SUSTAINABLE RANGELANDS ROUNDTABLE

SRR UPDATE

Promoting the social, ecological, and economic sustainability of rangelands through the development and widespread use of the criteria & indicators for rangeland assessments, and by providing a forum for dialogue on sustainability of rangelands.

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RANGELAND CONSERVATION & ASSESSMENT

Rangelands constitute approximately 770 million acres of the U.S. land base and provide commodity, amenity, and spiritual values that are vital to the well-being of counties, regions, and the Nation. These goods and services include: food and fiber, forage for grazing animals, wildlife habitat, water storage and filtration, carbon sequestration, recreation opportunities, erosion and pollution control, biofuels, cultural heritage and a way of life for rangeland-dependent human communities. Intact rangeland ecosystems' integral processes also contribute to critical functions such as pollination, nutrient storage, primary productivity, and maintenance of genetic reservoirs and seed sources.

Despite the importance of these ecosystem services provided by this unique resource, trends in supplies of the natural capital, rangeland resources, that must be maintained to ensure availability of such ecological, economic, and social benefits for future generations are not consistently tracked. Identification and assessment of these essential goods and services becomes more critical with ever-increasing threats including climate change, loss of habitat and open space, invasive species, over-exploitation of resources and pollution.

Therefore, consistent with Secretary Johanns' 2005 memoranda committing the Department of Agriculture to utilization of market-based incentives for environmental stewardship and cooperative conservation, the Sustainable Rangelands Roundtable (SRR) recognized a critical need to explore rangeland ecosystem services in association with monitoring needs, applicable valuation methods, and potential for improved cooperative rangeland conservation. Refinement of rangeland ecosystem services information is necessary, supporting Secretary Johanns' contention that effective markets require "…well-defined and quantifiable environmental goods and services."

SRR RANGELAND ECOSYSTEM SERVICES WORKSHOP

Since 2001, a collaborative partnership called the Sustainable Rangelands Roundtable (SRR) has sought to develop a set of criteria and indicators that can be used to monitor, assess, and manage rangelands, as well as promoting social, ecological and economic rangeland sustainability. A special October 2006 SRR workshop at Peaceful Valley Ranch in Lyons, Colorado sought to better identify and describe linkages among a variety of ecosystem goods and services that rangelands can produce, the ecological processes that can contribute to their sustainable production, and indicators to monitor trends in valuable rangeland resource stocks as natural capital. This workshop also attempted to address applicability of incentives – through markets or through non-market programs – to promote conservation and sustainable production of ecosystem goods and services from rangelands. Forty-seven participants attended the workshop, representing 14 states, 9 agencies, 10 universities, and 9 non-governmental organizations.

The workshop identified many rangeland ecosystem goods and services, and underlying ecological processes that provide them. Goods and services were categorized in several different ways by the various work groups at the workshop. Products are summarized here in a single comprehensive list (Table 1). This categorization is designed to be internally consistent, as well as generally compatible with the structure of the SRR Criteria and Indicators (C&I) and the SRR Conceptual Model.

Rangeland ecosystems cover approximately 40 percent of the U.S. and approximately 43 percent of this acreage is managed by federal government agencies; photo courtesy National Cattlemen's Beef Association.

TABLE 1: SRR RANGELAND ECOSYSTEM SERVICES BY CATEGORY

Type of Related Ecological Process	Tangible Extracted Goods	Tangible *In Situ* Services *(and disservices)*	Intangible *In Situ* Services *(primarily perceptual)*
Primarily Biologic Processes	Food for human consumption Food for livestock consumption Fiber Biofuels, feedstocks Fish & wildlife to catch & hunt Biochemicals Germ plasm	Ecologically transmitted diseases Ecologically transmitted pests	Wildlife & habitats to observe
Primarily Hydrologic Processes	Water for household use Water for human use in economic production	Floods affecting humans	Water bodies for recreation & tourism
Primarily Atmospheric Processes		Air humans breath Air temperature & humidity Precipitation on humans	
Multiple Processes	Ornamental resources Ceremonial items		Views and scenes to observe Culturally or spiritually significant sites to observe Historically or archeologically significant sites to observe Sites/areas for recreation & tourism Scientifically significant sites to observe
Physical processes			
Geologic	Minerals	Earth movements and volcanic eruptions affecting humans	
Atmospheric	Wind energy	Wind directly affecting humans Atmospherically transported chemicals & particulates	
Hydrologic	Hydropower		
Miscellaneous	Solar energy	Insolation for human tanning	

RANGELAND ECOSYSTEM GOODS & SERVICES

In general ecosystem goods and services are elements or processes that yield net benefits to humans. Benefits arise through the satisfaction of human needs and wants. As a result of such benefits, ecosystem goods and services have value. This section describes the basic terms that will be used to organize ecosystem goods and services and relate them to value.

The most important and generally agreed upon categories that emerged from the SRR rangeland ecosystem services workshop discussions are:

- Rangeland ecosystem goods
- Rangeland ecosystem services, and
- Core rangeland ecosystem processes

Rangeland ecosystem goods are tangible outputs from ecosystems, made available to humans through human activities beginning with extraction. Once outputs enter the economic system, they are transported, and usually transformed or combined with other goods and services to yield value to humans. Social and economic processes needed for extraction and subsequent processing and use of rangeland ecosystem goods are structured by our legal, institutional and economic frameworks, particularly those affecting markets for such goods and the products to which they contribute.

Rangeland ecosystem services may be intangible or tangible, but their value to humans results from direct experiences in situ, where they are produced on rangelands, rather than through extraction and processing elsewhere. Intangible services yield value to humans through experiences that are primarily perceptual, such as visual or kinesthetic experiences, rather than organic, such as eating or breathing. Tangible services are direct interactions with ecosystems that occur in situ - breathing air, or being exposed to air temperatures or wind.

Humans may receive negative values from interaction with some ecosystem services, resulting in damages or costs rather than benefits. Negatively valued ecosystem services (or disservices) are mostly tangible and arise from direct in situ experiences that are negatively valued by those people who experience them. Examples range from being bitten by a mosquito to having a home burned by wildfire. The Millennium Assessment refers to such negative services as Regulating Services, to emphasize healthy ecosystems' tendency to limit their damaging effects to humans. Their treatment in Table 1 is more value neutral to avoid implying that it is easy to measure the extent that healthy ecosystems mitigate damages by unaltered natural regulation. Moreover, rangeland assessment indicator refinement is better focused on measurement of past events, instead of past possibilities.

Rangeland ecosystems provide food and cover for grazing wildlife and domestic livestock; photo courtesy K. Maczko.

Core ecological processes are the fundamental processes that occur in ecosystems through which life is sustained and through which all ecosystem goods and services are produced. Most ecosystem goods and services result from complex interactions among these processes. Almost all core ecosystem processes contribute to numerous categories of goods and services.

SRR Rangeland Ecosystem Services Terminology

The language in Table 1 tends to be more value-neutral than that found in much of the ecosystem services literature. This increases clarity and consistency, but may not fully communicate value to outside readers. Revisions and refinement are anticipated.

Terms are currently consistent with the SRR Conceptual Model but their relationship to the SRR assessment C&I requires additional description. SRR's first three criteria deal with the maintenance of conditions, related to plants, animals, soil, and water, resulting from ecological processes. Criterion 3 begins to connect these conditions to the production of rangeland ecosystem goods and services. Criterion 4 sets forth the goal of maintaining values that arise from human use of ecological goods and services. Criterion 5 addresses frameworks for rangeland management (i.e., the institutions) rather than ecological processes, goods or services. Management may or may not focus upon the full range of ecosystem goods and services. SRR participants will continue to evaluate and adjust indicator applicability for assessment of rangeland ecosystem services.

Table One Categorization Considerations

Table 1 is not yet complete or final. The work groups from the October 2006 sessions are currently refining the amalgamated list of their individual products. Also, parsimony was a key consideration in creating Table 1. Many differently worded items from the work groups were lumped under more general terms. Some items were added as Table 1 was created too.

The terms for the goods and services in Table 1 have been chosen to convey their use by, or effect on, humans rather than their desirable characteristics, such as quality, quantity, location and timing. For example, the list includes "water for household use" rather than "clean water." Such characteristics have strong effects on value, but need careful discussion to assure a consistent treatment across the full range of goods and services.

Previously, ecosystem services have been labeled according to the human activity, experience or assigned value. Table 1 makes explicit the activity or experience, but it avoids use of the term "value" in listing an ecosystem good or service. Value is an attribute of human experience, not of ecosystems. There is a close relationship between characteristics of sites or areas and the type and value of experiences people have there. It is a challenge to itemize all characteristics that people may value and de-value. For example, we may drive long distances to enjoy a beautiful vista, but en route be irritated to see human developments on a landscape that was formerly undeveloped.

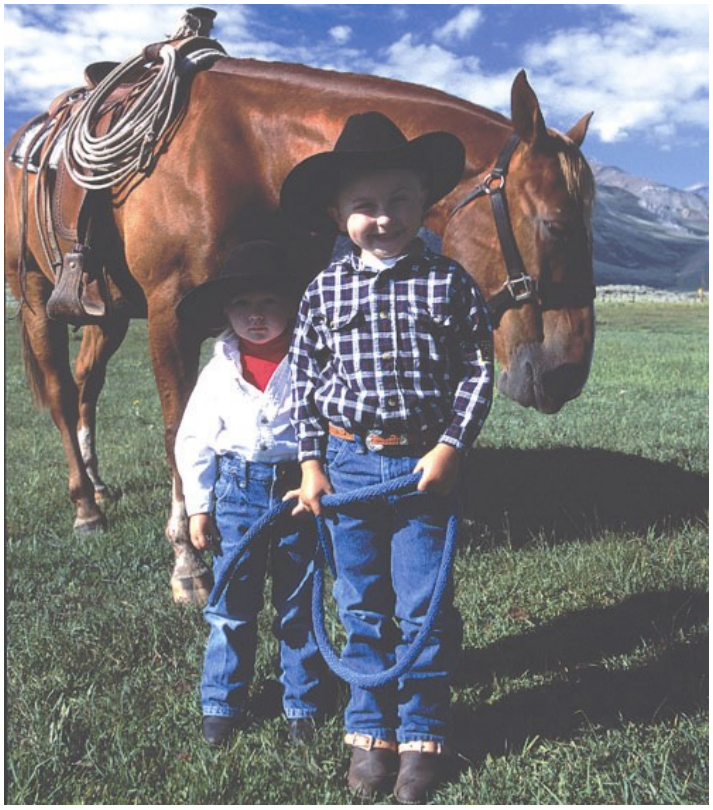
Several features appear in Table 1 that were helpful to its development, but may not enhance its utility. One is the use of the type of ecological processes that primarily yield the goods and services as a way of organizing them. Since the original work group lists included services associated with physical processes, such as wind energy, they have been included in Table 1. However, because these items have little or no biological component, some will not classify them as ecosystem services.

Rangeland ecosystems provide a setting for diverse consumptive and non-consumptive recreation opportunities including hiking, wildlife-viewing, hunting, and fishing; photo courtesy National Park Service, Yellowstone National Park.

VALUES OF RANGELAND ECOSYSTEM SERVICES & POTENTIAL FOR CONSERVATION INCENTIVES

Ecosystem goods and services have value because they increase or decrease the satisfaction of human needs. Value arises from human interactions with ecosystem goods and services and may be positive or negative. Interactions vary to include eating a good steak or lamb chop, watching a sunset from a high butte, galloping a horse over open range, meditating in wilderness, and fishing in a mountain stream.

Value is personal and subjective, but there are commonalities in basic human needs and experiences with ecosystem goods and services that make it possible to measure values realized by various populations. Values people place on goods and services are closely related to the preferences revealed by choices they make. Value can be signaled by prices in market transactions or revealed by other human behaviors. Using prices derived from market transactions for goods and services is part of the economic system's means of creating incentives that shape economic behavior, generally to yield greater production of goods and services with bigger differences between price and cost (i.e., profit).



Assessment of rangeland ecosystem services offers a valuable opportunity to ensure that rangelands provide current generations with their desired goods and services, while also ensuring that future generations' needs may be met; photo courtesy National Cattlemen's Beef Association.

Values revealed or expressed through non-market processes also influence behavior, often through institutions of collective action. In general, allocation of resources to production of goods and services through collective institutions is less dynamic and often less efficient. Such goods and services tend to be under-produced, because they depend on taxes or government regulation, which are limited by governance processes. In addition to interactions normally considered as uses, value can result from exchange of ownership, maintenance of the option for ownership or use, the desire to make something available to future generations, or the mere existence of the good or service. The first is generally more amenable to market transactions, while option, bequest, and existence (i.e., non-market) values are less frequently subject to transactions. Non-market values may be estimated by methods such as travel cost or contingent valuation.

In principle, all entities, conditions and processes in rangeland ecosystems that contribute to valued ecosystem goods and services also have value, though in many cases that value will not be signaled by market prices or measurable through methods revealing peoples' preferences. The fact that so many ecological processes interact to produce rangeland ecosystem goods and services also makes it more difficult to estimate the value of a specific process.

FUTURE PLANS & PRIORITIES

SRR participants, October 2006 workshop attendees, and rangeland stakeholders are eager to continue discernment and development of rangeland ecosystem services information as a foundation for conservation incentives. However, funding constraints will strongly influence future efforts.

Rangeland ecosystem service projects of high priority for SRR in 2007 include: development of standard definitions for rangeland ecosystem services terms so all participants and interested parties can speak a common, consistent language; ongoing Delphi surveys of October 2006 workshop participants; a follow-up rangeland ecosystem services session to develop appropriate and effective prioritization criteria to facilitate assessment and identification of common characteristics of specific ecosystem services best-suited to conservation incentives; begin to address differences between public goods and services - that is, rangeland ecosystem services on pubic lands - and private lands goods and services, to determine whether and when certain incentives are applicable; expansion and modification of the current SRR conceptual model to a more market-specific model to elucidate trade, transactions, and ecosystem services flows; and production of a comprehensive SRR ecosystem services publication to enhance dialogue and further development of rangeland ecosystem services information for market-based incentives, credit programs, and trading to improve rangeland conservation and management.