

CHAPTER VI

Indicators of Legal, Institutional, and Economic Framework for Rangeland Conservation and Sustainable Management

INTRODUCTION

The Legal, Institutional, and Economic Framework Criterion Group, one of the working groups created by the Sustainable Rangeland Roundtable (SRR), has developed 10 indicators that may be used to evaluate rangeland conservation and sustainable development. These indicators are patterned after Criteria and Indicators of the Montreal Process as found in the first approximation report entitled *Report of the United States on the Criteria and Indicators for the Sustainable Management of Temperate and Boreal Forests, 1997*.

Many of the indicators associated with this criterion represent abstract concepts to a far greater degree than indicators related to other criteria. For example, the legal framework for rangeland conservation and sustainable development cannot be effectively measured or evaluated by simply counting the number of laws that affect rangelands. Instead, the evaluator must examine the whole framework of laws and describe how that framework affects sustainability. Once the initial evaluation is complete, the evaluator must periodically examine the new laws, regulations, policies, and case law to assess the impact of changes in the legal framework on sustainability.

Similarly, indicators that evaluate the institutional framework for rangeland sustainability would not be effective if the number of institutions were counted. Again, the evaluator must examine how organizations and institutions work to affect rangeland sustainability. Once the initial evaluation is complete, the evaluator must periodically identify and evaluate additions and deletions from the listing of organizations and institutions. Even more difficult will be the need for the evaluator to assess how changes in organizations and institutions may affect rangeland sustainability.

The 10 indicators developed by the Framework Criterion Group accurately portray the wide range of the factors that affect rangeland sustainability. Many rangeland interests were represented in the Framework Criterion Group including federal, state and private land and natural resource managers, range science and natural resource educators, professional societies, environmental advocacy groups, two economists, and a lawyer.

The working group debated at length as to what the indicators should be selected. In particular the working group struggled with finding data categories that accurately “measured” the abstract concepts of the indicators. Eventually, the group decided to follow the lead of the forestry roundtable and use subjective evaluations for many of the indicators. A summary list of rangeland indicators developed by the Framework Criterion Group is shown in Table 6-1.

Table 6-1. Indicators for the legal, institutional, and economic framework for the conservation and sustainable management of rangelands.

Indicator	What the indicator describes
1. Land law and property rights	Nature and extent of the laws that affect tenure and stability of property ownership and use.
2. Institutions and organizations	Nature and extent of institutions and organizations that affect rangeland sustainability.
3. Economic policies and practices	Nature and extent of economic policies and practices that affect rangeland sustainability.
4. Public information and public participation	Laws and programs that ensure access to public information, and provide opportunities for public participation in land management.
5. Professional education and technical assistance	Nature and extent of natural resource and land management education and assistance programs.
6. Land management	Nature and extent of land management programs implemented by owners of rangelands.
7. Land planning, assessment, and policy review	Nature and extent of large scale land planning and assessment projects, and related policy review.
8. Protection of special values	Nature and extent of rangelands set aside to protect special values as the set asides affect rangeland sustainability.
9. Measuring and monitoring	Nature and extent of the various measuring and monitoring programs used to evaluate rangeland sustainability under these Criteria and Indicators.
10. Research and development	Nature and extent of research and development of new technologies as they affect rangeland sustainability.

LAND LAW AND PROPERTY RIGHTS

Description of the Indicator

This indicator describes the extent to which laws, regulations, and guidelines clarify property rights and land tenure arrangements; recognize customary and traditional rights of indigenous people; and provide means of resolving property disputes by due process as they relate to the conservation and sustainable management of rangelands. This indicator examines land law and property rights in the United States as they affect the conservation and sustainable management of rangelands.

Importance: What does it measure and why is it important to sustainability?

The existing land and property use patterns in the United States are the result of the American legal system, the Nation's cultural values, and our free market economy. An understanding of land law and property rights law is essential to understand their impact on rangeland sustainability.

There are four assumptions that underlie the land law and property rights indicator. They are:

- Stable property rights are essential for sustainable rangeland management.
- Property rights reflect society's values.
- Property rights are evolutionary.
- Property rights are determined by means of due process.

The property rights relevant to the sustainability of rangelands and other natural resources include: the ability to exclude or control access; dispose, alienate, or transfer; manage or manipulate; use, withdraw, consume, transform; and enjoy.

Property rights in the United States are protected by due process (the administration of law in the courts of justice) and restricted by police powers of the state. In addition, each level of government maintains powers of taxation and eminent domain. An important source of definition and clarification of land and property rights law is contained in judicial case law and its interpretations.

While roughly the same concepts apply to the land law and property rights at all levels of government, there are some important differences.

The federal code of land and property rights law that applies to the management of federal public lands is complex and addresses specific management issues in considerable detail. Federal laws speak directly to regulating grazing, oil and gas leasing, off road vehicle use, mining, wildlife protection, and other similar activities on federal lands. Federal land managers cannot make a decision on how rangeland is to be managed without doing an environmental analysis under the National Environmental Policy Act. That decision can usually be appealed to the federal courts. Decisions of federal land management agencies are strictly regulated, reviewable, and periodically revisited.

State laws governing the management of state-owned rangelands are often less explicit -- the guidance is usually more general regarding the use of rangelands. For example, many western states manage state endowment rangelands to maximize income for use by the common schools and other beneficiaries. However, there has been little "legal guidance" as to how that maximization affects rangeland conservation and sustainable management. Some states have adhered strictly to the charge to maximize revenues (short-term gains). Others have tempered the charge to maximize revenues with programs that manage the land for long-term returns -- a concept akin to sustainability.

That may be changing. Colorado recently changed its philosophy concerning the use of state lands so that maximizing income is no longer the only consideration ([See Colorado State Land Board Website](#)). Voters amended the state constitution allowing a stewardship trust of about 1/10th of state lands (300,000 acres out of three million acres) to protect "long-term productivity and sound stewardship." Stewardship trust lands must provide a consistent income or the lands can be withdrawn by the State Land Board. The State Land Board has also entered into an agreement with the State Division of Wildlife to allow about 500,000 acres of state land to be leased for "best wildlife values and wildlife-related recreation."

State rangeland management decisions are generally less constrained and less reviewable than federal rangeland management decisions, but there are still substantial rules. State rangeland management decisions may be subject to requirements of "little NEPA" laws in some states, but not in others. State rangeland managers are also subject to federal laws and regulations relating to clean water, clean air, endangered species, and a host of other environmental laws.

Private rangelands are subject to much less constraint and less review than either federal or state rangelands. However, private rangeland managers are subject to federal and state laws and regulations of general applicability such as those relating to clean water, clean air, and endangered species. Private rangeland managers are also subject to local land use laws and regulations including:

- Laws that govern the sale and transfer of lands while imposing little or no government control over how those private lands are used.
- Zoning and tax laws that address land use in broad -- minimum lot size or nuisance type activities (e.g. commercial hog operations or spreading of municipal sewage sludge) -- but are not likely to address, in detail, how the land is managed.

Private land owners have fewer constraints on the management of their private lands than federal or state land managers. However, federal grazing land permittees and state land lessees are subject to management constraints imposed by federal permit and state lease on federal public lands and leased state lands. And, in many cases, the intermingled nature of public and private rangelands lands may cause federal and state land management conditions to apply to private lands because lands of more than one owner are included in an allotment management plan.

Although the United States has one of the most highly developed property rights systems in the world, there has been a significant increase in the number of legislative, regulatory, and judicial actions that have affected rangeland law and property rights in the past 50 years.

There are indications that the proliferation of laws, regulations, and administrative policies has reached the point where it is difficult to traverse the maze, in good faith, without making appealable errors. The phrase “paralysis by analysis” is a catchword that describes this situation, and USDA Forest Service has an entire report, entitled *The Process Predicament – How Statutory, Regulatory, and Administrative Factors Affect National Forest Management* (USDA-Forest Service, June 2002), devoted to the problem as it affects the agency. Other agencies have similar concerns. Additionally, there is inconsistency, and apparent contradictions, between the various laws and the associated regulations.

As a result, property owners are not always aware of all the laws and regulations that may apply to their activities, or the civil and criminal penalties that may be incurred for actions that are not in compliance with laws and regulations. Unawareness, or uncertainty about how land laws and property right laws affect transactions can be perceived as deterrents to sustainable rangeland management practices when the confusion results in unsustainable investment decisions. On the other hand, rangeland owners may be more willing to undertake long-term management programs if awareness increases and uncertainties decrease through uniform and consistent application of laws and regulations.

There has been a significant change in patterns of ownership and use on rangelands during the past few years in response to environmental and ecological concerns, economic conditions, and the manner in which people transfer ownership through inheritance and other devices. Farms and ranches no longer automatically pass on to the next generation. More and more, the current generation of owners needs the money for their retirement, and increasingly, the younger generation wants nothing to do with the family business. Further, innovative tenure and legal use arrangements, such as conservation easements, are increasingly being used transfer cash to current owners in exchange for long-term conservation and preservation of critical rangeland habitats and other special values.

A stable, clearly understood and well-regulated code of land law and property rights law

is an important tool to ensure protection of private property rights and encourage stewardship of the land. The alternative – unstable, poorly understood, and poorly regulated, causes much uncertainty among landowners and may result in short-term management practices and hesitancy to invest in the land.

Geographic Variation: Is the indicator meaningful in different regions?

The indicator is meaningful in different regions. The laws, regulations, and policies relating to federal lands extend across all physiographic regions. State and local laws, regulations, and policies that affect rangelands, while meaningful within the political boundaries of the various units, may not be consistent across political boundaries or physiographic regions.

Scale: Is the indicator meaningful at different spatial and temporal scales?

This indicator is meaningful at different spatial and temporal scales. Federal and state laws are well documented and readily available. The decisions of all the various courts that have interpreted these laws are also well documented and readily available. It is not difficult to follow the train of decisions to arrive at the current status of the various laws.

Data

Methods and procedures and data set(s) of useable quality exist at the regional-national level. Most of the data are found in government documents, legal case law books and databases, and from private sources. Although considerable data are available in raw form, analysis of it is sporadic.

Data Category 1: Major federal and state legislation relating to land law, property rights and land tenure arrangements associated with rangelands.

Data Category 2: Major governmental and state agency regulations and policies relating to land law, property rights and land tenure arrangements associated with rangelands.

Data Category 3: Major federal and state court cases relating to land law, property rights, and land tenure arrangements associated with rangelands.

Data Category 4: Sales and transfers of rangeland titles and the right to take forage.

- Private, state, and federal rangeland acres sold annually, by type of transfer e.g. private treaty, closed auction, open auction, inheritance, or other device.
- Private, state, and federal AUMs (or equivalent) sold or transferred annually, by type of transfer e.g. private treaty, closed auction, open auction, inheritance, or other device.

Clarity: Do stakeholders understand the indicator and the indicator unit?

Stakeholders understand this indicator and its measurement units. While all interested persons may not know how to access the information directly, or evaluate it correctly once obtained, the information is available in an organized, retrievable form, and there is no shortage of people who can use the system effectively.

INSTITUTIONS AND ORGANIZATIONS

Description of the Indicator

This indicator describes the extent to which governmental agencies, educational institutions, and other for-profit and not-for-profit organizations affect the conservation and sustainable management of rangelands. It examines the effect of institutions and organizations (government agencies, universities, private-for-profit and not-for-profit organizations) on the conservation and sustainable management of rangelands.

Importance

Institutions and organizations are important to the conservation and sustainable management of rangeland because they collectively manage a huge percentage of the total rangeland resource. Further, rangelands owned and managed by institutions are far more likely to remain as rangelands and to be managed using rangeland sustainability concepts.

Most institutions and organizations, governmental and non-governmental, are subject to the vagaries of budgets and funding. The attention of senior management staff and policy makers can change very rapidly from one issue to another and from one management philosophy to another. Thus, it is important to know what agency culture, policy, and funding have been, and to track current and future actions to ensure continuing commitment to rangeland sustainability.

If the conservation and sustainable management of rangelands are to be guiding management principles in the future, institutions and organizations must commit to the concepts. Leadership at all levels of organizations must agree to instill sustainability concepts into the culture of the organization, and vigorously seek out the resources to implement programs that promote the conservation and sustainable management of rangelands.

Government agencies, education institutions, and private organizations play a key role in the management of rangelands and the development of expertise used to manage rangelands. The principal institutions that affect the conservation and sustainable management of rangelands are:

- Federal, state, and local land management agencies
- Indian tribes
- Large for-profit corporations
- Large not-for-profit organizations
- Private owners of rangelands
- Federal, state, and local regulatory agencies.
- Federal and state technical assistance agencies -- Department of Agriculture – Natural Resources Conservation Service (NRCS), Cooperative State Research, Education and Extension Service, and a number of other USDA units
- Professional societies representing a wide range of scientific and management disciplines.

Most federal and state land management agencies are long established dating back to the late 1850s or the early part of the twentieth century. Most agencies have clear organic acts and mission statements, although the rapid change in public participation during the past 25 years have greatly changed the course of many land management programs. Federal, state, and tribal agencies have the greatest amount of management authority for rangelands in the United States.

Federal Management Agencies

The primary federal rangeland management agencies include units of the Departments of Agriculture, Defense, and Interior.

The principal land management unit of the Department of Agriculture is the Forest Service. USDA Units offering information and technical assistance to the land management units and the public include the Agricultural Research Service, Cooperative State Research, Education, and Extension Service, Economic Research Service, Natural Resources Conservation Service Grazing Lands Technology Institute and Soil Quality Institute, and the Bureau of Land Management National Science and Technology Center.

The principal land management units of the Department of Defense include all of the branches of the armed forces (bases and training ranges) and the Army Corps of Engineers. All of the major service branches of DOD receives information and technical assistance from the EPA, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and other agencies. They also receive specialized technical assistance on environmental monitoring from universities; e.g., Center for Environmental Management of Military Lands, Colorado State University.

The principal land management units of the Department of Interior include the Bureau of Land Management, Fish and Wildlife Service, Bureau of Indian Affairs, National Park Service, and the Bureau of Reclamation. USDI units offering information and technical assistance to land management units and the public include the United States Geological Survey (USGS), USGS Biological Resources Division, and the USGS Forest and Rangeland Ecosystem Science Center.

The Environmental Protection Agency and the National Marine Fisheries Service of the Department of Commerce both provide information and technical assistance to all land management units and the public and also serve in a regulatory capacity.

State Land Management Agencies

Several states own and manage rangelands. Most of the western states still have trust lands acquired from the federal government at statehood ([Western States Land Commissioners Association Website](#)). Other states own rangelands acquired through foreclosure or other means. States with substantial holdings of rangelands are AZ, AK, CA, CO, FL, ID, NE, NV, NM, ND, MT, OK, OR, SD, TX, UT, WA, and WY. Many of these states manage rangelands to generate long-term revenues for specified beneficiaries.

Indian Tribes

There are more than 45 million acres of reserved American Indian lands in the lower 48 States with an additional 10 million in individual allotments. There are another 40 million acres of traditional Native lands in Alaska. A large portion of these lands is rangelands managed by more than 80 separate Indian Tribal Governments. Appendix 6-1 lists those tribes. The USDI Bureau of Indian Affairs provides technical assistance on rangeland management practices to the Tribes and individual Indian landowners. Indian operators and producers use about 75 percent of the rangelands owned by the Tribes. The remaining lands are leased to non-Indian operators and producers, with emphasis placed on further development of Indian agricultural resources (see USDI Annual Accountability Report, Bureau of Indian Affairs, FY 1998).

Professional Societies and Organizations

There are many professional societies and professional organizations whose members have an interest in the rangeland sciences, rangeland ecosystems, and rangeland management. Professional societies and organizations that play a significant role in rangeland sustainability include (see [Rangelands West Website](#)):

- American Agricultural Economists Association
- American Farm Bureau
- American Forage and Grassland Council
- American Society of Agronomy
- Collaborative Planning Organizations on the Colorado Plateau (USGS)
- Colorado Weed Management Association
- Ecological Society of America
- Grazing Lands Forum
- Institute for Agriculture and Trade Policy
- Society for Conservation Biology
- Society for Ecological Restoration
- Society for Range Management
- Soil and Water Conservation Society
- Soil Science Society of America

Colleges and Universities

The Morrill acts of 1862 and 1890, the 1887 Hatch Act, and the 1914 Smith-Lever Act charged the Land Grant Agricultural Colleges with a three-part mission of teaching, research, and extension. Extension was to be the means for extending the college's teaching and research programs to the people through continuing education and technology transfer.

The program brought the federal government and all of the states and territories into a partnership to provide meet the challenge of the Land Grant College charge from Congress ([Committee on the Future of Land Grant Colleges of Agriculture, Board on Agriculture](#)).

The land-grant acts provided funding for institutions of higher learning in each state. Each state received 30,000 acres of federal land for each congressional representative from that state to be sold to provide an endowment for:

“...at least one college where the leading object shall be, without excluding other scientific and classical studies and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts...” See [University of Kentucky Website](#).

A list of educational institutions such as colleges and universities ([Rangelands West Website](#)) that offer programs or courses in rangeland sciences is shown in Appendix 6-2.

Non-Governmental Organizations

There are numerous non-governmental, non-profit organizations ([Rangelands West Website](#)) that play a significant role in the conservation and sustainable management of rangelands. Many of these organizations provide training and educational opportunities, consulting services, and public interest advocacy programs. A partial list of active non-governmental, non-profit organizations is shown in Appendix 6-3.

Additionally, there are hundreds of “land trusts” that acquire and manage land for a variety of purposes. The Land Trust Alliance ([Land Trust Alliance Website](#)) is an umbrella organization that supports member land trusts and promotes voluntary land conservation across the country. The Alliance provides technical resources, leadership, and training to the nation's 1,200-plus nonprofit, grassroots land trusts.

Geographic Variation

This indicator is meaningful in different regions. The agencies of the federal government manage the federal public lands across all regions in the United States. Similarly, the large universities, private for-profit and not-for-profit organizations are active across all regions of the United States. However, state and local government agencies, while active and consistent within their respective political boundaries, do not maintain a uniform presence or consistent level of involvement across regions.

Scale

This indicator is meaningful at different spatial and temporal scales. The governmental agencies and educational institutions maintain excellent records over the long term.

Data

Conceptually feasible or initially promising, but no regional-national methods, procedures or data sets currently exist.

Data Category 1: Programs and activities of governmental agencies that affect the conservation and sustainable management of rangelands.

Data Category 2: Programs and activities of colleges and universities that affect the conservation and sustainable management of rangelands.

Data Category 3: Programs and activities of for-profit and not-for-profit organizations that affect the conservation and sustainable management of rangelands.

Clarity

In general, stakeholders understand this indicator and its measurement units. However, they are seldom described in identical formats, and considerable judgment must be exercised to integrate data and information into a meaningful analysis.

ECONOMIC POLICIES AND PRACTICES INDICATOR

Description of the Indicator

This indicator describes the extent to which economic policies and practices affect the conservation and sustainable management of rangelands. The indicator explores the relationships between micro-economic and macro-economic processes and rangeland management and use.

Importance

The extent to which rangelands are an integral part of local, regional, and national economies has implications for rangeland sustainability. For example, privately owned rangelands located near communities may be seen as a source of “vacant land” to fuel local development and community growth. Although federal and state-owned rangelands are seldom sold anymore, strategically located tracts of public rangeland may be sought by communities for development purposes. The conversion of rangelands to residential and industrial uses has implications for rangeland sustainability as the lands no longer function as natural ecosystems.

The amount of capital available to ranchers and other rangeland management activities is limited, and there is always substantial competition from other businesses for that capital. In recent years, ranching has encountered difficulty in attracting capital because of low prices for livestock products. One result has been a downward trend in the financial importance of the ranching community that depends on rangeland grazing for livestock production. The trend seems to be especially dramatic in local and regional economies where recreation and tourism have begun to supplant the harvest of natural resources as the dominant sector.

The maintenance of rangelands is important to the long-term economic future of agriculture. Many issues remain unexplored. There may be a relationship between economic growth and rangeland ecological, economic, and social sustainability at the national scale. For example, the Wildlife Society (2003:1) identified a "fundamental conflict between economic growth and wildlife conservation." This does not mean that there is a similar conflict between economic growth and the conservation and sustainable management of rangelands. The ongoing transition of rangelands to irrigated farmlands, and then to subdivisions and ranchettes is a phenomenon that is widely recognized in the West. Such transitions in land use may not be an economic growth issue but may be a rangeland sustainability issue. The Framework Criterion Group discussed these issues at length but has not resolved them.

Change comes slowly to industries like agriculture that are deeply rooted in tradition. However, changes are occurring at different levels and regions of the country, and these changes may be developing new paths toward how society values rangeland resources. Just as rangelands respond very slowly to changes in management practices, it will take some time to work through evolving economic policies.

The economics of rangeland uses are changing. There are transformations in the valuation of goods and services from private, public, and common property that affect rangelands. Some of those changes provide incentives for sustainable management practices in a variety of property regimes. Other changes, such as the fairly recent uses of conservation easements, hunting leases, and tax or subsidy opportunities for protecting threatened and endangered species, affect rangeland owner income streams, thus influencing decisions to retain or dispose of rangelands. As common pool resources (Carpenter, 1998) (including groundwater basins, public parks or commons, etc.) and open-access resources (including air, water, and scenic vistas) gain economic value and enter the marketplace, they evolve into common, private, or public properties, thereby affecting the manner in which the resource is managed.

Trade policies such as the North American Free Trade Act (NAFTA), and organizations such as the World Trade Organization (WTO) have tended to internationalize the livestock and meat industries.

“Implemented on January 1, 1994, the North American Free Trade Agreement (NAFTA) is a comprehensive trade agreement that improves virtually all aspects of doing business within North America. NAFTA eliminates nearly all tariffs by 2008 between the U.S. and Mexico by 1998 between the U.S. and Canada, and removes many of the non-tariff barriers, such as import licenses, that have helped to exclude U.S. goods from the other two markets, especially Mexico.” [See NAFTA Website.](#)

“The World Trade Organization (WTO) is the only global international organization dealing with the rules of trade between nations. At its heart are the WTO agreements, negotiated and signed by the bulk of the world’s trading nations and ratified in their parliaments. The goal is to help producers of goods and services, exporters, and importers conduct their business.” [See WTO Website.](#)

International trade policies that impact the domestic supply and demand (and prices) for beef and substitute meats in the United States and other countries can have a significant impact on the sustainability of rangelands. Rangeland use can also be affected by our tax codes and credit policies such as capital gains taxes, estate taxes, real estate taxes, income averaging for agriculture and subsidized credit programs.

Geographic Variation

This indicator is meaningful in different regions. Perhaps more than any other national indicator of rangeland sustainability, the economic aspect may be the most widely evaluated.

Scale

This indicator is meaningful at different spatial and temporal scales. Mixed information about the economic condition of agriculture is readily available, but the level of detail varies greatly by enterprise and location.

Data

Methods and procedures and data set(s) of useable quality exist at the regional-national level. However, it is difficult to separate rangeland-related data and information from agriculture in general. Even livestock grazing data and information is aggregated and hard to separate. Thus, this indicator is presently difficult to evaluate. Some examples of domestic policies which have the capability of directing federal funds towards putting into or maintaining land in rangelands rather than intensive crop or agricultural lands include the USDA NRCS Environmental Quality Incentives Program (EQIP), Conservation Reserve Program, and Conservation Reserve Enhancement Program. Consider the data sets for each of the following indicator subparts.

Data Category 1: Macro-economic policies and practices that affect rangelands including economic growth, interest rates, and international trade practices.

Data Category 2: Major federal and state legislation, regulations, and guidelines, and court cases that affect economic processes related to rangeland resources.

Data Category 3: University, public agency, and NGO studies on incidence and impacts of investment, trade, and taxation policies at national, state, and local levels.

Clarity

Stakeholders generally understand this indicator and its measurement units, because many people follow agriculture and associated economic trends. However, there is evidence that stakeholders may not fully understand the implications of economic growth as related to rangelands, alone.

PUBLIC INFORMATION AND PUBLIC PARTICIPATION

Description of the Indicator

This indicator describes the extent to which laws, regulations, and guidelines, institutions and organizations provide opportunities for: (1) public access to information; and, (2) public participation in the public policy and decision-making process relating to rangelands.

Importance

This indicator examines programs that provide for public information and public participation in public policy development and public agency decision-making as the programs affect the conservation and sustainability of rangelands.

Public Access to Information

Congress has enacted the Freedom of Information Act (FOIA) to ensure that information held by federal agencies will be made available to interested citizens. Each federal agency also follows internal guidelines relating to such requests in addition to the mandates of FOIA. Much information in agency files is not available for citizen perusal, including personnel files, proprietary information such as mining data, and information involved in litigation and other legal actions.

Virtually all states now have freedom of information acts equivalent to the federal legislation. However, each has its own requirements for requesting information, and each has its own rules and guidelines to follow. Each state legislature has also established its own categories of information that agencies are not required to divulge to the public.

Local government agencies may or may not have freedom of information acts of their own, but most political subdivisions of states are subject to the same laws as those that apply to state agencies.

Private owners of rangelands, individual or corporate, have no obligations to provide any information about their operations on private land. Citizens may obtain information about operations on federal or state lands from the management agency.

Existing laws guarantee that the public has access to information in public land management agency files about rangelands and rangeland resources. Open access to information in agency files helps interested citizens maintain confidence that their government is open and honest, and working in the best interests of all the people.

The conservation and sustainable management of public rangelands – indeed all public lands and associated resources – is dependent upon programs, such as the Forest and Rangeland Renewable Resources Planning Act, and activities that permit current uses and ensure future uses of rangelands by a broad cross-section of the people.

To note an old, but apropos cliché, “Information is power.” Before FOIA and state freedom of information programs came into existence, the land management agencies – and the users groups who worked with the agencies on a daily basis – had the information, and the power. Freedom-of-information acts have allowed other interested parties to gain information and insight into the management of rangelands.

Public Participation

Public participation ensures that policy and programs are vetted by a cross section of the people who are affected. Public participation can foster political support for sustainable management.

The National Environmental Policy Act of 1969 (NEPA), the Forest Rangeland Renewable Resources Planning Act of 1974 (RPA), the Federal Land Policy and Management Act of 1976, and the National Forest Management Act of 1976 (NFMA) are the principal laws mandating public participation in rangeland management.

The Endangered Species Act (ESA) is also relevant. For example, local and regional jurisdictions have been working together to mitigate takings under ESA by writing habitat conservation plans when landowners want to develop property. These activities certainly provide for public participation and involvement.

Public participation has long been a mandated part of the rangeland planning and management process for federal lands. However, the process has not always been efficient because of conflicting opinions as to desired results, and a lack of process to resolve these differences outside the courtroom.

All steps in the management decision process--problem identification, data collection, analysis, alternative formulation, and choice – must be open to public participation. However, the government cannot abdicate its responsibility for making decisions. The Federal Advisory Act of 1972 (FACA) allows the public to comment, advise, and recommend during the process – but the agency alone must make the actual decision.

Public Involvement

The conservation and sustainable management of rangelands is likely affected by public participation from rangeland users and others interested in rangeland resource management planning and decision-making. Such involvement requires citizens who are well informed and knowledgeable about rangeland issues and activities. The list of affected entities includes rangeland users, governmental agencies and services, not-for-profit educational foundations, facilitation organizations, and numerous environmental interest groups.

Broad public support and active involvement are essential to the success of programs for conservation and sustainable management of rangelands. Extensive public support can only be gained through public participation where people can learn about the program and express their opinions as to how the program should work.

Public involvement in federal and state land management activities is an interactive process of bargaining and negotiating between constituents and land managers. Engaging the public does not ensure sustainability in itself. It does, however, inform participants about the

issues involved, conflicting laws, lack of funds, and what other people and groups want. Institutions such as county governments, not-for-profit facilitation groups, not-for-profit environmental groups, tribal governments, state governments, the grazing and ranching industry, and scientists participate in planning and implementation activities.

Geographic Variation

The indicator is meaningful at federal and state levels of government, and at universities and colleges, where such programs are mandated by law and have established protocols for implementation.

Scale

The application of spatial and temporal scales to this indicator is not especially relevant.

Data

Some data set(s) exist at the regional-national level, but methods and procedures are not standardized at the regional-national level.

Data Category 1: Summarize federal, state, and local laws, regulations and guidelines that affect public access to information (freedom-of-information act requirements, etc.) that affect public access to information relating to rangeland sustainability.

Data Category 2: Summarize federal, state, and local laws, regulations, and guidelines that affect public participation and involvement in decision-making processes relating to rangelands.

Clarity

Stakeholders understand the relevance of this indicator, and the corresponding data sets, to sustainability. However, there is a tendency to judge the effectiveness of policy and programs for public participation and access to public information in terms of how the individual likes the results of any given application.

PROFESSIONAL EDUCATION AND TECHNICAL ASSISTANCE

Description of the Indicator

This indicator describes the extent to which laws, regulations, and guidelines, institutions, and organizations provide for professional education and the distribution of technical information and financial assistance related to the conservation and sustainable management of rangelands.

Importance

This indicator measures the nature and extent of professional education and technical assistance on the conservation and sustainable management of rangelands.

Professional Education and Training

The legal and institutional frameworks in the United States for supporting the development and maintenance of human resource skills in rangeland management have been well developed for many decades. Periodic assessments of the relevance and changing needs of range management education have guided the evolution of range management programs in the United States. The Society for Range Management offers accreditation to schools that meet its criteria for professional education in range sciences. Trade associations such as the National Cattlemen's Beef Association and its state affiliates are currently working with individual state and university technical training programs.

Many of the professional societies that represent disciplines with an interest in rangelands, offer certification programs for their members and require some type of continuing education for certification maintenance. Most societies open their continuing education programs to non-certified members as well. Accreditation programs reflect organization priorities.

Most government agencies and large private corporations involved with rangeland management offer, or require, some type of professional development or in-service training program for their employees. The extent and effectiveness of these programs vary with budgets and the interest and commitment of each organization's management team.

There is a relationship between professional education and technical assistance and results on the ground. It is essential that owners and managers understand the concepts of sound, stewardship-based land management practices to ensure the health and productivity of rangelands

Courses in ecology, environmental studies, natural resources, and range sciences and other topics vary between schools in their quality and quantity depending on the focus of each institution and the faculty they attract. One noticeable trend has been that many range management schools have begun to advocate the use of integrated resource management practices and programs that have less impact on the land.

The management practices, which determine the sustainability of the Nation's rangelands, depend largely upon human skill and ingenuity. A broad range of disciplines and skills is necessary to achieve the goals of sustainable rangeland management including not only the traditional scientific disciplines of rangeland management, botany, wildlife biology, ecology, but also the social sciences of economics, anthropology and conflict resolution.

Skills in the many disciplines are developed through formal education and on-the-job-training, and are maintained through direct experience working in the discipline as well as through professional certification/licensing requirements, professional societies, continuing education programs, extension landowner outreach programs, and technical/trade training and assistance programs.

A major change in the knowledge and skill requirements for natural resource managers has been caused by the increase in public participation in agency decisions over the past few years. Managers must not only understand the current scientific and technical issues in their fields but also understand the role of public interests in resource management. Furthermore, managers must find ways to encourage and facilitate public participation, which involve a

different set of skills than those taught in most natural resource management training curriculums.

National-in-Scope Environmental Education Programs

There are several conservation education or environmental education programs that focus on nature, wildlife, forests, natural resources, conservation biology, biological diversity, ecology, and a variety of other topics. Some of the notable national-in-scope conservation education and environmental education programs include:

- Natural Resources Conservation Education Program.
- EPA Environmental Education Office.
- National environmental education advancement project (NEEAP).
- North American Association for Environmental Education (NAAEE).
- National Forum on Education About the Environment.

We are unaware of any national-in-scope conservation education or environmental education programs that focus directly, and specifically, on rangeland conservation and sustainable management. Most programs do touch on rangelands as part of a broader examination of natural resources and ecosystems in general.

Not-for-Profit Environmental Education Programs

There are several national, not-for-profit environmental education programs that are supported and funded by state boards of education, private companies, professional associations, individual donations, and state and federal agencies. This form of environmental education is designed to educate the public to improve decision-making concerning natural resource issues and to increase involvement in the decision-making processes.

The most notable of the, national-in-scope, non-profit environmental education programs are Project Learning Tree, Project WILD, Project WET, and the World Wildlife Fund. All four programs are designed to be concept-oriented, balanced and fair, and neither pro nor con on value-sensitive issues. [See Project Learning Tree Website.](#)

Project Learning Tree (PLT) is an award winning, broad-based environmental education program for educators and students in PreK - grade 12. PLT helps students learn how to think, not what to think, about the environment. PLT materials bring the environment into the classroom and students into the environment. The program covers topics ranging from forests, wildlife, and water, to community planning, waste management and energy.

Project WET (Water Education for Teachers) is an international, interdisciplinary, water education program for formal and non-formal educators of students 5 to 18. The goal of Project WET is to facilitate and promote awareness, appreciation, knowledge, and stewardship of water resources through the development and dissemination of classroom-ready teaching aids and through the establishment of state and internationally sponsored Project WET programs.

World Wildlife Fund's (WWF) conservation agenda is centered on the belief that local communities—here in the United States and abroad—must be positioned as effective stewards of their natural resources. Supporting this philosophy, WWF has implemented community and classroom initiatives in environmental education and is working with governments, communities, and the private sector to evolve business practices toward environmental and economic sustainability.

Project WILD is an interdisciplinary, supplementary environmental and conservation education program for educators of kindergarten through high school. Project WILD is based on

the premise that young people and educators have a vital interest in learning about our natural world. The program emphasizes wildlife because of its intrinsic and ecological values, as well as its importance as a basis for teaching how ecosystems function.

There are also several not-for-profit organizations that offer thoughtful, well-designed information programs at all grade levels through magazines, periodicals, and journals devoted to nature and natural resources. Youth education camps in various states are established through county extension offices, soil conservation districts, or local Society for Range Management chapters to teach basic ecology and plant identification.

A wide variety of special interest groups have made efforts to develop K-12 programs that introduce students to their point of view about natural resources and their management. Such programs are not always well received unless they present objective, accurate educational material without significant bias or “commercials.” Teachers simply do not find time for programs that openly promote the views of particular interest groups.

The above institutions comprise a framework for environmental education at a national scale through which local programs are funded, programmed, or otherwise assisted. The framework itself appears well developed, although its level of funding is low and program impacts are unknown.

Almost all technical assistance and extension programs are sponsored by governmental agencies. Agencies such as the Cooperative State Research, Education, and Extension Service and the Natural Resource Conservation Service provide technical assistance and distribution of information about management practices that can be voluntarily applied. Some states also provide technical financial incentives to assist private landowners in implementing new range management practices. Those programs are about evenly distributed between technical assistance, educational, and financial assistance.

State Environmental Education Programs

Most states have not developed independent conservation education or environmental education programs; state programs tend to be an outgrowth of federal programs or the national-in-scope not-for-profit programs discussed above. The quality and quantity of environmental education varies dramatically by state. Some have strong, well-established programs, but many are just getting started and are helped through NEEAP and other national programs.

The National Environmental Education Advancement Project (NEEAP) supports the development and expansion of quality environmental education (EE) programs through a variety of state and local capacity building efforts. Many NEEAP efforts encourage the development and implementation of Comprehensive Environmental Education Programs at the state and local levels. [See NEEAP Website.](#)

The Environmental Education and Training Partnership (EETAP) is a consortium of leading education and environmental education organizations working to advance education and environmental literacy. EETAP partners conduct a variety of activities designed to support the capacity of educators to teach about the environment using sound methods and quality resources. EETAP's overall mission is to coordinate and deliver support services and training to advance education and environmental literacy in the United States.

The EETAP States Program seeks to quickly and successfully advance EE training in eight states -- Arizona, Ohio, California, Oklahoma, Illinois, Utah, Missouri, Washington -- utilizing the tools of capacity building and focusing on priority initiatives in the field of

environmental education. This includes training for teachers in pre- and in-service, increasing the cultural diversity of EE leaders and audiences served, using the NAAEE Guidelines for Excellence and utilizing Internet technology. See EETAP Website.

Technical Assistance

Federal and state extension agencies offer landowner assistance and education programs. The USDA – Cooperative State Research, Education, and Extension Service (CSREES) provides rangeland-related information and educational programs to private owners of rangeland and permittees and lessees of public rangelands. Owners are educated about the impacts of grazing and other land uses on rangelands. Past educational efforts have focused on commodity (animal) production while more recent programs have begun to emphasize ecological or aesthetic values.

Extension services do not reach a large percentage of landowners with technical assistance through educational outreach. Throughout the management plan process, education concerning multiple and often conflicting management objectives is a major focus of extension programs. Funding comes from many sources and funding levels affect the ability of these services to accomplish their mission.

Geographic Variation

This indicator is meaningful at federal and state levels of government, and at universities and colleges, where such programs are developed and implemented.

Scale

The application of spatial and temporal scales to this indicator is not especially relevant.

Data

Some data set(s) exist at the regional-national level, but methods and procedures are not standardized at the regional-national level.

Data Category 1: Federal and state agency and NGO public information, technical assistance, and other outreach programs that affect rangeland sustainability.

Data Category 2: College and university education and training programs that affect rangeland sustainability.

Data Category 3: Federal, state, and NGO agency internal training programs that affect rangeland sustainability (Current Research Information System (CRIS) Reports).

Clarity

Stakeholders understand this relevance of this indicator, and the corresponding data sets, to sustainability. There is no substitute for professional education and training in natural resource management. Technical assistance programs are a tested means of changing the land management practices used by landowners with limited financial and technical resources.

LAND MANAGEMENT

Description of the Indicator

This indicator describes the extent to which land management programs and practices support the conservation and sustainable management of rangelands.

Importance

This indicator examines the various land management programs and practices and measures the effects of the programs on the conservation and sustainable management of rangelands. Land management strategies that support rangeland conservation are an important component of sustainable management. If land management programs do not support sustainable management, rangelands may cease to be a healthy, viable ecosystem in the United States, and may provide reduced levels of goods and services to current and future generations.

Federal agencies that manage rangelands are faced with growing obligations to apply laws and monitor the conditions of the rangelands, but often are limited in their ability to accomplish this by limited budgets and staffs.

Perhaps as a result of increased political partisanship combined with heightened public debate over the management of federally owned rangelands, Congress has increasingly temporarily suspended operation of several laws which govern management of federal rangelands. For example, Congress has used riders to the appropriations bills for both BLM and the Forest Service to allow the agencies to suspend operation of all environmental laws when reissuing or transferring a grazing permit where there are no changes in terms and conditions. Such a suspension of existing laws creates uncertainty about how practices designed for sustaining rangelands will be implemented.

Federal and state land managers, and private rangeland owners with extensive holdings, collectively have considerable influence on the present and future activities of rangelands in the United States. Federal and state land managers also exert significant control over private owners of rangelands that are intermingled with lands they hold under federal grazing permits and state grazing land leases. An Exchange of Use Agreement is often used where private land is intermingled with Bureau of Land Management administered lands.

Land managers are key in land management decisions. It follows that it is important to sustainability that decision makers focus on conservation and sustainable management. Land management agencies should use criteria and indicators of sustainable rangeland management commensurate with the scale of the area under their purview as a policy for evaluating the effectiveness of land management programs and practices.

Federal Land Management Programs

The federal government owns and manages several hundred million acres of rangeland in the United States. The Department of Defense, the National Park Service, the Forest Service, the Fish and Wildlife Service, and the Bureau of Land Management manage these lands. Federal statutes demonstrate concern for management of rangelands for a wide range of special environmental, cultural, social, and/or scientific values on federal lands. Some of the important pieces of federal legislation for managing rangeland resources include:

- Taylor Grazing Act of 1934
- Multiple Use Sustained Yield Act of 1960
- National Environmental Policy Act of 1969 (NEPA)
- Federal Advisory Committee Act of 1972 (FACA)
- Endangered Species Act of 1973. P.L. 93-205. 87 Stat. 884.
- Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA)
- National Forest Management Act of 1976 (NFMA)
- Federal Land Policy and Management Act of 1976
- Archaeological Resources Protection Act of 1979. P.L. 96-95. 93 Stat. 721
- Federal Land Policy and Management Act of 1994. P.L. 94-579.

The Federal government does not directly regulate activities on state and private land. However, federal agencies participate in resource management decisions and sometimes provide incentives through technical and financial assistance to encourage better management practices.

State Land Management Programs

State land management agencies, particularly in the western states, collectively manage an estimated 146 million acres of land – much of it for livestock grazing. Until recently, state agencies spent little time or money evaluating the impacts of grazing on the land. Most of the law relating to the management of state-owned rangelands was directed toward the process and procedures for issuing leases for grazing and other uses. There was little concern about the manner in which grazing lands were used or the intensity of grazing practices. See Western State Land Commissioners Association Website.

In several states, the legislature enacted “Little NEPA laws” which required state management agencies to evaluate the impacts of proposed land uses when issuing or renewing leases. In other states, special interest groups have challenged the existing processes and procedures for issuing state land leases. The result of both actions has been similar – more scrutiny of leases to determine the impacts of proposed land uses.

Forty-one of the states have some requirement for agencies to assess the environmental impact of their actions. Of these, 14 states have “little NEPA” laws fashioned after the federal act and 27 states have scattered impact assessment requirements. Nine states have no identified requirements. Formal impact assessment requirements are generally more common in the East than the West. See Defenders of Wildlife Website.

Increasingly, state land management agencies are requiring their lessees to manage the state-owned lands in accordance with written management plans. The development of these plans requires the land management agencies to undertake assessments of the condition of the lands to be leased.

Private Land Management Programs

Ownership of the Nation’s privately owned rangelands is dispersed across several hundred thousand individuals. The most effective results have been achieved through voluntary programs where private landowners are encouraged, advised and assisted to develop stewardship programs by federal and state agencies, and various for-profit and not-for-profit associations.

Federal Law Enforcement

Laws that regulate natural resource management generally belong to one of the following categories:

- Environmental protection (air and water quality, species preservation, soil conservation).
- Public property protection.
- Special features protection (sensitive or fragile areas containing unique environmental attributes or resources).

Limitations on natural resource management activities come in several different forms ranging from voluntary to mandatory.

- Guidelines are non-authoritative standards of practice developed by governmental or non-governmental organizations and enforced by moral persuasion.
- Regulations express authoritative standards of operational procedures established to govern behavior and actions of agencies and enforced by superiors in the organization.
- Laws are legislatively binding authoritative standards enacted by the government to codify and regulate behavior and practices among the members of a society and enforced by agencies directed to execute policy.

Federal and state natural resource laws tend to be well publicized and are frequently critiqued in numerous publications. Agency regulations and guidelines are usually not as well publicized and do not get as much attention as the laws to which they relate. All laws, regulations, and guidelines have varied applicability and are enforced within a complex jurisdictional structure. Jurisdiction describes the enforceable reach of a law and who has the responsibility of enforcing that law.

Laws, regulations, and policies concerning the management of land and natural resources must be comprehensive, understandable, and, yet, concise. More importantly, these policies must reflect the consensus of a public that realizes the importance of balancing the needs of current and future generations and the benefits of the enforcement of such legislation. In terms of policy enforcement, this consensus is reached when nearly everyone expects the rules to be enforced (regardless of whether they agree with the specifics of those rules or not) and this expectation deters actions of non-compliance.

State Law Enforcement

The role of state and local governments include regulating property rights for privately owned lands and administering federal laws that affect private property rights. State laws that govern land management practices on private lands in various manners include “little NEPA acts,” coastal zone management acts, clean air acts, hazardous waste removal laws, pesticide and insecticide laws, worker safety laws, and endangered species laws. These laws may apply directly or indirectly to state, federal, or other government lands.

Land Management Practices

Management practices for agriculture, including rangelands, have been developed in almost every state in the United States. Some of these management practices for rangeland management activities (notably non-point source water quality) are required under various state, local, or federal laws. Other management practices are implemented through various voluntary or quasi-voluntary programs. Other alternatives include:

- Cost-share payments under a variety of state and federal programs.
- Preferential property or income tax treatment.
- Technical assistance and extension education programs.
- Environmental education programs.
- Conservation easements.

The condition of rangelands at the parcel, local, landscape, regional, national, and global levels depends, in large part, on the management (or lack of management) on the ground. Management practices and operations that support conservation and sustainable management of rangelands will ensure protection of ecological values, the delivery of goods and services, and protection of the various social, cultural and spiritual values of the rangeland.

Most collections of “best management practices” were originally developed to solve non-point source water quality issues caused by land management practices. These are not directly aimed at rangeland management but are indirectly applicable to water quality. Some states monitor compliance with water quality BMPs, but in general this is a non-regulatory approach. In some circumstances, the penalty for non-compliance may be the withdrawal of financial incentives or the loss of leases or permits to use the land.

Right-to-Farm Laws are being adopted by several states to ensure legal protection of farming and ranching in a perceived atmosphere of constricting environmental legislation. Bad Actor Laws are occasionally used by states to back-up pre-existing guidelines that don’t prescribe penalties for noncompliance. Generally, these laws provide a method of enforcing guidelines by invoking the penalty associated with similar resource conservation intentions (such as a water quality standard) that has also been broken.

Physical Infrastructure

The nature of the infrastructure needed to manage rangelands is dictated by the management goals of the owner and user. Physical infrastructure includes structures (trails, roads, and fences), and facilities (recreational, business and industrial), that are essential for the sustainable production of goods and services from rangelands for society.

In the United States, the profit motive of private, rangeland owners provides an analytical framework for determining how much infrastructure to develop and maintain on their lands. The cost of capital is a limited. Deferred maintenance can also mean increases in short-term profits at long-term expense. Federal land managers, and to some extent state land managers, face other problems as well. The long established concept of multiple use management of public lands also creates multiple, often contradictory objectives. Nothing paralyzes land management programs and practices like conflicting objectives for a parcel of land.

In most cases, there is little need for extensive infrastructure to support the conservation and sustainable management of rangelands. Indeed, the less infrastructure that is developed, the more likely that rangelands will continue to exist as productive rangelands in the future.

Some uses of rangelands, such as animal production, may require roads, fences, and water delivery systems. Camping may require roads and campgrounds. Other uses such as wilderness enjoyment or hiking are diminished by infrastructure. Population increases and changes in age groups will also change the demand for infrastructure. Conflicts about infrastructure needs arise often as the various user groups disagree about uses.

Infrastructure construction and maintenance requires expenditures of money by the landowner or user. Currently, many such facilities do not receive adequate maintenance which may diminish future sustainability through soil erosion and other processes.

Geographic Variation

The indicator is meaningful at federal and state levels of government, largely due to the pervasive presence of federal and state ownership of rangelands.

Scale

The application of spatial and temporal scales to this indicator is not especially relevant.

Data

Some data set(s) exist at the regional-national level, but methods and procedures are not standardized at the regional-national level.

Data Category 1: Major legislation relating to management, use, and protection of rangelands, e.g., Federal Land Policy Management Act (FLPMA), Taylor Grazing Act, National Forest Management Act, etc.

Data Category 2: Major governmental agency regulations and policies relating to management, use, and protection of rangelands

Data Category 3: Major court cases relating to management, use, and protection of rangelands.

Data Category 4: Degree to which public and private landowners practice conservation and sustainable management of rangelands, e.g. Clean Water Act programs, Grazing Land Conservation Initiative etc.

Data Category 5: Time and money spent to enforce laws that affect rangeland sustainability (land management agencies and local law enforcement units).

Data Category 6: Time and money spent to develop and maintain infrastructure on rangelands, including facilities and improvements such as roads, fences, structures and water systems.

Clarity

Stakeholders understand the relevance of this indicator, and the corresponding data sets, to sustainability. Most people understand the relationship between professional land management programs and practices and results on the ground. Well-developed and applied programs and practices result in well-managed rangelands and natural resources.

LAND PLANNING, ASSESSMENT, AND POLICY REVIEW

Description of the Indicator

This indicator describes the nature and extent of periodic range-related planning, assessment, and policy review activities, including planning and coordination between institutions and organizations. It measures the extent of land planning, assessment, and policy review by organizations responsible for or having a stakeholder interest in rangelands.

Importance

Planning is a central component of all land management. Each statute and administrative strategy governing land management incorporates planning. The planning guides individual

discretionary decisions guided by explicit plan goals. Land management policies, as well as resultant planning and assessments, are governed in part by statutes and case law. As the regulatory situation changes over time, planning and assessment activities undertaken by agencies will have to be flexible enough to keep up.

Federal Planning, Assessment, and Policy Review

Historically, federal land management agencies used a general strategy to implement programs. Federal laws now mandate and govern federal land use planning -- resulting in more formal planning which is more extensive in process and substance than at any time in history. Individual managers have less discretion in deciding whether and how to plan.

FLPMA and the NFMA require the BLM and the Forest Service to plan for their lands. Congress has mandated that management decisions must be "consistent" or "in accordance" with formal plans for both agencies. The Forest Service is required to comply with relatively specific procedures in its planning activities. The BLM has only very general provisions guiding its work.

Other agencies have different requirements. For example, the National Park Service (NPS) and the Fish and Wildlife Service (FWS) both prepare land use plans for a variety of uses. The NPS has a partial statutory planning requirement. The FWS has no statutory planning requirement. Both agencies have planning guidelines/discretionary regulations that help guide officials but rarely dictate the specified result. They do, however, provide reviewing courts with standards against which to judge subsequent management actions for arbitrariness or capriciousness.

The Sikes Act (16 USC 670) requires the Department of Defense to prepare Integrated Natural Resources Management Plans (INRMPs) for military lands in cooperation with the FWS and other federal agencies. While the provisions of the Sikes Act provide general guidelines for preparation of INRMPs, each branch of the military has developed extensive guidelines, in cooperation with the FWS, for preparing plans. See U.S. Fish and Wildlife Service Website.

Recently, federal land management agencies have undertaken comprehensive assessments in the Sierra Nevada, Columbia River Basin, and other areas. There are many different, often conflicting reasons for undertaking such regional assessments, but they do evaluate the current condition of all lands, including rangelands. The current condition is then compared to an earlier condition as obtained from historical records. Finally, the current condition is compared to some "desired future condition" and a management plan is developed to move from the current condition to the desired future condition.

Problems in accomplishing large-scale regional plans include the difficulty in obtaining adequate public participation and vague requirements for different institutions to collaborate -- although the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management, effective October 18, 2000, constitutes an agreement between the Departments of Interior, Agriculture, Commerce, Defense, EPA and Tennessee Valley Authority to collaborate under a unified Federal policy on watershed management (Federal Register / Vol. 65, No. 202 / Wednesday, October 18, 2000 / Notices). This policy, which provides a framework for a watershed approach to Federal land and resource management activities, is one of the action items in the President's Clean Water Action Plan: Restoring and Protecting America's Waters (EPA, 1998: EPA -- 840-R-98-001).

While there are various methods to assess the effectiveness of regional plans, none is comprehensive. For example with the Sierra Nevada Ecosystem Project, the steering committee

held public meetings. In the Columbia River Basin assessment, correspondence from county commissioners in Oregon, Washington and Idaho were used to gauge effectiveness.

Periodic planning, assessment, and policy review are endemic on federal lands, triggered by the Taylor Grazing Act, the Federal Land Policy and Management Act (FLPMA), the Forest and Rangeland Renewable Resources Planning Act (RPA), the National Forest Management Act (NFMA), the Soil and Water Resources Conservation Act (RCA), and a variety of federal legislation governing assessing and planning for mining and mineral leasing of federal lands. These assessments and planning documents are to be issued at specified intervals, although there is often a delay in complying with these schedules, and often the schedules are only precatory (even under federal law).

Moreover, such planning documents on federal lands operate at several different scales. There may be nation-wide guidance (such as BLM's riparian policy), regional assessments and plans (such as BLM Resource Area Management Plans), and local plans (such as allotment management plans). Under federal law, when assessments, plans, and policies are issued or revised, extensive coordination opportunities are required, including "consultation and coordination" with state and local governments, tribes, and the public. All are entitled to review drafts of policies, plans, rulemakings, and assessments.

Planning at the State and Local Level

Over the past 10 years, many of the western states have begun to develop and implement management plans for state-owned trust rangelands under their jurisdictions. These rangeland resource plans are intended to be a principal guiding document, providing long-range direction, operation objectives or targets, and a budget framework that will assure coordinated and balanced implementation of state-owned rangelands.

Concurrently, many of the western states, acting through their state Departments of Agriculture have begun to develop broad agricultural planning and technical assistance programs to help private rangeland owners manage rangelands more profitably and sustainably as part of the states overall agricultural planning programs.

Some states also provide for periodic rangeland-related assessments and policy reviews through their monitoring processes. States monitor their rangeland programs to determine whether the programs are producing the desired result. Information gathered from monitoring can clarify which management practices accomplish program goals and objectives best.

Since the early 1970s, at least twelve states have adopted programs to assert state control over land development policies to provide consistency and direction among counties (or other local jurisdictions) where zoning decisions traditionally lie. These programs attempt to reconcile the goal of environmental protection with that of economic development through the vehicle of growth management laws.

Growth management laws are designed to take a comprehensive approach to regulating the pattern and rate of land development. They direct local governments to identify lands with high natural resource, economic and environmental value and protect them from development. Growth management laws can protect agricultural lands, including rangelands, by concentrating new development away from important agricultural areas.

Of the 12 states with growth management statutes, only seven -- Hawaii, Maryland, Minnesota, New Jersey, Oregon, Vermont and Washington -- address the agricultural land conversion issue. The laws of these seven states vary considerably in their mandate to state and

local governments and the extent to which they protect agricultural land from development ([American Farmland Trust Website](#)).

Often, the programs are geared toward preventing or slowing the conversion of agricultural land to other uses. This is accomplished by a shift from low-density urban sprawl to compact development with higher densities and a sharper transition from urban areas to surrounding greenbelts. By limiting urban sprawl, existing open spaces, including rangelands, undeveloped wetlands, forests and mountains can be preserved. Many of these programs are unpopular with private landowners because of the restrictions that are placed on development of land and the potential loss of appreciation in value.

There are significant statutory and regulatory schemes in place that require rangeland-related planning and assessment at the federal level – and substantially smaller programs at the state and local level. Federal land managers have substantial regulatory powers with enforcement powers to match. Virtually all planning and assessment programs for private lands are voluntary in nature. Even the states that have land development policies tend to tread lightly with limitations on the use and development of rangelands.

There are a growing number of state land agencies that now perform resource assessments and use the information to develop land management plans for state-owned rangelands. The assessments are not as comprehensive as those required of federal agencies. Similarly, the management plans are not as detailed as federal agency management plans.

Private Lands

Privately owned rangelands may be assessed, or “planned for” through local (e.g. county) land use planning. Typically, some type of assessment precedes such plans. There do not seem to be any broadly accepted requirements for local rangeland plans or related assessments. However, these local assessments and land use plans are generally open to public review, although mandatory coordination with other sectors may not be required (e.g., local land use plans must be submitted to a state planning agency for comment and approval).

Geographic Variation

This indicator is meaningful at federal and state levels of government, and all regions of the country.

Scale

The application of spatial and temporal scales to this indicator is not especially relevant.

Data

Some data set(s) exist at the regional-national level, but methods and procedures are not standardized at the regional-national level.

Data Category 1: FLPMA, RPA, RCA, and other plans and reports for public lands; and National Resources Inventory (NRI) reports for non-federal lands.

Data Category 2: Forest Service RPA assessments, NRCS appraisals made under RCA, BLM, FWS and other public land assessments, NRCS reports resulting from the NRI, ERS and the World Outlook Board projections and forecasts.

Data Category 3: Monies spent on land and natural resource assessments (Interior Appropriations Act, etc.).

Clarity

Stakeholders understand this relevance of this indicator, and the corresponding data sets, to sustainability. However, there is a tendency to judge the effectiveness and usefulness of periodic range-related planning, assessment, and policy review activities in terms of how the individual likes the results of any given work product.

PROTECTION OF SPECIAL VALUES

Description of the Indicator

This indicator describes the extent to which laws, regulations, and guidelines, institutions, and organizations conserve special environmental, cultural, social and/or scientific values.

Importance

This indicator measures the extent of protection of special values on the conservation and sustainable management of rangelands.

Federal, state, and local governments have enacted laws and administrative regulations that provide for areas to be set aside for protection based on their social, cultural, ecological and environmental, scientific, and other special values. The president of the United States has the authority to create national monuments by executive order. Federal, State, Tribal governments, and local government agencies may designate and conserve areas with special values. In addition, there are a number of non-governmental organizations such as The Nature Conservancy, and many land trusts that do the same thing through purchase of land and a subsequent dedication of the land to specific purposes.

For example, the Grand Staircase-Escalante National Monument (1.9 million acres) was established on September 18, 1996, by the President of the United States, under the authority of the 1906 Antiquities Act. The lands within the Monument contain spectacular treasures of natural and human history. This beautiful area is so rugged and remote that it was the last place in the continental United States to be mapped ([Grand Staircase-Escalante National Monument Website](#)).

The Little Bighorn Battlefield National Monument, located near Crow Agency MT, is the site of the June 25, 1876 battle between the U.S. Army's seventh cavalry, guided by Crow and Arikara scouts, and several bands of Lakota Sioux, Cheyenne, and Arapaho. The site, protected for historical values, was designated as a National Cemetery on January 29, 1879, and as a National Monument on March 22, 1946 ([Little Bighorn Battlefield National Monument Website](#)).

Red Canyon Ranch, owned by The Nature Conservancy (TNC), encompasses nearly 5,000 acres of deeded property with 30,000 acres of state and federal leases ([The Nature Conservancy, Red Canyon Ranch Website](#)). The ranch, located just east of Lander WY, is dedicated to enhancing biological diversity, protecting native plants and animals, and raising

quality cattle. TNC believes that “responsible, economically viable livestock grazing can not only coexist with but also enhance high quality wildlife habitat.”

Federal laws and executive orders can set aside or restrict uses on various tracts of public land for a variety of unique social, cultural, aesthetic, environmental or scientific values. Some of those areas contain substantial acreages of rangelands. The magnitude of the areas set aside by these various projects can be very large, and can affect local rangeland management options. In some cases, concerns exist that such set aside areas focus on the resource value of interest to the exclusion of all other activities – even when such activities do not conflict with the principal interest. All set aside areas should be evaluated in terms of the conservation and sustainable management of rangelands to ensue that activities other than the identified special value uses may occur on the land whenever possible.

Perhaps the most important reason that special value set aside areas containing rangelands are important to sustainability is the high likelihood that such areas will be maintained and managed as rangelands into the long-term future.

Geographic Variation

The indicator is meaningful in different regions. There are a large number of “special values that can be considered under this indicator. The challenge will be to identify a common format for reporting on such values and the methods of protection.

Scale

The application of spatial and temporal scales to this indicator is not especially relevant.

Data

Some data set(s) exist at the regional-national level, but methods and procedures are not standardized at the regional-national level.

The National Center for Geographic Information and Analysis at the University of California, Santa Barbara, an independent research consortium dedicated to basic research and education in geographic information science and its related technologies, including geographic information systems (GIS), has developed and maintains a “Managed Areas Database” that shows many of the areas set aside for protection of special values. An excellent map of Managed Areas is shown on the Center’s website and is reproduced below. Additional work would be needed to update the database and adapt it for rangeland sustainability purposes.

“MAD is a comprehensive GIS database for the conterminous United States which includes all types of managed areas. Examples include National and State Parks and Forests, Wilderness Areas, Indian and Military Reservations, and National Wildlife Refuges. Researchers at the Remote Sensing Research Unit have compiled this database by integrating a number of data sources diverse in scale and map projection. The database has been compiled as a 1:2,000,000 scale product, and both the precision and accuracy of the database are in accord with that scale.” (Note: The Center has completed its work to develop the Managed Areas Database and is looking for a responsible organization to

assume responsibility for future maintenance.) Source: National Center for Geographic Information and Analysis, University of California, Santa Barbara, Website.

Data Category 1: Federal legislative and executive actions which set aside national parks and monuments that include rangelands, and identify the extent to which such acts affect conservation and sustainable management of rangelands.

Data Category 2: Presidential Executive Orders which set aside rangelands for conservation of special resources, and identify the extent to which such acts affect conservation and sustainable management of rangelands.

Data Category 3: Programs and activities of for-profit and not-for-profit organizations designed to protect tracts of rangelands for special values, and identify the extent to which such acts affect conservation and sustainable management of rangelands.

Data Category 4: GIS tabular and visual displays of size, location, and special values protected, and nature of rangeland uses within the set aside areas.

Clarity

Stakeholders understand this relevance of this indicator, and the corresponding data sets, to sustainability. Information relating to this indicator may be displayed in tabular form in terms of acres protected for each special value, or in map form in terms of areas protected for each special value.

MEASURING AND MONITORING

Description of the Indicator

This indicator describes the extent to which agencies, institutions, and organizations devote human and financial resources to measuring and monitoring changes in the condition of rangelands.

Importance

This indicator measures the extent to which government agencies, universities, and NGOs spend time and money to find out what is happening on and to rangelands. The United States has a large, but fragmented, capacity to measure changes in the conservation and sustainable management of rangelands. The bulk of the Nation's rangelands are held by the federal government and managed by the Departments of Agriculture, Interior, and Defense. These agencies have the ability to monitor land under their jurisdictions, but currently do not measure the same variables, nor do they use the same protocols to ensure consistent, reproducible results.

Almost all of the western states still hold and manage extensive tracts of lands granted to the states by the federal government at statehood. Most states monitor the condition of the land to some extent, but the states do not have common methodologies among themselves much less methodologies that are consistent with the methodologies used by the federal agencies.

Various tribes and private landowners hold the rest of the Nation's rangelands. Most ranchers do little formal monitoring of their private rangeland holdings. However, the USDA-

NRCS and other USDA agencies do extensive monitoring and measuring of the various aspects of land cover and land use change. The NRCS uses its own protocols, often different than those used by other federal agencies, to measure and monitor environmental and social changes.

The capacity exists to measure the indicators of sustainable rangeland management. Similarly, the capacity exists to monitor changes in land condition. It is necessary, however, to agree on what criteria, indicators, and verifiers will be used, and to dedicate the resources to a monitoring program that includes all agencies that perform such measurements.

There is a need to improve the quality and quantity of information that is gathered on the Nation's rangelands. Without accurate information, it is not productive to undertake the periodic resource assessment projects that are necessary to find any gradual decline in rangeland condition.

Rangelands comprise a large percentage of the Nation's land and provide vital watershed and grazing land functions. Currently, there is no coordinated inventory of these lands and yet, several agencies in the various departments have responsibilities for differing aspects of rangeland inventory and assessment.

The capacity exists to measure many indicators of sustainable rangeland management. Similarly, the capacity exists to monitor changes in land condition. It is necessary, however, to agree on what criteria, indicators, and verifiers will be used, and to dedicate the resources to a monitoring program that includes all agencies that perform such measurements.

Availability of Up-to-Date Data, Statistics, and Other Information

Congress has enacted legislation, such as the Government Results and Performance Act of 1994 (GPRA) and the required, to insure that their information and performance lends itself to up-to-date performance reporting and strategic planning and the use of reliable information. Strategic Plans prepared by agencies such as the Forest Service, BLM, NRCS, and the Agricultural Research Service also address issues relating to the availability and accuracy of information. All agencies must report on their activities and levels of compliance.

Information applicable to this indicator can be found and monitored in the Forest Service RPA Assessments, the BLM's Public Land Statistics, and the NRCS's National Resources Inventory and RCA Appraisal work.

There is not an equivalent GPRA for state governments that would be consistent across the country. Information relating to private rangelands is addressed by the NRCS and is only available to the Major Land Resource Area Level, in many cases a large amount of acreage.

Strategic planning undertaken by state boards and agencies obviously varies greatly from state to state. Information on whether planning occurs, and something about its extent, should be available from the Internet and other public information sources.

Another recent law, which may have an impact on Federal agencies, is the Data Quality Act of 2000. The impact of this Act is yet to be determined; however, it has the potential to have a significant impact on how the Federal government develops, handles and disseminates data, including that from monitoring efforts.

Scope, Frequency, and Statistical Reliability of Range Inventories, Assessments, and Monitoring

With the passage of GPRA, there is an increased amount of coordination regarding some of these issues, but most significant in the rangeland monitoring subject area was the following paragraph in the U.S. House Appropriations Committee Report for the Department of Interior and Related Agencies Appropriations Bill for FY 2002: "Prior to the passage of the Government

Performance and Results Act, it is likely that any consistency of information disseminated by U.S. government agencies was coincidental.”

Information relating to natural resources and land management was gathered, analyzed, and maintained as a requirement of a number of laws, for example, the NFMA, RPA, FLPMA, Taylor Grazing Act, and others relating to natural resources. These laws, subject to budgetary limitations, direct the agencies to conduct rangeland inventories, assessments, and monitoring as needed to carry out the agency mission. However there is often little coordination or support for needed statistical reliability or in many cases consistent scope or frequency.

Geographic Variation

This indicator is generally meaningful in different regions. The indicator will be difficult to verify because the data is widely scattered throughout many organizations and institutions that do not report budgets, programs, or results in a uniform manner. It will be very difficult to collect, analyze, and synthesize all of the relevant information into a meaningful report.

Scale

This indicator is meaningful at different spatial and temporal scales. It is possible to determine the human and financial resources devoted to measuring and monitoring programs over time, although reducing that information to a common format may not be easy.

Data

Conceptually feasible or initially promising, but no regional-national methods, procedures or data sets currently exist.

Data Category 1: Scope and reliability of rangeland related information in existing databases and information sources relevant to these Criteria and Indicators.

Data Category 2: Time and money currently used to monitor and measure rangeland related data sets by Federal and State Agencies and NGO's.

Data Category 3: Extent to which the various agency databases may be combined and used effectively.

Data Category 4: Additional time and money needed to monitor and measure information deemed necessary but not already being monitored and measured.

Clarity

Stakeholders understand this indicator and its measurement units. However, there are so many different sources of information that a great deal of professional judgment on the part of the analyst will be necessary to develop a suitable summary.

RESEARCH AND DEVELOPMENT

Description of the Indicator

This indicator describes the nature and extent of research and development programs that affect the conservation and sustainable management of rangelands. It examines research and development as it affects the conservation and sustainable development of rangelands.

Importance

This indicator measures the extent of research and development programs that improve scientific understanding, develop new technologies, and assess the impacts of naturally occurring and human disturbances on the conservation and sustainability of rangelands. Essentially, this indicator looks at the extent to which government agencies, universities, and NGOs spend time and money spent on research and development activities related to rangelands.

Research and development are necessary to better understand the sustainability of rangeland. Without active research and development programs and projects, accurate information, existing activities and uses will continue to eventual steady state or stagnation conditions. It is important to constantly evaluate existing activities and develop better ways to do things.

Scientific Understanding

The United States has made significant investments in development of scientific understanding of rangeland ecosystem characteristics and functions. Research on rangeland ecosystem characteristics, functions and processes has been carried out in universities and federal agencies for many years, but the extent of this research has probably never been commensurate with the degree of biological complexity and the geographic extent of rangelands.

There appears to be increasing recognition of the need to better understand rangeland ecosystems, but the public at large has not yet come to understand the complexity and importance of rangeland ecosystems. An important point related to research capacity on rangeland ecosystems is that very little research on this topic takes place outside university rangeland departments and federal agencies. Research on the structure and function of rangeland ecosystems has led to major changes in our view of rangelands and how they work -- and has helped resolve conflicts among users of the various rangeland resources.

Private sector organizations have not been extensively involved in basic research on rangeland ecosystem structure and function in the United States. The livestock industry's research and development investments are focused heavily toward improvement of domestic grazing animals. Recently the industry has begun to place considerable emphasis on developing increased scientific understanding of rangeland ecosystems.

The more scientific resources are effectively applied, the more likely that rangelands will be managed on a sustainable basis. This indicator suggests the need to know the quality of our scientific understanding of rangeland ecosystem characteristics and function.

New Technologies

The origins of new technologies include academia, federal agencies and private corporations. Research aimed at assessing the socioeconomic consequences of new technologies

in rangeland has been carried out on a small scale for a number of years, both in rangeland departments in several universities and in federal agency research programs. Currently, the USDA conducts case studies of individual technologies and assessments of the impacts of technologies at an aggregate level. In addition to evaluating the economic (efficiency and demand) impacts of livestock production, the agency is also evaluating impacts on supply, employment, trade, carbon cycling, and to some degree air and water emissions.

Several economists in rangeland schools around the country also have expertise in analyzing the economic consequences of new technologies. These university scientists depend mainly on funding from the USDA to conduct research in this area – funding which has significantly declined in recent years.

Limitations of past research on the impacts of new technologies in rangeland are that livestock production technologies have been the main focus, with very little attention given to rangeland management technologies, outdoor recreation technologies, etc. The focus has been on economic efficiency impacts rather than impacts on social and ecosystem sustainability.

Funding and the number of scientist-years devoted to research on assessing the socioeconomic consequences of new technologies in rangeland has never been substantial, but may have increased slightly during the past few years.

As our knowledge tools and technology become more powerful, we do a better job of managing rangelands on a sustainable basis. The technologies associated with rangeland management have continued to evolve over time, but at best those technologies remain simple to understand and apply. Generally, the goal is to minimize impacts from prevailing human and domestic livestock uses.

Predicting Impacts of Human Disturbances

There is research underway to predict impacts of human disturbances on rangelands. Research capacity is spread out across many organizations, including Federal and state governments, university rangeland departments, and many other university departments, ranging from sociology to ecology. Funding comes from full range of research funding sources, from state governments to the National Science Foundation and private foundations. Trends related to the capacity for research on the impacts of human disturbance on rangelands are difficult to assess, because the funding history -- except for individual programs such as global environmental change -- is essentially not retrievable.

The driving force behind all of today's critical natural resource and environmental issues (e.g., sustainable development, global environmental change, loss of biodiversity, ecosystem health, etc.) may well be the impacts of human disturbance. Research on the impacts of human disturbance on rangelands is an extremely broad area, cutting across many lines of research. Research areas that relate include global environmental change, loss of biodiversity, acid deposition, loss of wetlands, loss and alteration of wildlife habitat, exotic species introduced by humans, toxic contaminants and other types of pollution, land-use and management practices, and all other research dealing with the impacts of anthropogenic disturbances. Research on these and related topics includes everything from social science research (e.g., research on the economic impacts of alternative rangeland management systems) to research in the biological and physical sciences.

Identifying Impacts of Climate Change

Many knowledgeable people believe that climate change--global warming--is presently occurring. If true, the impacts on rangelands could be considerable--ranging from desertification in the south to dramatic changes in vegetation composition elsewhere, including increases in invasive species. The impacts on associated resources such as wildlife and biological diversity could also be considerable.

The United States has had a global climate change research Program since 1990. Participating agencies include the Environmental Protection Agency, Department of Energy, NOAA, the Department of Agriculture, and the Department of Interior. As the knowledge base grows, so does the ability to identify, and perhaps predict, the impacts of climate change.

A greater ability to predict impacts provides the capability to take mitigating actions earlier, thus improving the likelihood that rangelands will be managed on a sustainable basis. Climate change may alter growing seasons thereby affecting rangelands. Some 50 percent of the world's livestock are supported by grasslands, which are also grazed by wildlife. The boundaries between grasslands, shrublands, forests, and other ecosystems may be reshaped by shifts in temperature and precipitation ([United Nations Framework Convention on Climate Change Website](#)).

Research on climate change suggests that the impacts on rangelands could be significant. A major local impact could be the reduced viability of grazing open rangelands due to a declining availability of water. The impact would not be as significant at the national level because open range livestock is a relatively small part of the nation's beef production. A second impact would be variations to the geographical extent and the plant composition of rangelands due to changes in precipitation patterns. If wet areas that now support forest become dryer, the vegetation communities could become grasslands or shrub-grassland communities. A change from a dry climate to a wetter climate could support forest growth. Changing levels of carbon dioxide may also induce changes in vegetation communities ([Environmental Protection Agency Global Warming Website](#)).

Capacity to conduct and apply research and development to the problem of predicting climate change effects involves the development of a good understanding of the impacts of climate change on rangelands and their disturbances such as pests and fire, the ability to quantify those effects on rangeland productivity and changes in vegetative cover, and the ability to integrate these effects across the atmospheric, ecological, and economic systems.

Potential species shifts and changes in productivity imply potential shifts in rangeland product use and depend on new technology. The nature of those change over periods of 50 years or more for which climate changes are being analyzed, is not well understood. Improving rangeland management and the delivery of rangeland goods and services will depend on future research and development in these areas.

Geographic Variation

This indicator is generally meaningful in different regions of the country. However, the indicator will be difficult to verify because data are widely scattered throughout many organizations and institutions that do not report budgets, programs, or results in a uniform manner. It will be very difficult to collect, analyze, and synthesize of the relevant information into a meaningful report.

Scale

This indicator is meaningful at different spatial and temporal scales. It is possible to determine the human and financial resources devoted to research and development programs over time, although reducing that information to a common format might not be easy.

Data

Some data set(s) exist at the regional-national level, but methods and procedures are not standardized at the regional-national level.

Data Category 1: Major agency, university, and NGO research programs related to rangeland ecosystem characteristics and functions (ecology and biology), including the time and money utilized in such activities. See CSREES reports on current research and information (CRIS).

Data Category 2: Major agency, university, and NGO research programs related to the development of methodologies to measure and integrate environmental and social costs and benefits into markets and public policies, including the time and money utilized in such activities. See CRIS

Data Category 3: Major agency, university, and NGO research programs related to new technologies and the capacity to assess the socioeconomic consequences associated with the introduction of new technologies, including the time and money utilized in such activities.

Data Category 4: Major agency, university, and NGO research programs related to enhancement of ability to predict impacts of human intervention on rangelands, including the time and money utilized in such activities.

Data Category 5: Major agency, university, and NGO research programs related to the impacts of climate change on United States rangeland ecology and biology and associated activities and uses, including the time and money utilized in such activities.

Clarity

Stakeholders understand the relevance of this indicator, and the corresponding data sets, to sustainability. There are so many different sources of information that a great deal of professional judgment on the part of the analyst will be necessary to develop a suitable summary.

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APPENDIX 6-1. Indian Tribal Governments that own and manage rangelands.

- Confederated Tribes of the Colville Reservation, Nespelem, WA
- Skokomish Reservation, Skokomish, WA
- Snoqualmie Tribe, Fall City, WA
- Spokane Tribe of Indians, Wellpinit, WA
- Yakama Nation, Toppenish, WA
- Burns Paiute Tribe, Burns, OR
- Confederated Tribes of the Umatilla Indian Reservation (Cayuse, Umatilla and Walla Walla Tribes), Pendleton, OR
- Confederated Tribes of the Warm Springs Reservation (Warm Springs, Wasco & Paiute), Warm Springs, OR
- Coquille Indian Tribe, North Bend, OR
- Cow Creek Band of Umpqua Indians, Rosburg, OR
- Klamath General Council (Klamath, Modoc & Yahooskin), Chiloquin, OR
- Blackfeet Nation, Browning, MT
- Chippewa-Cree Business Committee, Box Elder, MT
- Confederated Salish & Kootenai Tribal Council, Flathead Reservation, Pablo, MT
- Crow Tribal Council, Crow Agency, MT
- Fort Belknap Community Council, Gros Ventre & Assiniboine Tribes, Harlem, MT
- Fort Peck Tribal Council, Assiniboine & Sioux Tribes, Poplar, MT
- Northern Cheyenne Tribe, Lame Deer, MT
- Coeur d'Alene Tribal Council, Plummer, ID
- Kootenai Tribal Council, Bonners Ferry, ID
- Nez Perce Tribal Executive Committee, Lapwai, ID
- Northwestern Band of Shoshoni Nation, Blackfoot, ID
- Shoshone-Bannock Tribe, Fort Hall, ID
- Duck Valley Reservation, Nevada & Idaho Shoshone-Paiute Tribes, Owyhee, NV
- Duckwater Shoshone Tribe of the Duckwater Reservation, Duckwater, NV
- Fallon Paiute-Shoshone Tribe, Fallon, NV
- Fort McDermitt Paiute and Shoshone Tribe, McDermitt, NV
- Moapa Paiute Band of the Moapa Indian Reservation, Moapa, NV
- Pyramid Lake Paiute Tribe, Nixon, NV
- South Fork Band of the Te-Moak Tribe of Western Shoshone Indians, Lee, NV
- Summit Lake Paiute Tribe, Winnemucca, NV
- Walker River Paiute Tribe, Schurz, NV
- Washoe Tribe of Nevada and California, Carson City, NV
- Yomba Shoshone Tribe, Austin, NV
- Havasupai Tribe, Supai, AZ
- Hopi Tribal Council, Kykotsmovi, AZ
- Hualapai Tribal Council, Peach Springs, AZ
- Kaibab-Paiute Tribe, Pipe Springs, AZ
- Navajo Nation, Window Rock, AZ
- Pascua Yaqui Tribal Council, Tucson, AZ

- San Carlos Apache Tribe, San Carlos, AZ
- San Juan Southern Paiute Council, Tuba City, AZ
- Tohono O'Odham, Sells, AZ
- White Mountain Apache Tribe, Whiteriver, AZ
- Yavapai-Prescott, Prescott, AZ
- BIA/Northern Pueblos Agency (in cooperation with numerous tribes), Espanola, NM
- BIA/Southern Pueblos Agency (in cooperation with numerous tribes), Albuquerque, NM
- Alamo Navajo Chapter, Magdalena, NM
- Canoncito Navajo Chapter, Canoncito, NM
- Jicarilla Apache Tribe, Dulce, NM
- Laguna Pueblo, Laguna, NM
- Mescalero Apache Tribe, Mescalero, NM
- Ramah Navaho Chapter, Ramah, NM
- Zuni Pueblo, Zuni, NM
- Southern Ute Tribe, Ignacio, CO
- Ute Mountain Ute, Towaoc, CO
- Devils Lake Sioux Tribe a.k.a. Mni Wakan Oyate Tribe, Fort Totten, ND
- Standing Rock Sioux, Fort Yates, ND
- Three Affiliated Tribes - Fort Berthold Reservation, Mandan, Hidatsa & Arikara Tribes, New Town, ND
- Cheyenne River Sioux Tribal Council, Eagle Butte, SD
- Crow Creek Sioux Tribal Council, Fort Thompson, SD
- Lower Brule Sioux Tribal Council, Lower Brule, SD
- Oglala Sioux Tribal Council, Pine Ridge, SD
- Rosebud Sioux Tribe, Rosebud, SD
- Alturas Rancheria, Pit River, Alturas, CA
- American Indian Council of Mariposa, Mariposa, CA
- Barona Rancheria, Kumeyaay (Diegueño), Lakeside, CA
- Big Bend Rancheria, Pit River (Achomawi), Burney, CA
- Cahuilla Band of Mission Indians, Anza, CA
- Chemehuevi Tribal Council, Havasu Lake, CA
- Fort Bidwell Indian Community of Paiute Indians, Fort Bidwell, CA
- Fort Mohave Tribe, Mohave, Needles, CA (Actual location is in AZ)
- Lookout Rancheria, Pit River Tribe, Burney, CA
- Manzanita Band of Mission Indian, Kumeyaay (Diegueño), Boulevard, CA
- Mesa Grande Band of Mission Indians, Kumeyaay (Diegueño), Santa Ysabel, CA
- Morongo Band of Mission Indians (Cahuilla, Serrano & Cupeño), Banning, CA
- Round Valley Reservation (Achomawi, Concow, Nomelaki, Wailaki, Wintun, Yuki & Pomo), Covelo, CA Santa Ysabel Band of Mission Indians Kumeyaay (Diegueño), Santa Ysabel, CA
- Tule River, Yokuts, Porterville, CA
- Confederated Tribes of the Goshute Reservation, Ibapah, UT
- Northern Ute Uintah & Ouray, Fort Duchesne, UT
- Paiute Indian Tribe of Utah Tribal Council, Cedar City, UT

APPENDIX 6-2. Colleges and universities with programs or courses in rangeland sciences.

- Angelo State University, San Angelo, TX
- Arizona State University, Tempe, AZ
- Brigham Young University, Provo, UT
- California Polytechnic State University, San Luis Obispo, CA
- Colorado State University, Fort Collins, CO
- Fort Hays State University, Hays, KS
- Humboldt State University, Arcata, CA
- Iowa State University, Ames, Iowa
- Kansas State University, Manhattan, KS
- Montana State University, Bozeman, MT
- New Mexico State University, Las Cruces, NM
- North Dakota State University, Fargo, ND
- Oklahoma State University, Stillwater, OK
- Oregon State University, Corvallis, OR
- South Dakota State University, Brookings, SD
- Sul Ross State University, Alpine, TX
- Tarleton State University, Stephenville, TX
- Texas A & M University, College Station, TX
- Texas Christian University, Fort Worth, Texas
- Texas Tech University, Lubbock, TX
- University of Alberta, Edmonton, Alberta CANADA
- University of Arizona, Tucson, AZ
- University of California – Berkeley, Berkeley, CA
- University of California – Davis, Davis, CA
- University of Florida, Gainesville, FL
- University of Idaho, Moscow, ID
- University of Montana, Missoula, MT
- University of Nebraska – Lincoln, Lincoln, NE
- University of Nevada – Reno, Reno, NV
- University of Wyoming, Laramie, WY
- Utah State University, Logan, UT
- Washington State University, Pullman, WA

APPENDIX 6-3. Non-governmental, non-profit organizations involved in the conservation and sustainable management of rangelands.

- Allan Savory Center for Holistic Management
- Arizona Common Ground Roundtable
- Audubon Society
- CAB International
- Center for Biological Diversity
- Collaborative Planning Organizations on the Colorado Plateau
- Diablo Trust
- EcoresultsFoundation E.A.R.T.H.
- Idaho Conservation League
- Malpais Borderlands Group
- National Wildlife Federation
- Natural Resources Defense Council
- Overseas Development Institute
- Public Lands Information Center
- Ranch West
- RangeBiome, A Public Rangeland Almanac
- Rocky Mountain Elk Foundation
- Sierra Club
- Sonoita Crossroads Community Forum
- Sonoita Valley Planning Partnership
- Southern Arizona Grasslands Trust, Inc.
- The Nature Conservancy
- The Quivira Coalition
- U.S. Institute for Environmental Conflict Resolution
- Udall Center for Studies in Public Policy
- Western Gamebird Alliance
- World Conservation Monitoring Centre

APPENDIX 6-4. Summary table of indicator data categories.

Land Law and Property Rights Indicator

Extent to which laws, regulations, and guidelines, clarify property rights, and land tenure arrangements, recognize customary and traditional rights of indigenous people, and provide means of resolving property disputes by due process as they relate to the conservation and sustainable management of rangelands.

Institutions and Organizations Indicator

Extent to which governmental agencies, educational institutions, and other for-profit and not-for-profit organizations affect the conservation and sustainable management of rangelands.

Economic Policies and Practices Indicator

Extent to which economic policies and practices affect the conservation and sustainable management of rangelands.

Data Category 1: Major federal and state legislation relating to land law, property rights and land tenure arrangements associated with rangelands.

Data Category 2: Major governmental and state agency regulations and policies relating to land law, property rights and land tenure arrangements associated with rangelands.

Data Category 3: Major federal and state court cases relating to land law, property rights, and land tenure arrangements associated with rangelands.

Data Category 4: Sales and transfers of rangeland titles and the right to take forage.

- Private, state, and federal rangeland acres sold annually, by type of transfer e.g. private treaty, closed auction, open auction, inheritance, or other device.
- Private, state, and federal AUMs (or equivalent) sold or transferred annually, by type of transfer e.g. private treaty, closed auction, open auction, inheritance, or other device.

Data Category 1: Programs and activities of governmental agencies that affect the conservation and sustainable management of rangelands.

Data Category 2: Programs and activities of colleges and universities that affect the conservation and sustainable management of rangelands.

Data Category 3: Programs and activities of for-profit and not-for-profit organizations that affect the conservation and sustainable management of rangelands.

Data Category 1: Macro-economic policies and practices that affect rangeland sustainability including economic growth, interest rates, and international trade practices.

Data Category 2: Major federal and state legislation, regulations, and guidelines, and court cases that affect economic processes related to rangeland resources.

Data Category 3: University, public agency, and NGO studies on incidence and impacts of investment, trade, and taxation policies at national, state, and local levels.

Public Information and Public Participation Indicator

Extent to which laws, regulations, and guidelines, institutions and organizations provide opportunities for: (1) public access to information; and, (2) public participation in the public policy and decision-making process relating to rangelands.

Professional Education and Technical Assistance Indicator

Extent to which laws, regulations, and guidelines, institutions, and organizations provide for professional education and the distribution of technical information and financial assistance related to the conservation and sustainable management of rangelands.

Land Management Indicator

Extent to which land management programs and practices support the conservation and sustainable management of rangelands.

Data Category 1: Summarize federal, state, and local laws, regulations and guidelines that affect public access to information (freedom-of-information act requirements, etc.) that affect public access to information relating to rangeland sustainability.

Data Category 2: Summarize federal, state, and local laws, regulations, and guidelines that affect public participation and involvement in decision-making processes relating to rangelands.

Data Category 1: Federal and state agency and NGO public information, technical assistance, and other outreach programs that affect rangeland sustainability.

Data Category 2: College and university education and training programs that affect rangeland sustainability.

Data Category 3: Federal, state, and NGO agency internal training programs that affect rangeland sustainability (Current Research Information System (CRIS) Reports).

Data Category 1: Major legislation relating to management, use, and protection of rangelands, e.g., Federal Land Policy Management Act (FLPMA), Taylor Grazing Act, National Forest Management Act, etc.

Data Category 2: Major governmental agency regulations and policies relating to management, use, and protection of rangelands

Data Category 3: Major court cases relating to management, use, and protection of rangelands.

Data Category 4: Degree to which public and private landowners practice conservation and sustainable management of rangelands, e.g. Clean Water Act programs, Grazing Land Conservation Initiative etc.

Data Category 5: Time and money spent to enforce laws that affect rangeland sustainability (land management agencies and local law enforcement units).

Data Category 6: Time and money spent to develop and maintain infrastructure on rangelands, including facilities and improvements such as roads, fences, structures and water systems.

Land Planning, Assessment, and Policy Review Indicator

Nature and extent of periodic range-related planning, assessment, and policy review activities, including planning and coordination between institutions and organizations.

Protection of Special Values Indicator

Extent to which laws, regulations, and guidelines, institutions, and organizations conserve special environmental, cultural, social and/or scientific values.

Measuring and Monitoring Indicator

Extent to which agencies, institutions and organizations devote human and financial resources to measuring and monitoring changes in the condition of rangelands.

Data Category 1: FLPMA, RPA, RCA, and other plans and reports for public lands; and National Resources Inventory (NRI) reports for non-federal lands.

Data Category 2: Forest Service RPA assessments, NRCS appraisals made under RCA, BLM, FWS and other public land assessments, NRCS reports resulting from the NRI, ERS and the World Outlook Board projections and forecasts.

Data Category 3: Monies spent on land and natural resource assessments (Interior Appropriations Act, etc.).

Data Category 4: Programs and expenditures for financial assistance to owners and users of rangelands.

Data Category 5: Grazing Lands Conservation Initiative for production, and the requirements of the Clean Water Act, etc., and identify the extent to which the act affects conservation and sustainable management of rangelands. See EQIP.

Data Category 1: Federal legislative and executive actions which set aside national parks and monuments that include rangelands, and identify the extent to which such acts affect conservation and sustainable management of rangelands.

Data Category 2: Presidential Executive Orders which set aside rangelands for conservation of special resources, and identify the extent to which such acts affect conservation and sustainable management of rangelands.

Data Category 3: Programs and activities of for-profit and not-for-profit organizations designed to protect tracts of rangelands for special values, and identify the extent to which such acts affect conservation and sustainable management of rangelands.

Data Category 4: GIS tabular and visual displays of size, location, and special values protected, and nature of rangeland uses within the set aside areas.

Data Category 1: Scope and reliability of rangeland related information in existing databases and information sources relevant to these Criteria and Indicators.

Data Category 2: Time and money currently used to monitor and measure rangeland related data sets by Federal and State Agencies and NGO's.

Data Category 3: Extent to which the various agency databases may be combined and used effectively.

Data Category 4: Additional time and money needed to monitor and measure information deemed necessary but not already being monitored and measured.

Research and Development Indicator

Nature and extent of research and development programs that affect the conservation and sustainable management of rangelands.

Category 1: Major agency, university, and NGO research programs related to rangeland ecosystem characteristics and functions (ecology and biology), including the time and money utilized in such activities. See CSREES reports on current research and information (CRIS).

Data Category 2: Major agency, university, and NGO research programs related to the development of methodologies to measure and integrate environmental and social costs and benefits into markets and public policies, including the time and money utilized in such activities. See CRIS

Data Category 3: Major agency, university, and NGO research programs related to new technologies and the capacity to assess the socioeconomic consequences associated with the introduction of new technologies, including the time and money utilized in such activities.

Data Category 4: Major agency, university, and NGO research programs related to enhancement of ability to predict impacts of human intervention on rangelands, including the time and money utilized in such activities.

Data Category 5: Major agency, university, and NGO research programs related to the impacts of climate change on United States rangeland ecology and biology and associated activities and uses, including the time and money utilized in such activities.