



Southern Arizona's Native Grasslands:

Understanding and Valuing Their Ecosystem Services



The Research Ranch Foundation
and the Sonoran Institute
have committed to a
cooperative study of the
value of native grasslands
ecosystem services.
See page 3 for information.

Arizona's grassland ecosystems are an integral part of the regional ecology, and they provide important social and economic values such as clean water, recreation, grazing and habitat. When early European migrants arrived, grasslands covered about one-third of the area that is now Arizona. Significant impacts now threaten these ecosystems and the essential and valuable services they supply.

It is important to understand how valuable native grasslands ecosystems are to society. Resources will be required to conserve and maintain them – resources that could be used for other, competing purposes. Also, conserving the grassland ecosystems may mean forgoing some of their uses and the benefits associated with those uses. For example, not converting some grasslands to residential development preserves ecosystem services those grasslands provide, but prevents society from having the benefits of the housing that would have been constructed there.

The question of value leads directly to the question: "How valuable to whom?" Ecosystem services are wide-ranging – food production, recreation, waste processing and climate regulation, to mention a few. Impacts of these services vary, with benefits to one group often accruing as costs to another. Groups that will likely bear losses from conservation may work against it. Ecosystem services valuation can provide information about the magnitude, distribution and beneficiaries of these services. That information facilitates crafting strategies and financing for conservation and the ensuing work with stakeholders.



Impacts on Grassland Ecosystems

Over the last 150 years, significant, extensive and non-uniform changes in grassland vegetation have occurred, including the loss of perennial grasses, invasion by exotic species and the spread of shrubs. These combined to produce habitat degradation and the loss of grassland-dependent plants to invading species. Among various causes that have contributed to the grassland changes are:

- **LAND DEVELOPMENT** Land development has affected Arizona's grasslands since early European settlers moved into the region, but the pace of development has greatly accelerated over the last 30 years. Where urban, suburban and exurban development encroaches on grasslands, varying impacts are observed, from total destruction in the case of most urban and suburban forms to fragmentation in the case of exurban development. Among other effects, development prevents beneficial wildfire and disrupts wildlife habitat corridors that connect mountain ranges.
- **WILDFIRE SUPPRESSION** Fire is an essential process for maintaining grassland function and structure. The prevalence of wildfire in southern Arizona grasslands has declined considerably since the early 1900s, with resulting impacts on shrub encroachment and grassland function.
- **LIVESTOCK MANAGEMENT** Large-scale livestock grazing started in the 1870s in southern Arizona, and by 1900 the area was severely overgrazed. Grazing has led to soil erosion, the spread of non-native plants, changes in fire ecology and an increase in shrubs.

Grassland Ecosystem Services

Arizona's grassland ecosystems provide many services that directly or indirectly benefit society. Among these are:

- **WATER** The storage, cleansing and distribution of available water resources are the most important services provided by grasslands. Water is the most fundamental resource for sustainable ecosystem function and is the only resource that is renewable in short periods of time. These traits make water a commodity with economic value to exurban home owners and consumers of downstream groundwater and intrinsic value to vegetation and wildlife.
- **RECREATION** Grassland locations offer tourism and outdoor recreation activities such as hiking, hunting, wildlife watching and camping.
- **AGRICULTURE** Grasslands supply forage for grazing animals and areas for growing wine grapes.
- **BIODIVERSITY** Grasslands support critical habitat, wildlife migration corridors, and important habitat links between riparian areas and mountains.



SEEKING ANSWERS IN SOUTHERN ARIZONA STUDY

With mutual interests in protecting grasslands, understanding landscape changes, and using valuation techniques, The Research Ranch Foundation and the Sonoran Institute have committed to a cooperative study of native grasslands ecosystem services and their valuation. The Sonoita Valley, southeast of Tucson, Arizona, with its semiarid climate and changing land uses, has been selected for the study.

The Institute and the Foundation are seeking partners and funding to address a series of research questions to promote understanding of grassland ecosystems, help value the services they provide, and increase their protection. Studying these questions can also provide more detailed information for decision- and policy-makers. Sonoita Valley property owners, public land managers, conservation organizations, interested citizens and potential donors are encouraged to become partners in designing, conducting, evaluating and funding this study.

Potential Research Questions

DEVELOPMENT

- What are the effects of development on the viability of grassland ecosystems?*
- What are useful and appropriate land-use regulations to ensure conservation of grassland ecosystems?*
- Are there nonlinear threshold effects related to development density?*
- What level of development is sustainable in the Sonoita area?*
- What are the relative effects of clustered versus dispersed housing on biological diversity and watershed function?*

WATER

- How should we approach the use of water in a fragile grassland environment?*
- How does land use affect watershed function?*
- What are the relative ground-water recharge capacities of lands that are grazed by livestock, converted to exurban developments, or both, or neither?*

ECOSYSTEM SERVICES VALUATION

- What are the best approaches for valuation of arid grassland ecosystem services?*
- What is the value of various ecosystem services provided by Arizona's grasslands?*
- What specific market-based mechanisms and financial incentives are best applied to achieve restoration and conservation of desert grasslands?*

Market-Based Approaches to Grassland Conservation

Currently in the U.S., the financial resources focused on grassland conservation are not sufficient to restore, protect and maintain these critical ecosystems. Although the work of public agencies, land trusts, private landowners and conservation organizations is significant, development, road construction, and natural resource extraction are occurring at an unsustainable pace and scale. Grassland restoration and conservation efforts are overwhelmed.

Direct benefits that grasslands provide to society can be monetized through ecosystem services valuation. Market-oriented mechanisms and innovative financial incentives are promising, higher-leverage approaches to grassland conservation. These programs reward public land managers and private landowners for scientifically measureable environmental improvement. Two approaches that could be applicable for grassland conservation are mitigation banking and conservation banking.

A mitigation bank is an aquatic resource area, such as a stream or wetland, that has been created, restored or enhanced to compensate for unavoidable impacts to other aquatic resources. A state or federal agency may permit these impacts along with a requirement to use mitigation banking within the same watershed. A mitigation bank is valued in "compensatory mitigation credits," identified by an ecological assessment. The sale of these credits provides income to the mitigation bank's owners. The buyers of the credits are offsetting impacts from projects such as development and road construction. A similar approach could be explored for grassland ecosystems.

Conservation banks are lands that are permanently protected and managed to provide large, sustainable habitat for endangered or threatened species. Riparian areas, wildlife corridors and other habitat can serve as conservation banks, as can ranch or farmland if the habitat is managed properly. Developers also may opt to create conservation banks instead of subdivisions on their properties. Conservation banks are valued in credits that can be bought and sold. Credits represent actual species or their habitat, such as breeding pairs of a species, acres of habitat, or linear feet of riparian habitat. Purchasing credits safeguards equivalent habitat elsewhere and benefits the buyer by transferring the liability of managing the endangered species habitat. Property owners who sell credits receive income as an incentive to conserve and manage habitat.





The Research Ranch Foundation sponsored and convened a workshop in October 2006 on *Ecosystem Services in Southwestern Grasslands: Bridging the Gap between Consumers and Producers*. In March 2007 Sonoran Institute staff members were major participants of a workshop convened by the Packard Foundation in Los Altos, California, which was summarized in the document, *A Strategy for Investment in Conservation Management of Private Lands in the Western U.S.* The two workshops are described in a jointly written document, *Water, Conservation, and Exurban Development in Semiarid Grasslands of Southwestern North America – Impacts on Biodiversity and Ecosystem Services*, available at www.sonoran.org.



THE RESEARCH RANCH FOUNDATION is a private, nonprofit organization that promotes scientific research at the Appleton-Whittell Research Ranch, Elgin, Arizona, and elsewhere in the American Southwest. The Foundation assists in the management of the Ranch and fulfillment of its goals, which are to be a sanctuary for plants and animals of grasslands of the Southwest, to serve as an undisturbed ecological benchmark, and to be a catalyst for thoughtful and ecologically sound use of grasslands in water-deficient areas.

THE SONORAN INSTITUTE'S mission is to inspire and enable community decisions and public policies that respect the land and people of western North America. Through collaboration, civil dialogue, sound information, practical solutions and big-picture thinking, the Institute works toward a vision of the West with healthy landscapes, vibrant communities, and resilient economies.

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W.R. Osterkamp, Ph.D.
The Research Ranch Foundation
P.O. Box 12987
Tucson, AZ 85732
520-670-6821 ext. 113

Josef E. Marlow, Ph.D.
Land & Resource Economist
Sonoran Institute | Tucson Office
7650 E. Broadway Blvd., Ste. 203
Tucson, AZ 85710
520-290-0828



Sonoran Institute
sonoran.org