

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.

YEARLY UPDATE OF SRR

SPRING 2005

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Sustainable Rangelands Roundtable Criteria and Indicators for Standardized Inventory, Monitoring, and Reporting

The conservation and sustainable management of our natural resource base is critical. Ten governments, including the United States, agreed to the Santiago Declaration and are participating in the Working Group on Criteria and Indicators (C&I) for the Conservation and Sustainable Management of Temperate and Boreal Forests. This "Montreal Process" Working Group was formed in Geneva, Switzerland in June 1994 to develop and implement internationally agreed criteria & indicators.

Rangelands comprise ~ 70% of the earth's land surface. Rangelands and the people who are connected to these lands face increased pressures to long-term sustainability. The development of "Criteria and Indicators" for the conservation and sustainable management of rangelands is a high priority and is receiving increased international attention. Without an effective way to accurately monitor social, ecological and economic aspects of rangeland sustainability, it is difficult to measure progress toward sustainability. Consistent, standardized baseline information is needed to provide a common language for assessment and planning that will lead to proper and effective decision making.






The Sustainable Rangelands Roundtable had its formal beginning in 2001. Participants have included rangeland scientists and managers, ecologists, sociologists, economists, policy and legal experts, environmental advocates, agency staff, and industry representatives. Today the group has over 100 participants, representing more than 50 organizations.

Funding has been provided by Colorado State University, the Agricul-

tural Research Service, Forest Service, Natural Resources Conservation Service, Bureau of Land Management, and US Geological Survey. Though funding was important, the volunteered time and effort of participants has been the most valuable contribution. Over 4 years, the group has held 19 2-day meetings. Between meetings, participants help with special projects, like the conceptual model, trade exhibits, presentations and symposia like this SRM meeting.

A comprehensive set of "Criteria and Indicators" has been suggested by the Sustainable Rangelands Roundtable. In 2003, participants collaborated to identify 64 indicators, categorized under 5 criteria, and released them as part of the group's First Approximation Report on Criteria and Indicators for Sustainable Rangelands.

The 5 criteria are summarized as follows:

-  Conservation and maintenance of soil and water resources on rangelands.
-  Conservation and maintenance of plant and animal resources on rangelands.
-  Maintenance of productive capacity on rangelands.
-  Maintenance and enhancement of multiple social & economic benefits to present & future generations.
-  Legal, institutional, and economic frameworks for rangeland conservation and sustainable management.



In keeping with the Sustainable Rangelands Roundtable mission, SRR aims to promote widespread use of criteria and indicators and to provide a forum for dialogue on rangeland sustainability. Material presented in this brief summary will be further detailed in the 'Progress Report' to be produced for distribution by the Sustainable Rangelands Roundtable in Spring 2005.

SRR C & I and the Agricultural Research Service (ARS)

The Agricultural Research Service (ARS) is the in-house research arm of the USDA. The ARS mission includes providing knowledge and technologies to farmers, ranchers, and other land managers to help manage the Nation's land in a productive and fully sustainable manner. Core to these developing technologies is an in-depth understanding of ecological processes as they relate to the management and conservation of rangeland, pasture, and forage resources. New understandings and technologies being developed at over 35 ARS locations include an array of indicators within SRR Criterion 1 (Soil & Water), 2 (Plant & Animal Resources), and 3 (Productivity Capacity).



Specific to Criterion 1 are new technologies and advanced understandings that are being developed for inventorying and monitoring changes in soil organic matter content (Indicator 1) and soil microbial activity (Indicator 3). This is important because both of these "soil quality/health" indicators are believed to be tied closely to the ecological sustainability of rangelands. Extensive efforts are also being expended to understand and accurately assess the effects that varying amounts of bare ground/foilage cover (Indicator 4) have on long-term sustainability as well as the impact that varying management tactics have on rates and amounts of water and wind erosion (Indicator 5), water quality (Indicator 7) and overall hydrologic function (Indicator 9).

Developmental technologies related to Criterion 2 include refined use of remote sensing and other rapid, broad based technologies for monitoring changes in amount (Indicator 1), type (Indicator 2), and landscape level distribution patterns (Indicator 4) of rangelands, riparian areas within rangelands (Indicator 7), and rate, extent, and pattern of invasive weed infestations (Indicator 8). Likewise, similar technologies are being used to monitor sustainability as it relates to changes in Criterion 3 indicators such as aboveground biomass (Indicator 1) and annual productivity (Indicator 2).

The linkages between ARS and SRR are more subtle than the linkages between SRR and the Nation's premier land management agencies such as the US Forest Service (FS), Bureau of Land Management (BLM), and the Natural Resource Conservation Service (NRCS). This is because ARS research efforts are focused on developing new understandings and technologies for use in

inventorying and monitoring the ecological health and sustainability of the Nation's rangeland ecosystems at a variety of scales, whereas FS, BLM, and NRCS are charged with actually inventorying, monitoring, and assessing the ecological health and well-being of our Nation's rangelands. Thus, the linkage between these land management agencies and SRR is obvious, direct, and critical to accomplishing like-minded land management goals and objectives. But these linkages are no more compelling than those between ARS and SRR as manifested through the continual exchange of ideas relative to: 1) the scientific merits of varying criteria and indicators, and the challenges associated with the technical capacity required to; 2) accurately inventory and monitor changes in varying indicators in a timely manner; and 3) accurately summarize and precisely interpret said monitoring data. These linkages SRR are critical as new rangeland inventorying and monitoring challenges emerge and new understandings and associated technologies are developed to effectively meet these challenges.

SRR C & I and the U.S. Environmental Protection Agency (EPA)

The U.S. Environmental Protection Agency's Environmental Monitoring & Assessment Program (EMAP) has been developing a set of spatial or landscape metrics for a 12-state area (Arizona, Colorado, California, Nevada, Utah, Wyoming, Montana, Idaho, North Dakota, South Dakota, Oregon, & Washington) with the aim of assessing ecological conditions of terrestrial ecosystems across this large region. One of the primary goals of this project is to link observed conditions of terrestrial systems to surface water conditions, as well as to measure potential stressors and biophysical conditions that might account for observed conditions. The project includes all terrestrial biome-types, including forests, woodlands, and rangelands.



Advances in computer technology and geographic information systems (GIS), and new spatial databases derived from remote sensing and other sources (for example, the National Land Cover Database or NLCD) make it possible to calculate a relatively large number of landscape metrics at relatively fine scales (30 meters). Many of these spatial databases have attributes that can be related to important attributes of ecosystems that relate to condition ... for example, attributes related to structure and function. Field data (e.g., measures of surface water quality) are used to validate conditions, improve metric interpretation, and to develop spatially distributed, landscape models that link watershed and riparian metrics to observed watershed and riparian metrics to observed water quality conditions in surface waters. Once quantitative relationships are developed, it is then possible to apply the model to the spatial data to evaluate potential surface water conditions across the entire region.

Examples of landscape metrics being used in the project include: (1) the proportion of different land cover types, (2) road density and distance to the nearest road, (3) agricultural areas on steep slopes (> 3%), (3) human population density, (4) a topographic position index (to look at the influence of near-site topography), (5) a U-Index (the amount of anthropogenic cover), (6) an N-Index (the amount of natural land cover), (7) roads crossing streams, and (8) an index of fragmentation of natural cover types. The project is also developing and applying spatial models, including a modified soil loss model and a grazing intensity model. These models use a combination of spatial data on topography, soils, hydrology, vegetation, and precipitation to evaluate spatial patterns of



erosion and grazing pressure. Land cover, road, human census, digital elevation (DEM), stream network, geology, soils, and climate data are

among the types of spatial databases used to generate metrics and to run models. Data on surface water conditions come from EMAP stream survey samples, the USGS NAWQA program, and from STORET. Additionally, the US EPA Landscape Ecology group in Las Vegas, in collaboration with the USDA Agricultural Research Service in Tucson, Arizona, has developed user-friendly GIS extensions that generate landscape metrics at different scales (Analytical Tools Interface for Landscape Assessments or ATtILA) and that run spatially distributed watershed models to evaluate run-off and sedimentation (Automated Geospatial Water Assessment or AGWA tool). Results of these models are then combined with landscape metrics and compared against observed stream water quality at a range of scales (watershed, riparian zone, near-site) using multivariate and Bayesian statistical techniques.

Metrics and indicators generated by the Western EMAP project relate primarily to Criterion 1 of the Sustainable Rangeland Roundtable Criteria and Indicators for Sustainable Rangelands, and in particular, indicators related to: (1) Area and percent of rangeland with a significant change in extent of bare ground, (2) percent of surface water on rangeland areas with significant deterioration of their chemical, physical, and biological properties from acceptable levels, and (3) area and percent of rangeland with accelerated

soil erosion. The group has focused on the surface water aspect because of EPA's role in protecting and enhancing the Nation's water resources, and because there are few studies that have linked terrestrial ecosystem conditions to surface water conditions in the western US. For future information on the Western EMAP Pilot project go to either:

<http://www.epa.gov/emap/west/index.html>
<http://www.epa.gov/nerlesd1/land-sci/western-us.htm>.

SRR C & I and the Forest Service

The Forest Service has a legal mandate under the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) to produce a decennial assessment of the status in supply, demand, and trends of renewable resources coming from all forests and rangelands of the United States. The Agency also has a legal requirement for monitoring for purposes of research, planning, and management embedded in several laws, including the Forest and Rangelands Research Act of 1978.

The first comprehensive RPA Assessment was published in 1980. The chapter on rangelands focused upon range condition and the future supply and demand for rangeland forage. The Assessment estimated that about one half of all rangelands in the 48 conterminous states were in fair to good condition. It projected that a 46 percent increase in demand for forage between 1980 and 2030 would increase pressures to expand livestock grazing on



both publicly and privately owned rangelands. The 1990 Rangeland Assessment technical document, alternatively, concluded that private rangelands could satisfy demands for increased forage over the next 50 years, thus allowing public land managers to accommodate an expanding public interest in natural and other amenity values. The 2000 Assessment (http://www.fs.fed.us/rm/pubs/rmrs_gtr68.html) also examined rangeland health and productive capacity, showing that rangeland health, although measured differently over the 20 years, had clearly improved during this time in most regions. All three Assessments relied upon a patchwork of data and models available at the time from various agencies and other sources.

Different issues from those of 20 years ago are having major effects on the status and trends of rangelands and their use. Some of the most prominent factors include invasive species, fragmentation by



exurban development, and increasing demand for clean water and other ecosystem services. Another fundamental shift has been an expansion in the criteria for assessing rangelands from ecological measures alone to a triad of ecological, economic, and social aspects. These include soil and water conservation, maintaining native plant communities and animal populations, maintaining productive capacity, maintaining long-term socioeconomic benefits derived from rangelands, and maintaining a legal, institutional, and economic framework for rangeland conservation and sustainable management.

The Sustainable Rangelands Roundtable has identified 64 indicators that are correlated with the five criteria listed above. Participants in the Roundtable recognized, however, that financial and technical limitations will rule out comprehensive assessments using all 64 indicators, so they recently converged upon a set of 26 core indicators that can be monitored and reported upon to some extent. Although the RPA calls for recurring assessments of "renewable resources," the law does not limit their extent, which means that the Assessment can report upon trends in all relevant social, economic, and legal variables needed to assess regional and national trends pertaining to U.S. rangelands.

Complicating both the RPA and the SRR, no U.S. national plot-based monitoring system is in place to allow the estimation of biotic and abiotic indicators of rangeland sustainable management not obtainable by remote sensing. The Forest Service collects data under its Forest Inventory and Analysis (FIA) Program from a sampling grid that includes all forests and woodlands on both federal and non-federal lands. The FIA grid does not extend onto non-forested lands, however. The only U.S. national-level sampling program on rangelands is the National Resources Inventory (NRI). Carried out by USDA-NRCS, the NRI grid does not extend onto federal rangelands, leaving a large monitoring gap. Until this gap is somehow closed, monitoring trends on all rangelands will be problematic.

SRR C & I and the USDA Natural Resources Conserva- tion Service (NRCS)

The primary emphasis of the USDA Natural Resources Conservation Service (NRCS) is to conserve, maintain, and improve our natural resources, particularly on private lands. Some of the SRR criteria and indicators are identical or similar to those in use by NRCS while other criteria and indicators are not used. Historically, the NRCS framework for conservation planning



and natural resource management has been soils, water, air, plants, and animals (SWAPA). This effectively skews the mission and efforts of NRCS towards the first three of the SRR criteria: "Conservation and Maintenance of Soil and Water Resources of Rangelands", "Conservation and Maintenance of Plant and Animal Resources on Rangelands", and "Maintenance of Productive Capacity on Rangelands". For the indicators of these three criteria, the primary NRCS inventory and monitoring program is the National Resources Inventory (NRI). Of current note, NRCS is in the midst of a special three-year NRI specifically on rangelands. Other minor inventories are conducted as part of traditional conservation planning.

There are several potential standards against which these inventories are compared. The primary standard is the ecological site description. The institutional housing for these descriptions is the Ecological Site Information System (ESIS). However, many descriptions have not currently been entered in this storage system. Instead, many descriptions are located in the electronic Field Office Technical Guide (eFOTG). Another standard is the soil survey. The primary location is the National Soil Information System (NASIS). This database, however, is primarily for users internal to the soil survey program. Soil survey information is available to the public through the NRCS Soil Data Mart. Occasionally, standards (site descriptions or soil survey) have not been completed, or are significantly outdated. In such cases, the only standard of comparison for NRI data are earlier NRI data.

NRCS also collects data on indicators not currently accepted by SRR. Significant among these is a sizable amount of climate data. Fairly unique to NRCS are programs addressing soil climate (SCAN data network) and snow-pack (SNOTEL data network). However, there are many other sources for climate and weather data, especially for precipitation and temperature. Many of SRR's criteria and indicators are directly affected by climate. By following weather and climate trends (relatively low-cost and available) as a surrogate, the correlated trend of other indicators (potentially high-cost or currently undeveloped) can be predicted.

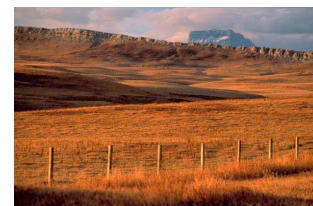
SRR C & I and the Bureau of Land Management (BLM)

The BLM has been entrusted with stewardship responsibility for the multiple-use management of natural resources on nearly 262 million acres of public land, much of which is rangeland. The BLM has legal mandates for national-level (BLM-wide) reporting of rangeland condition and trend in rangeland condition. These legal mandates are The Federal Land Policy and Management Act (FLPMA) of 1976, and the Public Rangelands Improvement Act (PRIA) of 1978.

How does BLM comply with FLPMA and PRIA regarding national-level reporting of range condition and trend? BLM reports percent of rangeland acreage by ecological status, by state, in 2 publications: USDI-BLM's annual Public Land Statistics, and BLM's Annual Report. If looked at over a series of years, the ecological status data in these reports have been interpreted as trend in rangeland condition over time. Several problems with BLM's way of reporting rangeland condition have surfaced, relating to the scientifically-obsolete concept of ecological status, the lack of rangeland condition data on all BLM-administered rangelands, and the old (more than 20 years) age of much of the data.



Given these problems, BLM is considering a "course correction". Two courses are being considered. The first course is identifying a minimum set of aquatic, riparian, and upland rangeland indicators which could be quantitatively reported nationally for land health. SRR indicators are being seriously considered here. For example, bare ground, invasive plants, and aquatic macroinvertebrates, 3 indicators from SRR, will likely be in the final minimum set. BLM will have a need for data sets and data collection methods for these indicators.



SRR will serve BLM's need here because SRR has been identifying the currently available data sets for all of its 64 indicators, and SRR is sponsoring a workshop in May 2005 on indicator data sets and data collection methods.

The 2nd course is a roll up of BLM's Land Health Standards data from the field office level to the state office level to a BLM-wide level, resulting in a qualitative report of land health at the national level. Land Health Standards are ecologically-based goal statements that BLM gauges resource conditions against, to identify needed changes in land uses such as live-stock grazing. Suites of indicators are associated with each Land Health Standard and are measured to evaluate whether Standards are being achieved. Although these suites of indicators were identified prior to SRR, many of these indicators are the same as those identified by SRR. BLM field offices currently have discretion to measure select indicators out of the suite available, but BLM is considering requiring at least a minimum set of aquatic, riparian, and upland indicators be part of all Land Health Standard assessments and in all land use plans. Some SRR indicators will likely be included in the minimum set.

In summary, BLM regards SRR indicators as credible. BLM currently is in the process of making course corrections for future national-level (BLM-wide) reporting of land health. For quantitative reporting using a minimum set of aquatic, riparian, and upland indicators, and for qualitative reporting using Land Health Standard assessments, BLM intends to use some SRR indicators.