Arizona and New Mexico Land and Game and Fish Departments, Whitewater Draw and Hidalgo Conservation Districts, Fort Huachuca, and the Arizona Department of Corrections.

These partners and the many special people working with these agencies and organizations are the critical elements in making the research program successful. The project is a national example of how private citizens and organizations and public agencies can collaborate to ensure the health and future of large, open landscape areas.

## Reference

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Gottfried, Gerald J.; Eskew, Lane G.; Curtin, Charles G.; Edminster, Carleton B., compilers. 1999. Toward integrated research, land management, and ecosystem protection in the Malpai Borderlands: Conference summary; 6-8 January 1999; Douglas, AZ. Proceedings RMRS-P-10. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 136 p.