

NEW PROPOSED NATIONAL RESOURCES INVENTORY PROTOCOLS ON NONFEDERAL RANGELANDS

The U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) has used resource inventories for over 65 years to assess the Nation's natural resources on nonfederal lands. Rangeland National Resources Inventory (NRI) activities in NRCS have provided scientifically credible information about status, conditions, and trends on nonfederal rangelands. The inventory process has evolved in the last two decades from qualitative in the early 80s to more quantitative field methods in the 90s. Since 1995, cooperation between government agencies has resulted in new protocols for rangeland field inventory techniques giving the Nation a quantitative foundation for assessing rangeland conditions.

The new proposed NRI protocols are designed to detect long-term—years to decades—changes in the condition on rangeland ecosystems, and monitor short-term impacts, which may be of immediate concern. The new rangeland NRI protocols will provide field-based benchmarks for primary sample units and fulfill NRCS-NRI objectives (see sidebar, page 20A).

An interagency group—the USDA-

NRCS, USDA-Agricultural Research Service (ARS), U.S. Department of Interior (USDI)-Bureau of Land Management (BLM), USDI-U.S. Geological Survey (USGS), and the USDA-Forest Service (USFS)—worked together to develop a list of data elements that could be used for national level inventories. Through pilot studies and inventories the group originated a new NRI design for rangelands.

The NRI process on rangelands

To establish a sound field based dataset for rangelands, it is important to understand the process that currently is being utilized. The NRI surveys in 1982, 1987, and 1992 included rangeland, pastureland, and forestland. Table 1 shows what types of information were collected during these years. A comprehensive review of the NRI inventory sampling strategy is presented in Goebel and Baker (1987), Nusser et al. (1998), and Nusser and Goebel (1997).

The basic statistical design of NRI surveys incorporates a stratified two-stage area sample. The public land survey system, which exists in most states serves as

the structure for developing and locating primary sample units in the field. A common primary sample unit area is 160 acres (64.8 ha) and typically two primary sample units were randomly selected within a township stratum. In the second stage of sampling, three random sample points using a restricted randomization procedure were selected in each primary sample unit (Goebel and Baker, 1987). In some instances and locations in the United States, primary sample unit sizes were 40 or 640 acres (16.2 ha or 259 ha). In counties that are not mapped according to the public land survey system, a superimposed grid system analogous to townships and sections was used (see Nusser and Goebel, 1997 for details).

Analysis of 1992 rangeland NRI

The last comprehensive nationwide survey on rangeland was in 1992 and included 14,368 rangeland NRI points which represented nearly 4 million acres (Alaska was not sampled). For this report, relevant 1992 rangeland NRI data (Spaeth et al., 1998) were organized into nine categories. Table 2 summarizes the findings. In 1992, no resource problems were identified on 16 percent of the Nation's nonfederal rangelands. These lands require continued prescribed grazing use and are not associated with problems such as brush encroachment, increase in weedy species and/or noxious weeds, erosion, declining rangeland trend, and a change in range condition status (less than 50 percent similarity with ecological site description).

Soil loss from a combination of wind and water erosion exceeded soil loss tolerance on 30.5 percent of the nonfederal acreage. This estimate was derived from qualitative ratings for gully, concentrated flow, streambank erosion, and wind erosion. On eroding lands, site productivity, use, and potential for restoring the original native plant community were seriously at risk or have already been reduced.

The second largest problem affecting private rangelands is invasion of brush and non-noxious weeds. On 22.5 percent of nonfederal rangelands, brush and weeds were above the normal limits given in respective NRCS ecological site descriptions. On these lands, site productivity has decreased and/or is shifting to an altered vegetative state.

In the 1982, 1987, and 1992 NRIs, summary reports traditionally classified number of acres in four range condition classes (poor, fair, good, excellent) (USDA-SCS, 1982; USDA-SCS, 1987; and USDA-SCS, 1994). The NRCS no longer uses these classifications (USDA-NRCS, 1997).

Pilot studies and interagency cooperation (1995-2002)

It was in 1995 that NRCS began working with other agencies—ARS, BLM, USGS, and USFS—to develop an interagency list of data elements that could be used for national level inventories. A trial study in 1996 tested new field protocols for the rangeland NRI process in Texas, New Mexico, Colorado, and Wyoming.

These protocols included clipping

quadrats for production estimates (all plant species), canopy cover determinations from line intercept, similarity calculations, apparent rangeland trend, invasive plant and noxious weed identification, and use of an early draft version of the rangeland health protocol (Pellant et al., 2000; Pyke et al., 2002).

The 1996 pilot analysis showed that decreasing trends in soil surface stability, apparent rangeland trend, similarity index, litter distribution, litter decay, and productivity were correlated with increases of specific plants. This pilot showed that rangeland health indicators were correlated with specific indicator plant species—often these relationships were associated with ecologically undesirable weedy plants or plants that act as increasers when site conditions deteriorate.

In 1997, the BLM and NRCS collaborated in a pilot inventory on Federal land. The BLM was interested in developing and conducting a national level inventory for lands they administer. During the summer of 1997, a Colorado field test was conducted on 7.6 million acres and was designed to help identify resource strengths and weaknesses. The goal of this project was to test the utility and applicability of the NRI process and several new inventory protocols.

Sample NRI in 1999 on nonfederal rangeland

Using the basic data elements and lessons from the 1997 Colorado pilot, a sample NRI was conducted on nonfederal rangeland in 1999. Data elements and methodologies developed to date were

TABLE 1. Specific NRI information collected on rangelands (1982–1992). The symbol (+) indicates that data was collected, (–) is no data.

	1982	1987	1992
Soil series identification	+	+	+
Soil taxonomy description	+	+	+
Ecological site correlation	–	+	+
Rangeland condition rating ¹	+	+	+
Apparent range trend	+	+	+
Grazing status	+	–	–
Applied conservation practices	–	+	+
Woody species canopy cover (%)	Estimated (0-100%)	Estimated (0-100%)	300 ft line intercept for woody species
Noxious weed species identification	–	–	Identify noxious species
Conservation treatment needs ²	+	+	+
Info about windbreaks, water bodies, perennial streams, and roads in PSU	+	+	+
USLE determination	+	+	+
Wind erosion (WEQ)	Wind erosion—where applicable	Wind erosion—where applicable	Wind erosion—where applicable
Subjective determination of water erosion	Water erosion: none-slight; moderate; severe.	Ephemeral gullies—yes, no	Gully, concentrated flow, and streambank erosion (none, stable, slight, significant)

¹ Range condition classification: poor, fair, good, or excellent. Based on percent similarity to plant composition (historic plant climax community) given in correlated ecological site description (See USDA-SCS 1976, NRCS 1997 National Pasture and Rangeland Handbook for details).

² Conservation treatment needs: erosion control, drainage, irrigation management, management for forage improvement, mechanical soil treatment for forage improvement, weed control or brush management for forage improvement, plant reestablishment for forage improvement, forage reestablishment with brush management, and toxic salt reduction.

tested on a limited number of primary sample units in Florida, Louisiana, Nebraska, New Mexico, Colorado, Arizona, and Nevada. The information gained from the 1999 test was used to refine data collection, timelines, and cost analyses for each field protocol. Since 1999, the NRCS, ARS, BLM, USGS, and USFS have continued their collaboration on refining field methods and procedures. These protocols were tested during recent field tests (October 2001) at the Jornada Experimental Range near Las Cruces, New Mexico with a computer assisted survey instrument.

The computer assisted survey instrument automated data entry for the entire field sampling process (Figure 1 shows the basic plot layout around the primary sample unit point and lists tested field protocol elements). Databases including the U.S. Plants, U.S. noxious weeds, and State noxious weed listings were installed in the computer assisted survey instrument (USDA-NRCS, 2002). The user must assess these internal computer assisted survey instrument databases to download official plant names-scientific and common-and build custom databases that may contain frequently encountered plants.

In conclusion, field based inventories to assess plant composition, invasive and noxious weed trends, rangeland health, conservation practices applied and needed, identification of disturbances, measures of canopy and basal plant gaps for use in rangeland hydrologic and erosion models (Pierson et al. 2001), and soil stability field test (Herrick et al. 2001) have been tested by the interagency group. Traditional NRI components such as percent similarity, apparent rangeland trend, and conservation treatment needs have been retained. In addition to the usual NRI objectives (see sidebar), data from the proposed NRI field protocols could be used to further range science and provide more knowledge about interactions among environmental, soil, and plant variables, and management practices.

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CURRENT NRCS-NATIONAL RESOURCES INVENTORY OBJECTIVES:

- 1 Fulfill legislative directives;
- 2 conduct all phases of NRI in accordance with scientifically developed statistical principles, procedures, and practices;
- 3 obtain scientifically credible, timely and relevant information about the Nation's natural resources and environmental conditions at national, regional, and sub-regional levels;
- 4 collect and develop science-based, continuous natural resource information in support of NRCS strategic planning and accountability;
- 5 provide information to evaluate the effectiveness of conservation programs;
- 6 support development and implementation of agri-environmental policy and programs at national, regional, and local levels;
- 7 provide information to the public on status, condition, and trends of the Nation's soil, water, and related resources; and
- 8 contribute scientific information to facilitate the development of models, analysis tools, and reports (USDA-NRCS, 2001).

TABLE 2. Summary of 1992 National Resources Inventory on nonfederal rangelands in the United States. States represented are Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Wyoming, Arizona, California, Hawaii, Idaho, Nevada, New Mexico, Oregon, Utah, Washington, and Florida (from Spaeth et al., 1998).

Category description	Acres	Percent of total acres
1 Erosion control exceeds soil loss tolerance	113,770,100	30.5
2 Brush and non-noxious weeds present-control needed	83,874,300	22.5
3 No rangeland resource problems ¹ ; continue prescribed grazing use	59,164,600	15.8
4 0-25% of historic climax vegetation (range condition poor) ²	57,572,800	15.4
5 25-50% of historic climax vegetation; range trend down (range condition fair) ²	38,926,200	10.4
6 Multiple major problems (one or more of categories 2, 3, 4, and 5)	31,083,800	8.3
7 Noxious weeds identified around PSU point	11,744,600	3.1
8 Forage re-establishment needed (no brush control needed)	6,148,600	1.7
9 25-50% of historic climax vegetation; inadequate site data to determine trend ²	1,119,600	0.3

¹ Includes the following: excellent range condition, good range condition with trend static or up, fair range condition with trend up, and none of the problems in categories 1,2, 7, 8.

² Acres not associated with categories 1,2, 7, 8.

Note: good range condition with down trend was usually associated with categories 1,2, 7.

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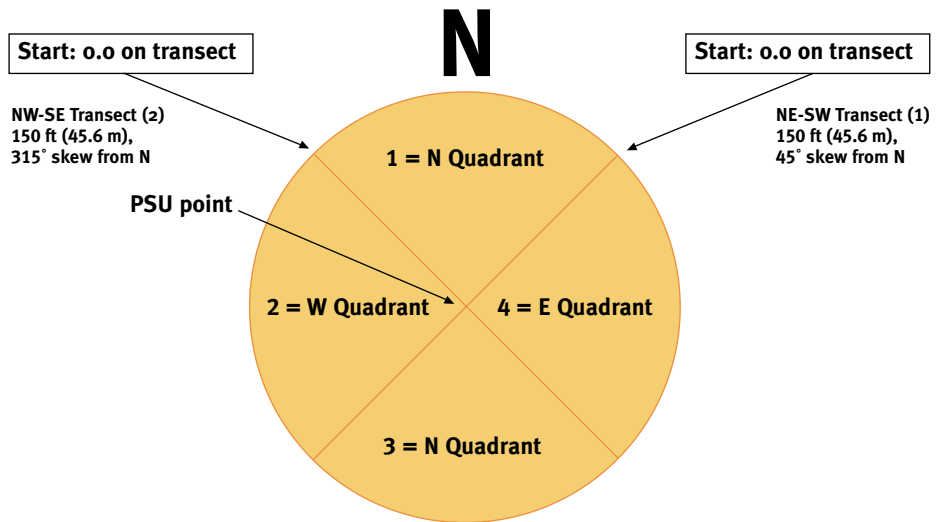
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FIGURE 1. List of proposed future NRI field protocols and diagram of the basic plot (0.5 ac; 0.2 ha macroplot) layout around the primary sample unit point.



LIST OF PROPOSED NATIONAL RESOURCES INVENTORY FIELD PROTOCOLS:

- Rangeland health (determined in 0.5 ac; 0.2 ha macroplot)
- Productivity by plant species (on transects 1 and 2)(calculate percent similarity)
- Apparent rangeland trend (in 0.5 ac; 0.2 ha macroplot)
- Identify Federal and State noxious and other local weeds of interest (in quadrants 1-4)
- Plant canopy and ground cover by plant life form (on transects 1 and 2)
- Cover pole measurements (on transects 1 and 2)
- Plant height measurements (on transects 1 and 2)
- Canopy and basal gap measurements (on transects 1 and 2)
- Identify disturbances (in 0.5 ac; 0.2 ha macroplot)
- Identify existing conservation practices
- Identify conservation treatment needs
- Soil aggregate stability test (on transects 1 and 2)