

**National Strategic Plan
Soil Management Program
USDA Forest Service**

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Executive Summary

This plan describes goals, objectives, and strategies for the USDA Forest Service (FS) Soil Program. The strategy is intended to define goals and objectives that will guide the program. It also assesses the soil program and displays ways to adjust its direction to respond to changing needs. In short, this plan defines the purpose of the soil program, articulates its mission, vision, and goals, and describes desired outcomes to achieve those objectives.

The FS is responsible for management of approximately 192 million acres of national forests and grasslands. It has always considered sustainable production of natural resources and maintenance of soil productivity a high priority as it has planned and carried out management initiatives and activities. Major legislation such as the Organic Administration Act of 1897, Multiple-Use and Sustained-Yield Act of 1960, National Environmental Policy Act of 1969, Forest and Rangelands Renewable Resources Planning Act, 1994, and National Forest Management Act of 1976 mandate that we provide high quality water, protection of soil productivity, continuous supplies of timber and forage, improve growth of forest and grassland vegetation and protection of fisheries and wildlife habitats.

Beyond laws and regulatory mandates, soil and water are the basis from which all life on earth derives its sustenance. The Forest Service mission is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. The Forest Service Strategic Plan identifies improving and protecting watershed conditions to provide soil productivity necessary to support ecological functions as an agency objective. Ecological diversity and watershed function are dependent on well-managed productive soils.

Seven program objectives are identified along with tasks and actions to support their completion:

- ❖ Soil Quality Maintenance
- ❖ Ecosystem/Watershed Restoration
- ❖ Inventory Program Evaluation and Update
- ❖ Soil Quality Monitoring/Administrative Studies/Research
- ❖ Soil Information Management
- ❖ Partnership Development
- ❖ Organizational Capacity Maintenance and Enhancement

Appendix A displays a summary of objectives, tasks, actions, and timeframes to accomplish this strategy. A detailed Action Plan is in development to address specific soil program needs identified in this strategy.

Introduction

Forest Service soil scientists ensure that the capacity of soil resources on National Forest System lands are properly cared for in all resource management plans and activities including its character, capability, and function. Proper soil stewardship involves a host of parameters and outcomes. Two of those outcomes are ecosystem sustainability and hydrologic function. Ecosystem approaches and adaptive management provide the framework upon which the FS plans and implements activities. Without adequate consideration of soil resources, ecosystem management and sustainable rangeland and forestry are not achievable. Watershed analysis plans and improvements are successful when soil characteristics are integrated in all aspects of watershed management.

The national FS soil program began in 1955 with the appointment of its first National Soil Program Leader, John Retzer, with the initial emphasis on conducting soil resource inventories intended to identify soils with similar properties and physical characteristics. While still maintaining inventory responsibilities, the focus of the soil program has shifted toward providing support to other program areas, forest and project-level planning, and environmental analysis with the purpose of protecting and utilizing soils in a sustainable way.

In the early 1990's, an important milestone for the program was development of soil quality policy and standards to protect soil productivity. Regional threshold values were established for defining the extent of soil disturbance that can be tolerated and still maintain the functional productivity of the resource. These standards were based on the best available science at the time. Work is needed to validate and/or refine these thresholds.

Management issues challenging the Forest Service and the Soil Program:

- Completion of Forest Plan revisions.
- Responding to additional agency initiatives with limited organizational capacity.
- Integration with other resource programs.
- Lack of a corporate cumulative effects model for watershed analysis.
- Applying best available science in land management decisions.
- Heightened public awareness of the importance of protecting soil resources.

The Soil Program has made progress in meeting some of the Agency's land management issues:

- ✓ Establishment and implementation of ecology-base soil resource inventory: Terrestrial Ecological Unit Inventory.
- ✓ Establishment and implementation of a corporate soils' database: NRIS Terra
- ✓ Conducting National and Regional workshops to share advancements in science and technology.

Other on-going soil projects nearing completion to further satisfy management issues include:

- Qualitative soil monitoring protocols to validate ocular observations for assessing soil disturbance.
- Quantification of soil disturbance effects on vegetative growth and hydrological response of watersheds: Long Term Soil Productivity project
- Update of soil quality policies and standards

Soil Program Mission, Vision, and Goal

Mission: **Caring for the Land and Serving People.**

FS soil scientists play a vital role in implementing this mission. In the mission statement, the term “Land” can be defined in several ways. One definition could refer to ecosystems for which the FS is responsible. Soils are an integral part of ecosystems, their function and above- and belowground interaction of organisms. These functions all determine sustainability. “Land” could also refer to an area of the earth’s surface, such as a National Forest or Grassland and its ability to increase, reduce or eliminate desired products. It is important to remember that soils occurring on any given area of land are very difficult if not impossible to be replaced once they are damaged, destroyed or lost.

Vision: **“The USDA Forest Service is a national and international leader in sustainable forest and rangeland management. Sound soil conservation principles and measures are important components of all management activities.**

Managing soils for sustained forest and rangeland productivity and protection of water quality is a major goal of National Forest Management. When the Creative Act of 1891 authorized the President to establish the forest reserves, later called National Forests, no management direction was given. It was not until the Organic Administration Act of 1897 did Congress issue management direction that included improvement and protection of the forest, the protection of favorable water flows, and provisions for a continuous supply of timber. Beginning with the Multiple-Use Sustained-Yield Act of 1960, culminating with the Act of Dec. 12, 1980 Statement of Policy by the Congress, it is clear that Congress expects the National Forests and Rangelands to utilize resources, and produce abundantly.

Goal: **“Conserve soil resources and not allow significant or permanent impairment of the productivity of the land.”**

Protection of long-term soil productivity is specifically identified in the National Forest Management Act of 1976. Regulations further state that “...implementation shall be evaluated on a sample basis to determine how well objectives have been met and how closely management standards and guidelines have been applied...”

Tasks and Actions for a Responsive Soil Program

A. Maintain Soil Quality

A clearly defined soil conservation and protection program is required if the FS is to effectively maintain soil productivity, ensure sustainable ecosystems, and improve or protect watershed conditions. FS soil scientists must provide leadership in formulating this program and integrating research and development needed to support it. Specific actions include:

- Develop qualitative and quantitative soil disturbance monitoring protocols, to support ocular observations and establish operability risk ratings.
- Participate with other agencies and groups to cooperatively develop common research and development programs that support maintenance of soil productivity and ecosystem sustainability.
- Modify or refine soil quality standards based on information gained from pertinent monitoring efforts.
- Ensure that soil management objectives for specific projects reflect local soil conditions and capabilities.
- Systematically explore and document relationships between terrestrial and aquatic ecological unit inventories at a variety of scales for a better understanding of the importance of soils in the hydrologic function of watersheds.
- Complete the revision of the FS Soil Management Manual and Handbook to reflect advancements in soil science and updates to other FS manuals and handbooks.

B. Maintain/Restore Ecosystems and Watersheds

If healthy ecosystems and fully functional watersheds are to be maintained or need to be restored, soil quality must be protected or improved. Assessments of soil quality (either natural or disturbed) are important when planning management activities. As the FS proceeds with plans to reduce fuel loads, treat areas with insect or disease infestations, or reintroduce fire into fire suppressed or excluded ecosystems, it must be sensitive to current soil conditions and provide mitigation in those areas with prior detrimental disturbances to insure there is not an increased loss of soil quality.

Development of restoration prescriptions should follow the same processes that are followed for other resource activities such as vegetation management, wildlife and fish habitat improvement, and stream restoration. Soil restoration or mitigation measures should be considered as integral components of all project plans. Mitigation methodologies must be prescribed and implemented by trained professionals. Specific actions include:

- Establish minimum standards for soil restoration prescriptions. Training programs for soil scientists and other resource specialists should be developed to provide standards for proper implementation of soil restoration prescriptions.
- Provide direction and training for inclusion of site-specific best management practices (BMPs) and associated mitigation measures in environmental documents.
- Complete projects to maintain or restore soil conditions.
- Annually review WIT/WINS databases to update watershed conditions and improvement needs.

C. Evaluate, Update and Conduct Soil Inventory

The FS has a long successful history of gathering and providing information about soils and plants on National Forests and Grasslands. This valuable information has been collected and used for a variety of purposes. It has been collected using nationally and regionally standardized protocols with defined quality control/quality assurance procedures including those established by the National Cooperative Soil Survey (NCSS).

Existing soil resource and terrestrial ecological unit inventories (SRI/TEUI) need to be evaluated to ensure they are adequate and meet current business needs and corporate standards. Where updates are needed, projects need to be developed along with staffing and scheduling.

Providing soil information to our internal and external customers and demonstrating how they relate to other resource values is a high program priority. The FS must demonstrate knowledge of the soils it manages and how they will respond to specific activities. Specific actions include:

- Actively participate in preparation and updating of the FS Inventory and Monitoring Program Plan. Identify priorities and costs of providing updated SRI/TEUI information.
- Facilitate the appropriate multi-scale application of SRI/TEUI information available during Forest Plan revision and project planning processes.
- Provide training in proper use and interpretation of SRI/TEUI information.
- Maximize the appropriate use of existing soil inventory products and legacy data. These data can be updated or refreshed if necessary to satisfy specific business needs and it is shown to be cost effective to do so.
- For SRI/TEUI at all scales, soil scientists at all organizational levels provide both spatial and associated attribute/interpretive data in electronic formats.

- Insure soil scientists use appropriate SRI/TEUI protocols.
- Insure that soil scientists maintain oversight responsibility for SRI/TEUI.
- Work closely with Ecosystem Management Coordination Staff along with other staff groups to ensure that soil program business needs are adequately considered during program development.
- Work to achieve an acceptable balance between field inventories and database development/implementation.
- Continue collaboration with the NCSS program.
- Complete the development of the EcoMap project and use the information to enhance the understanding of ecological processes.

D. Conduct Monitoring/Administrative Studies /Research

All FS regions have developed soil quality standards and many National Forests have adopted similar soil quality standards in their land and resource management plans. Soil scientists have used these standards as thresholds to monitor effects of management activities on soils. To validate our present standards or any other standards, the Soil Program needs to develop methodologies that are statistically sound and effective.

The FS soil management program must work closely with FS Research to clearly articulate its needs with important emerging issues such as soil biology, carbon sequestration, soil acidification, hydrologic function, and developing and validating soil quality standards. It must also consider alternative approaches to gathering needed research information such as working with academia, developing partnership opportunities, and conducting its own monitoring and research programs.

National Soil Program Leader should encourage development of applied research programs dealing with effects of land management activities in relation to soil productivity and hydrologic function. Specific actions include:

- Actively collaborate with NFS line-officers, FS Research Stations, State and Private Forestry Cooperative Forestry staff and others to define soil science research needs and priorities.
- Continue active involvement in the Long Term Soil Productivity (LTSP) project.
- Promote expansion of the LTSP network in areas where data gaps exist where funding allows.
- Distribute information generated by the LTSP program to user groups.

- Support and provide funding for projects to develop chemical, physical, and biological indices of soil quality (currently managed by PSW Research Station and R5).
- Collaborate with representatives of land management agencies, private forest land owners, FS Research Stations, State and Private Forestry Cooperative Forestry staff and universities to develop standard soil disturbance definitions, monitoring protocols, reporting and information procedures.
- Develop effective soil monitoring programs that are in support of land and resource management plans.
- Develop monitoring programs that support the project planning process and resolve identified data gaps.

E. Manage Soil Information

Forest Service soil scientists have invested a great deal of time and money collecting data (inventories, pedon, monitoring, project analysis, watershed improvements, etc.). Much of it, although valuable, has not been used effectively because it has not been easily accessible. Data management must be considered as part of the basic responsibility for every soil scientist. Therefore, a high priority needs to be placed on capturing as much legacy data as possible into NRIS and GIS. With better record keeping we will have the documentation to support the information when sharing/informing our publics, partners, and internal users regarding the excellent resources and expertise provided by the program. Specific actions include:

- Develop a strategy for moving from legacy to corporate point soil data management systems.
- Evaluate the time requirements for accomplishing necessary data management work and provide this information to Forest soil scientists so that yearly activities and budgets can be planned accordingly.
- Work with other agency representatives, FS research stations, academia, and private industrial forestland owners to take advantage of other information sharing systems and opportunities.
- Resolve data sharing issues related to the National Soil Information System (NASIS) and NRIS Terra.

F. Develop Partnerships

The FS Soil Program has traditionally relied upon its own staff for providing technical assistance and conducting monitoring projects. The soil program staff needs to be proactive and adaptive in completing needed work by fostering partnerships with outside interest groups. Groups such as The Nature Conservancy, Soil and Water Conservation Society, Soil Science Society of America, soil and water conservation districts, local watershed councils, and/or other resource oriented groups may be able to provide much needed assistance in achieving common goals. Specific actions include:

- Develop a partnership plan for soil resource management on the National Forests and Grasslands.
- Provide information to associated user-groups about program components and seek opportunities for cooperation.
- Support the Smithsonian Soil Exhibit.

G. Maintain and Enhance Organizational Capacity

FS soil scientists have job responsibilities that are unique and differ somewhat from the traditional roles commonly associated with soil surveyors and classifiers or agricultural soil scientists. Conducting proper soil resource effects analysis, developing landscape or Forest-level plans, planning watershed restoration projects, and assessing soil quality are important tasks in which FS soil scientists are involved.

The FS must continue to employ entry-level soil scientists if it is to maintain an adequate skill pool into the future. It also must develop career ladders for scientists within their specialty so that it can recruit and retain highly qualified and motivated staff. Specific actions include:

- Evaluate/analyze the soil program business area and determine staffing needs.
- Collaborate with other agencies (NRCS/BLM) and/or private sector soil scientists to provide SRI/TEUI information.
- Cooperate with other agencies in developing an active recruitment and retention program for soil scientists.
- Take an active role in SCEP and other recruitment efforts.
- Develop and implement training programs for entry-level soil scientists.
- Develop and implement a continuing education program designed to maintain/enhance professional soil science skills

- Explore options and requirements for certification of soil scientists.
- Elevate findings and recommendations as a priority issue with line and staff officers and work cooperatively to develop a course of action for meeting future staffing needs.

Appendix A. Action Plan: Summary – Objectives, Actions, and Responsible Group

**See Excel Spreadsheet Appendix A. –
Objective A. Maintain Soil Quality Spreadsheet**

**See Excel Spreadsheet Appendix A. -
Objective B. Maintain and Restore Ecosystems/Watershed Spreadsheet**

**See Excel Spreadsheet Appendix A. - Objective C. Evaluate, Update, and conduct SRI/TEUI
Spreadsheet**

**See Excel Spreadsheet Appendix A. - Objective C. Evaluate, Update, and conduct SRI/TEUI –
Continued Spreadsheet**

**See Excel Spreadsheet Appendix A. - Objective D. Conduct Monitoring/Administrative
Studies/Research Spreadsheet**

See Excel Spreadsheet Appendix A. - Objective E. Manage Soil Information Spreadsheet

See Excel Spreadsheet Appendix A. - Objective F. Develop Partnerships Spreadsheet

**See Excel Spreadsheet Appendix A. - Objective G. Maintain and Enhance Organizational
Capacity Spreadsheet**

Appendix B. Overview of Soil Science in the Forest Service

Appendix B. Overview of Soil Science in the Forest Service

As mentioned before, the national FS soil program officially began in 1955 with the appointment of its first national leader. That same year, the California Region appointed its first Regional Soil Scientist. Additional soil scientists were selected shortly thereafter to serve as program leaders in each region. Initially, the program focused on soil surveys. Many of the first FS soil scientists were recruited because of their demonstrated soil classification and mapping abilities. These individuals working on national forest lands discovered that traditional soil survey methods employed on agricultural lands did not always work well for soils encountered in steep mountainous terrain.

They also found that Forest managers were dealing with completely different sets of concerns such as road building, slope stability, reforestation potential, grazing impacts, and logging system designs. Managers were also dealing with different time frames than the Natural Resources Conservation Service (NRCS). As a result, FS soil scientists often had to be innovative in meeting needs of resource managers although it meant deviating from some of the established NRCS standards and protocols. As a result, the level of consistency between the FS and NRCS fluctuated over the years. The FS is a major cooperator in the National Cooperative Soil Survey (NCSS). Cooperation between the two agencies in matters pertaining to soil survey has always been important in sharing soil inventory information and in quality control of progressive soil surveys. Early in the development of the National Hierarchical Framework of Ecological Units, NRCS and FS as well as other land management agencies agreed on basic principles of “nesting” ecological processes.

The National Hierarchical Framework of Ecological Units provides a multi-scale context in which to assess ecosystem capability and health. Terrestrial Ecological Unit Inventory (TEUI) is the culmination of many years of experience involving FS soil scientists, botanists, ecologists, geologists, range conservationists, and land management decision makers. Many FS Regions and National Forests have been in need of better inventory data and protocols to understand ecological processes. The intent of TEUI is to provide a better understanding of the soil-plant environment and ecological processes. TEUI meets correlation standards of the NCSS but includes more vegetation information along with potential natural community interpretations. The NRIS Terra database grew out of the need for soil scientists to have a means to store and retrieve progressive soil inventory data as well as project soil data. NRIS Terra mimics NRCS database components while expanding plant data storage capabilities. NRIS Terra also includes analysis tools that are not associated with the NRCS database.

The passage of the National Environmental Policy Act in 1969 created increased demands for information regarding the location, productivity and vulnerability of forest soils. Applying soil inventory information in forest and rangeland planning efforts and conducting on-site investigations in support of specific projects became the primary activities in which soil scientists were involved. Eventually, each National Forest and many ranger districts had soil scientists on their staffs. However, without a strategic program or national protocols, soil scientists at the Regional and Forest levels developed their own individual programs which resulted in an incoherent/incompatible collection of information when viewed from a larger perspective.

An important milestone for the soil program was the development of policy and standards related to soil quality. Policy and standards were initially developed in the Northwest Region in 1977 to meet provisions of the National Forest Management Act and other legislation that focus on “maintenance and improvement of soil productivity.” All other regions have since developed similar policy statements and soil quality standards. These quality standards included threshold values using the best available science for defining and limiting amounts (extent) of detrimental soil conditions within management activity areas. The policy statements and soil quality standards have also served as a stimulus for development of scientifically defensible soil monitoring methodologies on impacts of forest management activities on soil resources.

Although earlier legislation spoke to the importance of soil productivity, the FS did not have to deal directly with other regulatory agencies on this important issue. As such, attention shifted away from soil and the number of agency soil scientists declined after peaking in the 1980’s. Reduced timber harvests and trust fund balances, along with increasing funding commitments in other resource areas, have been major factors in reducing the number of soil scientists.

However, a strong soil science presence is important if the FS is to maintain soil productivity and concurrently achieve other natural resource goals. Today soil productivity lies at the heart of many land management challenges including forest health, reintroduction of fire into fire-dependent ecosystems, watershed health and restoration, delineating and restoring riparian areas and wetlands, wildlife and fish habitat improvement, and location of administrative sites and other facilities. Soils play an important role in making assessments of watershed and rangeland health called for in the 1998 Clean Water Action Plan. In June, 1999 the Forest Service issued the “Policy and Framework for Developing and Implementing Total Maximum Daily Loads (TMDL) in Forest and Rangeland Environments” which need the input and assessments of qualified soil scientists. Understanding basic soil productivity of individual restoration sites is essential to designing effective habitats that will be sustainable over time and meet the requirements of associated dependent species.

Professional soil science expertise is required to conduct terrestrial ecological unit inventories, needed to predict soil responses to specific forest management activities, and to monitor long-term effects. If FS soil resource analyses are to withstand public scrutiny and court challenges, professionals with proper credentials and experience must be available to implement and interpret the soil protocols and assessments.

In 1995, the United States agreed to use the Montreal Process Criteria and Indicators to measure national progress in achieving the goals of sustainable forest management. The Montreal Process identified seven criteria and 67 indicators to characterize conservation and sustainable management of temperate and boreal forests. Criterion 4 encompassed the conservation and management of soil and water resources. Of its 8 indicators, five are related to soil and three related to water. There is also an effort to apply the Montreal Process Criteria and Indicators to rangelands. Soil/site stability and hydrologic function have

long been recognized as key attributes of rangeland health. Current efforts to assess the health of rangeland ecosystems in the United States must include FS soil scientists.

**Appendix C. Chronology of the USDA Forest Service W.O. Soils
Program Leadership**