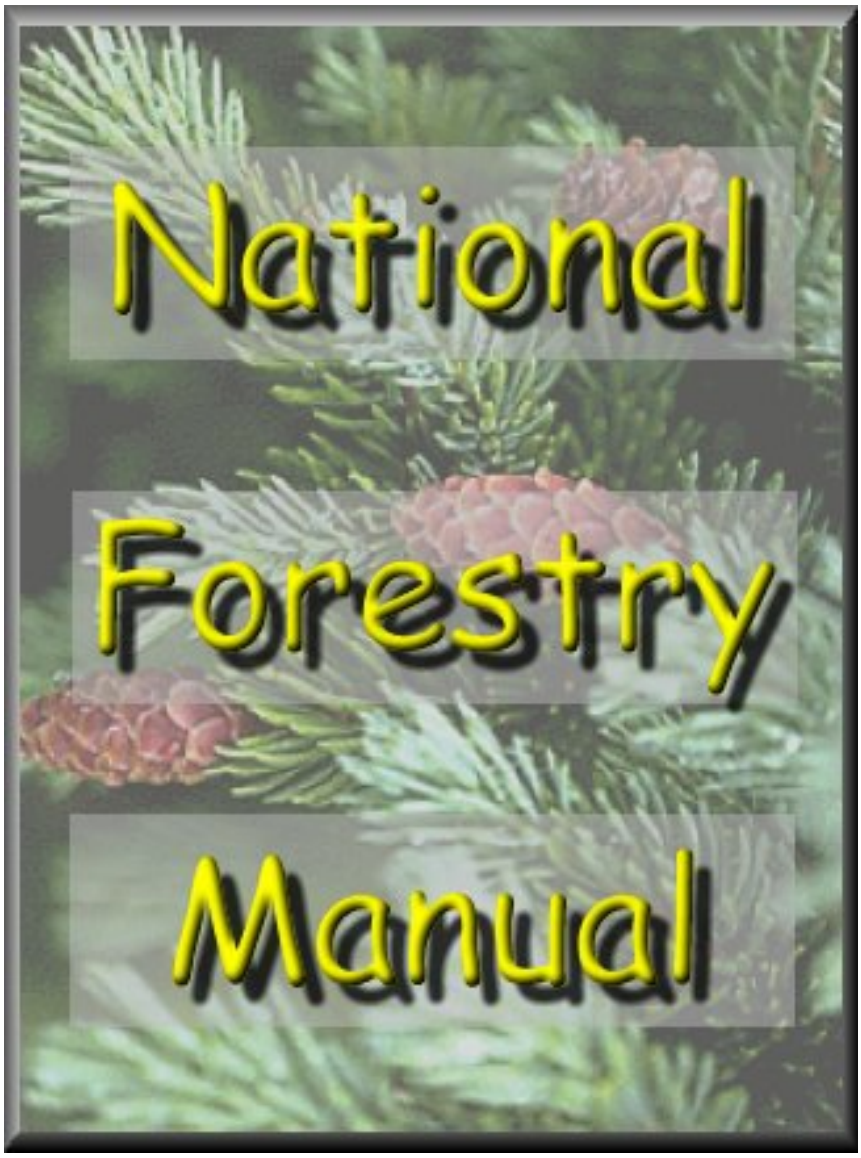
United States
Department of
Agriculture

Natural
Resources
Conservation
Service

NATIONAL FORESTRY MANUAL



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NATIONAL FORESTRY MANUAL

PREFACE

The National Forestry Manual, as a subdivision of the NRCS directives system, includes parts 535 through 538.

The format is intended to allow flexibility for additions and updates.

The National Forestry Manual (NFM) describes forestry policy within the Natural Resources Conservation Service (NRCS) and complements the General Manual.

All references to the Soil Conservation Service or SCS by Public Laws, Memoranda or other documents stated herein have been changed to the Natural Resources Conservation Service or NRCS, respectively.

All policies and responsibilities relating to forestry previously assigned to the Soil Conservation Service are carried forward in full to the Natural Resources Conservation Service unless otherwise noted or amended in this manual.

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Part 535.0 - General

535.00 Mission and Objectives

The mission of NRCS is to provide leadership and administer programs to help people conserve, improve, and sustain our natural resources and environment. Toward this end, NRCS is committed to conservation forestry by maintaining a high level of expertise in planning, using and conserving soil, water, animals, plants, air, and related human resources.

535.01 Purpose

The purpose of the National Forestry Manual (NFM) is to establish policy for forestry and agroforestry activities within the Natural Resources Conservation Service (NRCS).

535.02 Supplementing the Manual

Some supplemental manual material may be required at the state level to provide additional clarification and to comply with specific state and local laws and regulation. Supplements must be in accordance with the NRCS Directives System. Copies of all state level supplements will be provided to the Director of Ecological Sciences Division at National Headquarters.

535.03 Relationship to the National Forestry Handbook

The National Forestry Handbook (NFH) is a companion document to the NFM. The NFH contains methodology, procedures, and related reference materials that assist NRCS personnel to implement NFM policy in forestry and agroforestry technologies. The NFH consists of Parts 635, 636, 637 and 638 that directly complement NFM Parts 535, 536, 537 and 538, respectively. Materials prepared for the NFH will be numbered based on the predominant relationship to specific paragraphs in the NFM. NFH material may be prepared at any administrative level. The originating level is responsible for administrative and technical support of such materials published in the NFH.

535.04 Quality Assurance

Appraisals of forestry and agroforestry activities are performed in conjunction with normally scheduled conservation program appraisals. Appraisals are in accordance with GM-330, Part 405. The checklist contained in Exhibit 535-3 will be used for appraisals of forestry and agroforestry activities.

Quality assurance reviews are initiated by any administrative level. Quality assurance reviews are conducted in each state as prescribed in the General Manual. State staff forester or assigned specialists lead area forestry quality assurance reviews. In states where there is no administrative designation below the state level, state staff forester or assigned specialists conduct county forestry quality assurance reviews.

(190-V-NFM, 1998)

Part 535.1 - Authorities

535.10 General

The forestry program activities of the Natural Resources Conservation Service are provided through authorities charged to the Secretary of Agriculture and delegated to the Chief of the Natural Resources Conservation Service in 7 Code of Federal Register (CFR) 2.62(c).

535.11 Conservation Operations, Soil Surveys, and Plant Materials Centers

Public Law 74-46 (16 U.S.C. 590a-f) of 1935 authorizes the work of the Natural Resources Conservation Service to prevent the "wastage of soil and moisture resources on farm, grazing, and forestlands of the Nation." It also provides basic authority for plant materials centers and soil surveys. Additional authorities for forestry activities are in the 1985 Food Security Act (FSA), the 1990 Food and Agricultural Conservation Trade Act (FACTA) and the 1996 Federal Agriculture Improvement and Reform Act (FAIRA). Additional authority for soil surveys was added by Public Law 89-560 (42 U.S.C. 3271-3274), and additional authority for plant materials centers was added by Public Law 74-210 (7 U.S.C. 1010-1011).

NRCS personnel provide forestry assistance to landowners as set forth in the delegation of authorities to NRCS by the Secretary of Agriculture and in cooperation with state forestry and other agencies as outlined in the USDA Interagency Agreement on Forestry, February 1978. See Exhibit 535-1.

NRCS provides forestry assistance to the plant materials program. NRCS state staff foresters serve on the State Plant Materials Committee to advise on matters relating to forestry. See Part 604 of the National Plant Materials Handbook.

Within the Department, NRCS has technical leadership for forestry services in connection with windbreaks and shelterbelts to prevent wind and water erosion of lands. [7CFR 2.62(a)(3)(i)(c)].

535.12 Authorized Watershed Projects

Public Law 78-534 (33 U.S.C. 701b-1 et seq) of 1944 authorizes the construction of certain public works on rivers and harbors for flood control and other purposes.

The defined responsibilities for program management and accountability of the forestry activities in the flood prevention program are contained in the "Interagency Agreement between the Soil Conservation Service and the Forest Service," page 501-9, National Watersheds Manual, Second Edition, Dec. 1992.

535.13 Emergency Flood Control

Public Law 81-516 (33 U.S.C. 701b-1) of 1950 and Public Law 95-334 (7CFR 624) authorizes emergency flood control work under Section 216 except for responsibilities assigned to the Forest Service (USFS).

Forestry responsibilities for this program are contained on page 501-9, National Watersheds Manual, Second Edition, Dec. 1992.

535.14 Small Watershed Program and River Basin Surveys

Public Law 83-566 (16 U.S.C. 1001-1009) of 1954 authorizes the Small Watershed Program and the Cooperative River Basin Surveys and Investigations Programs.

Forestry responsibilities for the Small Watershed Program are contained in the “Memorandum of Understanding between the Soil Conservation Service and the Forest Service,” page 501-9, National Watershed Manual, Second Edition, Dec. 1992.

Forestry responsibilities for the Cooperative River Basin Survey Program are contained in the "Memorandum of Understanding - Soil Conservation Service and Forest Service," April 15, 1968. See part 502.72 National Basin and Area Planning Manual, Amendment 2, Aug. 1987.

535.15 Farm Bill Programs

Public Law 104-127 of 1996 authorizes or re-authorizes the Environmental Quality Incentives Program, Forestry Incentives Program, Wildlife Habitat Incentives Program, and Wetland Reserve Program to cost-share with producers for installing environmental and conservation improvements on their farms.

NRCS is responsible for administering the Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), and Wetland Reserve Program (WRP) and provides technical assistance to producers for eligible conservation practices including forestry and agroforestry.

NRCS and USFS share responsibility for the administration of the Forestry Incentives Program (FIP). The USFS (lead agency) and NRCS provide technical expertise to this program in cooperation with state forestry agencies.

535.16 Resource Conservation and Development Program (RC&D)

Public Laws 97-98 (16 U.S.C. 3451-3461) authorizes the Resource Conservation and Development Program (RC&D).

The responsibilities for forestry activities in RC&D are contained in the "Memorandum of Understanding between the Soil Conservation Service and the Forest Service, United States Department of Agriculture," January 9, 1989. See Exhibit 520.30 of the RC&D Handbook.

535.17 Resources Conservation Act (RCA)

Public Law 95-192 (16 U.S.C. 2001-2009) of 1977 authorizes the Secretary of Agriculture to appraise the status and condition of the Nation's soil, water, and related resources.

NRCS personnel coordinate the forestry phase of the Resource Conservation Act with the activities of the USFS Resource Planning Act. See Soil and Water Resources Conservation Act - National Manual.

535.18 Rural Abandoned Mine Program (RAMP)

Public Law 95-87 (30 U.S.C. 1236) of 1977 authorizes a program of technical and financial assistance for reclamation of abandoned mined land in rural areas.

NRCS provides forestry assistance on the reclamation of abandoned mined land in the same manner as assistance is provided under the Conservation Operations Program.

Part 535.2 - Cooperation With Other Agencies

535.20 General

USDA Interagency coordination of forestry related programs is contained in Secretary's Memorandum No. 1933 and the USDA Interagency Agreement on Forestry, issued February 1978. See Exhibit 535-1.

535.21 Forest Service (USFS)

(a) Department Level

The USFS manages National Forestlands and has departmental leadership for forestry research and cooperative forestry programs throughout the United States. NRCS shall maintain a working relationship with the Forest Service to coordinate forestry activities.

(b) National Level

NRCS foresters at national headquarters and the national centers and institutes maintain contact with their counterparts in State and Private Forestry and represent NRCS on technical forestry matters.

(c) State Level

The state conservationist will cooperate with the USFS on programs of mutual interest such as the Forest Stewardship Program, Forestry Incentives Program, National Cooperative Soil Survey Program, the Small Watersheds Program and River Basin Program. The state staff forester gives technical support to the state conservationist.

535.22 Cooperative, State, Research, Education, and Extension Service (CSREES)

(a) Department Level

Cooperative, State, Research, Education, and Extension Service has USDA leadership for education activities. Group audiences are the primary targets and clientele. Education programs are offered in forestry, home horticulture, soil, entomology, landscape architecture, tree selection and care, environmental protection, and other related subjects. Agricultural research and cooperative research related to agroforestry may also be carried out.

(b) National Level

NRCS foresters at national headquarters and the national centers and institutes maintain technical contact with their CSREES counterparts.

(c) State Level

The state conservationist will cooperate with CSREES on programs of mutual interest . The state staff forester gives technical support to the state conservationist.

(d) Local Level

NRCS district conservationists work closely with county CSREES personnel on tours, demonstrations, workshops, and other group functions.

535.23 Farm Services Agency (FSA)

(a) Department Level

FSA has USDA leadership for land retirement programs such as the Conservation Reserve Program (CRP). USFS and NRCS provide technical expertise to these programs.

(b) National Level

The principal technical contact between NRCS and FSA is through the activities of the USDA Forestry Planning Committee.

(c) State Level

The state staff forester gives technical support to the state conservationist in working relationships with FSA.

(d) Local Level

NRCS personnel assist FSA County Committees in technical matters.

535.24 Research Agencies

(a) National Level

NRCS foresters at national headquarters and the national centers and institutes maintain contact with research agencies and represent NRCS on technical forestry matters. Agencies include the USDA Cooperative, State, Research, Education, and Extension Service, USDA Forest and Range Experiment Stations, the Association of State College and University Forestry Research Organization, the National Association of State Universities and Land Grant Colleges, the USDA Agricultural Research Service, the USDA Economic Research Service, and other research organizations and groups.

(b) State Level

The state conservationist is responsible for maintaining relations with research institutions and ensuring the activities are closely coordinated. The state staff forester is to assist in this work.

535.25 State Forestry Agencies

(a) National Level

The National Association of State Foresters (NASF) represents the State forestry agencies at the national level. The national headquarters forester maintains contacts with NASF. NRCS foresters at national headquarters and the national centers and institutes attend NASF annual meetings, represent NRCS in dealing with NASF, and recommend appropriate actions to NRCS line officers. See Exhibit 535-2.

(b) State Level

The state conservationist is responsible for maintaining relations with the State forestry agency and ensuring the activities of both agencies are closely coordinated. The state staff forester assists in this work. At the request of the state conservationist, NRCS foresters at national headquarters and the national centers and institutes may be involved.

535.26 Conservation Districts

(a) National Level

The National Association of Conservation Districts (NACD) represents conservation districts at the national level. NRCS foresters at national headquarters and the national centers and institutes are responsible for cooperating with the NACD Forestry Committee on matters pertaining to NRCS forestry and agroforestry conservation relating to conservation districts nationwide.

The U.S. Department of Agriculture has entered into a memorandum of understanding with each conservation district in the United States.

(b) State Level

Conservation districts are usually affiliated with a state association or a federation that is recognized state-wide. Each state association will be encouraged to have a forestry committee. The state staff forester works with this committee to ensure participation in forestry and agroforestry activities.

(c) Local Level

NRCS district conservationists work with conservation districts to include forestry and agroforestry activities in the district conservation program and annual work plan. Conservation districts often administer state cost share programs to implement forestry and agroforestry practices. State staff foresters work with district conservationists in this effort.

535.27 State-Level Committees

Secretary's Memorandum No. 1933, states that USDA agencies with forestry responsibilities will cooperate in encouraging the formation of State Forestry Planning Committees. The state conservationist is the NRCS designated member of the State Forestry Planning Committee. The state conservationist is to encourage the formation and the periodic meeting of this committee to discuss the coordination of forestry activities throughout the state. The state staff forester apprises the state conservationist of forestry-related activities and technical needs.

The Food Security Act (FSA) of 1985 as amended by the Food, Agriculture, Conservation, and Trade Act (FACTA) of 1990 and the Federal Agriculture and Improvement Reform Act (FAIRA) of 1996 authorized formation of the state technical committee to coordinate all conservation programs. The state conservationist is the chair of this committee.

Title XII of the 1990 Food Agriculture Conservation and Trade Act (FACTA) authorized formation of the State Forest Stewardship Coordinating Committee to coordinate the Forest Stewardship Program. The state conservationist is the designated NRCS member of this committee. In some states, this committee may serve in place of the State Forestry Planning Committee.

535.28 State Conservation Agencies

NRCS foresters at any level will work with state conservation agencies to implement conservation forestry cost share programs.

535.29 Other Agencies, Officials, Committees, Councils, Advisory Boards and Groups

NRCS foresters at any level may be called on to consult with officials, councils and groups of various agencies. The purpose of such contacts is usually to evaluate specific items of on-going forestry legislation and programs or to give input on proposed initiatives. The form of consultation may be by phone, correspondence, or a work detail.

Foresters providing information shall apprise their supervisor and state conservationist on the nature of the consultation. NRCS foresters draft, as appropriate, information bulletins and issue papers to inform NRCS administrators and affected staffs.

(190-V-NFM, 1998)

Part 535.3 - Cooperation With Non-Government Organizations

535.30 General

This section describes NRCS cooperation with non-government forestry organizations.

535.31 Non-Government Organizations

(a) Forestry Schools, Colleges and Universities

NRCS foresters at national headquarters, national centers, institutes, NRCS regional and state offices, and other appropriate state staff personnel coordinate with forestry schools for purposes of employee recruitment, technology transfer, establishing research needs, and assisting with ongoing research.

(b) Forest Industries and Associations

Forest industry and their associations are of local, state, regional, and national scope. NRCS foresters and other appropriate NRCS people are to maintain working relationships with forestry industry organizations at all levels. NRCS foresters at national headquarters and the national centers and institutes maintain contacts with national and regional forest industry associations.

(c) State and National Forestry and Conservation Associations

National and state foresters participate with forestry-related associations and apprise them of NRCS activities. NRCS foresters at national headquarters and the national centers and institutes maintain relations with national forestry organizations, such as the National Association of State Foresters and the National Association of Conservation Districts forestry committee.

(d) Professional and Technical Societies and Organizations

NRCS foresters participate with professional and technical societies and organizations to ensure technology exchange and cooperative activities. Such groups include but are not limited to the Society of American Foresters, the Soil and Water Conservation Society, forest soil councils, conferences, associations, or committees.

(190-V-NFM, 1998)

Part 535.4 - Forestry Within NRCS

535.40 General

This section describes forestry positions in NRCS, steps in career development, training guidelines, and sources of technical materials and information.

535.41 Forestry Positions

(a) National Level

The NRCS will have foresters at national headquarters, national centers and institutes to represent NRCS nationally and provide national leadership on NRCS forestry-related activities.

(b) State Level

State Conservationists will have a state staff forester or a designated staff forestry specialist. This position has technical responsibility for conservation forestry matters for NRCS programs within the state.

(c) Area and Field Levels

Where needed, State Conservationists will have area and field foresters or designated forestry specialists. Area-wide and field foresters provide assistance on forestry-related operations within their administrative area.

535.42 Career Development

Foresters at all levels will pursue continuing education to maintain technical expertise. Foresters will encourage qualified employees to consider forestry positions within the NRCS.

535.43 Performance Benchmarks

The training guidelines for soil conservationists and foresters are contained in GM-360, Part 410. Additional guidelines are contained in Exhibit 535-4.

535.44 Technology Transfer

(a) Acquiring and Maintaining Technical Materials

Foresters acquire or maintain access to technical materials for the administrative area they serve.

(b) Disseminating Technical Information

Foresters will issue technical information at the area, state, or national level. This may include original information, research notes or papers, or excerpts of such material. Foresters are encouraged to submit articles for publication or presentation at professional meetings. Information will have an appropriate technical review and include crediting of information source(s).

(c) Training

Foresters will receive and provide training necessary to maintain technical competency at all administrative levels. Training includes but is not limited to National Employee Development Courses, workshops, conferences, and university courses.

535.45 Technical Guides

State staff foresters develop and review Field Office Technical Guide materials and ensure materials are technically correct, comprehensive, and useful to other agencies. NRCS policy on preparing and maintaining technical guides is contained in Title 450-GM, Part 401.

Exhibit 535-1 USDA Interagency Agreement on Forestry, Feb. 1978.

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

October 24, 1978
SECRETARY'S MEMORANDUM NO. 1933 - REVISED

USDA Interagency Coordination of Forestry Programs

Farm and other nonindustrial private ownerships include about three-fifths of the commercial forestlands in the United States. These lands produce a large share of the Nation's timber, provide habitat for wildlife, are important watersheds, provide forage for livestock, and provide recreational opportunities for many more people than the four million landowners. How these lands and resources are managed has important implications for meeting future economic, social, and environmental needs of the Nation's people. There is a clear mandate in legislative actions spanning 100 years for USDA assistance to private landowners in the conservation and management of these lands and resources. USDA agencies and their State and local agency cooperators have an unparalleled delivery system reaching into every county in the United States.

The purpose of this memorandum is to further USDA interagency coordination in forestry planning and to more effectively formulate budget proposals and define agency roles and the delivery programs to the various clientele. Many strengths are evident, and many opportunities exist for increased interagency coordination and cooperation. Strengthened educational programs, technical assistance, and incentives are needed. Coordinated program and budget planning is needed at the Federal and State level to assure a well balanced, mutually supported mix of agency programs and activities.

There is need for a widely based, effective coordinating mechanism for USDA and our cooperators at the national and State levels. In 1966 a benchmark "Tripartite Agreement" was negotiated to set forth the Forest Service, Extension Service, and Soil Conservation Service agency roles in forestry. This established the USDA Forestry Planning Committee at the national level and encouraged the establishment of State Forestry Planning Committees chaired by State Foresters. In 1978 the agreement was updated.

Coordination at the National Level

The membership of the USDA Forestry Planning Committee will include representatives of the following agencies:

Forest Service, Chairman
Soil Conservation Service
Science and Education Administration
Agricultural Stabilization and Conservation Service
Farmers Home Administration
Animal and Plant Health Inspection Service

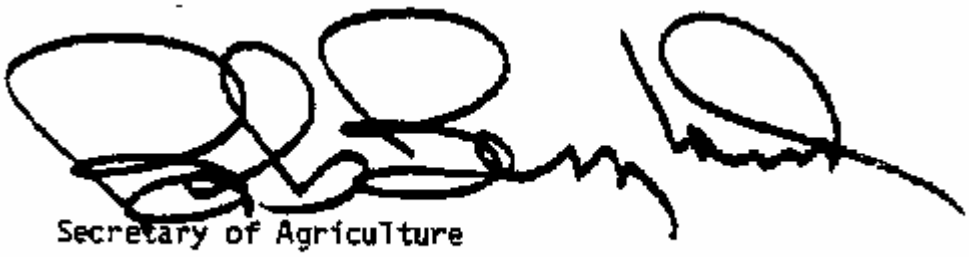
The Committee will report to the Assistant Secretary for Conservation, Research, and Education. He will consult with the Assistant Secretaries for International Affairs and Commodity Programs, for Marketing Services, and for Rural Development on all appropriate matters.

Coordination at the State Level

The purpose of the forestry committee or other mechanism in each State is to coordinate forestry planning, budget proposals, agency roles in education, technical assistance, technology transfer, incentives, etc. The committee should include as a minimum the State level cooperators, including university, research, State departments of agriculture and other State agencies directly involved in action plans, industry, and wildlife interests. Other State and local interests should be involved at the discretion of the interested parties as needed, on a formal or informal basis, to help guide a smaller "core" committee.

It is my intent and expectation that USDA Agencies concerned will provide leadership and action to support the efforts of State and local cooperators, forest landowner, and others to improve the protection, management, productivity, and use of America's nonindustrial privet forestlands.

This memorandum supersedes Secretary's Memorandum No. 1933 dated February 1, 1978.



TO: All Line & Staff Officers, FS, SCS, SEA
ASCS and FmHA

USDA Interagency Agreement on Forestry

This memorandum supersedes the ES, SCS, FS tripartite memorandum of October 6, 1966 that was revised on February 11, 1974. The Agricultural Stabilization and Conservation Service, Farmers Home Administration and the Science and Education Administration (SEA) have been added as signatories. The latter includes activities formerly handled by ES and CSRS. Formal concurrence is being sought from cooperating organizations.

Each of the signatory agencies have statutory and delegated authorities bearing on the subject. (Sections 2.57, 2.60, 2.62, 2.65, 2.70 Subtitle A, Title VII of the Code of Federal Regulations are attached for reference.) Other memoranda and agreements are relevant; such as the April 15, 1968 Memorandum of Understanding on river basin planning.

I. Purpose

This agreement is intended to further clarify responsibilities of the USDA agencies with respect to the protection, development, management, and utilization of the Nation's privately owned forest resources, urban 4 forestry; wood processing and utilization; technology transfer; incentives and related activities. It is also intended to foster a high level of cooperation and coordination among the agencies and their cooperators at National, State and local levels.

II. Objectives

The specific objectives of this agreement are:

1. To identify, prescribe and implement an optimum mix of education, technical services, and incentives in forestry programs and activities. This is to be based on the specific needs of the situation and the strengths, capabilities and competencies of the various agencies and organizations involved.

2. To develop mutually supported working relationships that provide a visible, effective and persuasive demonstration of interagency coordination and cooperation at the National, State and local levels.

3. To support and strengthen State and local agencies in their efforts to achieve viable and productive roles in forestry activities.

4. To emphasize the importance of multi-purpose management of forest and related resources -- specifically, recognizing the non commodity benefits as well as timber production goals.

5. To design and build an extension component into all relevant forestry activities and programs--at the formative stage of new efforts, and through modification of on-going or expanding programs as appropriate.

III. Technology Transfer

Technology transfer has two primary and essential components - "education" and "service". The following will guide agency personnel in technology transfer activities:

1. SEA has the lead role in the "education" component and has group audiences as the primary target and clientele. Whenever feasible, extension professionals should be offered a lead role in handling proposed group meetings of an educational nature.

2. Forest Service in cooperation with State Foresters and Soil Conservation Service in cooperation with Conservation Districts have the lead role in the "service" component and have one-on-one, on-site situations as their primary targets and clientele. Forest Service in cooperation with State Foresters are responsible for forestry plans, recommendations and technical assistance, etc. SCS in cooperation with Conservation Districts are responsible for soil mapping and soil-related forest management interpretation, technical assistance in-land-use decision-making and on-site resource planning assistance.

3. Educational efforts by FS, State Foresters, SCS, Conservation Districts and ASCS will be appropriate and needed in some one-on one, on-site situations for example, when a SCS resource planner or State CFM forester meets with a landowner on his property to determine the owner's objectives, explain opportunities, and review alternatives. ASCS will provide information to landowners who request cost-sharing assistance and will refer them to the appropriate technical agency for technical assistance.

4. Similarly, extension professionals will provide some one-on-one, on-site "service" activities needed to meet certain demonstration or similar opportunities.

5. In many group meetings of a forestry education nature, it is necessary, desirable and appropriate to involve qualified specialists from all agencies and sources--for example, as instructors, discussion leaders, or resource people.

6. Extension and forestry school professionals should strengthen continuing forestry education efforts directed toward graduate foresters and other professionals. They should also help instruct county agents, district conservationists, ASCS and FmHA field personnel and others concerning forestry programs, sources of assistance, etc.

7. USDA education, technical services and incentive programs should be targeted as much as possible toward the most productive and significant non-industrial private forestlands--on a cost effective basis. For example, wider use should be made of soil surveys and similar tools.

8. In many situations, a multiple-agency approach is needed to strengthen program performance. For example, in providing feedback to researchers all agencies have a share of the responsibility. Technology transfer should be strengthened through closer links between researchers and action programs.

9. Urban forestry presents a special technology transfer challenge for USDA agencies and their cooperators. Education, technical services and the necessary underlying research efforts should be provided in the context of existing urban forestry programs, laws and working arrangements that have been established in many States, cities and communities. Items 1-6 above apply to technology transfer in urban forestry. More specific agency roles are:

a. SEA offers educational programs in forestry, home horticulture, soils, entomology, pathology, landscape architecture, tree selection and care, environmental protection and other related subjects. Audiences include municipal officials and professionals, homeowners, the horticulture industry, landscape contractors and others involved in urban forestry work and tree problems.

b. FS in cooperation with State Foresters offer urban forestry technical assistance or services such as planning; landscape architecture; insect and disease management; planting, maintenance and care of trees and shrubs; environmental enhancement of open space and forested areas; environmental education and utilization of urban wood waste.

c. SCS in cooperation with Conservation Districts provide technical assistance on erosion control planning, water management, use of plant materials for environmental protection and enhancement, soil maps and interpretations, and environmental education assistance.

Rapidly growing interest in urban forestry, together with many existing urban forestry programs and interagency arrangements of long standing require USDA agency coordination that is tailored to fit a variety of situations.

IV. Incentives

In addition to education and technical services, USDA provides financial assistance or economic incentives to achieve forestry objectives through ASCS, FmHA, and SCS programs. Cost-sharing forestry practices on non-industrial private forestlands is a major incentive of long standing. Loan programs and forest crop insurance have high potential but are not operational now at a meaningful level. The following will guide agency personnel in their activities relating to such incentives:

1. The education and information activities of USDA agencies will support the ACP, FIP and other ASCS programs of cost-sharing that are relevant to forestry.

2. The technical services programs of the FS/State Foresters will provide prompt and adequate technical support of the ACP and FIP programs in a manner fully coordinated with other related activities such as CFM assistance to forest landowners.

3. SCS personnel will encourage district cooperators to effectively use ACP forestry practices and FIP practices as appropriate.

4. All agency personnel will encourage the development and use of cost-effective loan, insurance or other financial incentive programs that may further encourage landowners to better manage their forest resources.

V. State Level Coordination

The great variation among States must be recognized. State laws and regulations, the evolution of various on-going programs and activities, existing working relationships and assignments, differing organizational patterns among State agencies, widely differing agency capabilities, natural resource situations and program needs--all combine to create uniquely different situations that require State level determination. Primary responsibility for inter-agency coordination of education, service, incentives and related activities resides at the State level. This should be accomplished through a State forestry committee.

Agency personnel should take actions to assure:

1. That a State forestry committee is formally established including appropriate State agencies, USDA agency representation and their cooperators, University, research, industry, wildlife, and other interests should be involved (see item 3). Some States may choose to have a once-a-year major policy meeting of all interested parties to help guide the smaller "core" committee during the year. Suggested activities of the committee include:

   a. Review the forestry situation; identify forestry needs; decide how best to use the resources and authorities of each agency to meet those needs; propose and implement necessary actions.

   b. Coordinate program and budget planning to assure a well-balanced, mutually supported mix of agency programs and activities.

   c. Monitor progress of agency programs toward established goals and targets; emphasize coordination of efforts; revise targets or develop new initiatives to meet emerging needs. Strengthen application of research results through coordinated development of technical materials, publications 1 and other approaches.

2. That the State forestry agency, in most instances, provides leadership in achieving inter-agency coordination and cooperation. However, State Forester chairmanship of the committee should not be mandatory. If the State Forester cannot or does not choose to provide that leadership an alternative arrangement should be made.

3. That there is effective involvement and coordination between forestry research and action program agencies at the State level. Forestry school, FS Research and the Administrative-Technical representative and/or forestry

representative of schools participating in the McIntire-Stennis Program should be represented on the State forestry committee. This would complement on-going regional and national research planning efforts.

4. That emphasis is given to coordination of forestry programs at the sub-State, county, or local levels as well as on a State wide basis.

VI. National Coordination

The USDA Forestry Planning Committee is the primary coordinating mechanism for education, service, incentives and related programs at the National level. Members represent each of the agencies including a Forest Service chairman. The Committee meets at least twice a year or at the request of any member. Functions of the committee include:

1. Monitoring the forestry situation nationally, and the progress of USDA programs and activities affecting forestry.

2. Identifying and coordinating the forestry roles of member agencies based on existing authorities and programs.

3. Proposing new authorities and funding needed to accomplish Departmental objectives. For example, the Committee develops analyses and coordinated budget recommendations for consideration by the respective agency administrators and the Department.

4. Encouraging States to achieve effective program planning and coordination and to introduce national and regional concerns into State decision-making.

5. Assuring that the responsibilities of each agency will be recognized and given positive support by the others to achieve a cohesive Departmental approach. For example:

a. Technical assistance to landowners and others from USDA agencies and the State forestry agency will be emphasized in the public information programs of all member agencies.

b. Information activities of the other agencies will be coordinated with the educational activities of SEA.

c. Conservation districts will be involved in forestry program development and implementation at the local level.

d. County and State ASC Committees will be encouraged to take action resulting in forestry cost-sharing activities that are attuned to local, State and national needs.

e. All available forestry-related surveys, plans and reports such as State forestry plans, the National Cooperative Soil Survey, River Basin Reports, Small Watershed plans, Forest Survey and inventories will be used as a basis for program planning and implementation on a multi-agency basis.

f. To the extent possible a common action plan will be developed with each cooperator to make effective multiple uses of his forests an related resources with appropriate inputs from private as well as USDA or other governmental sources.

This agreement shall remain in effect until canceled or modified by the parties in writing. It may be amended or supplemented to include agreement by other agencies or groups as appropriates.

Approved

Director, Science and Education, USDA — Date: Jan 26, 1978

Administrator, Soil Conservation Service, USDA — Date: Jan. 30 1978

Chief, Forest Service, USDA — Date: Jan. 20, 1978

Administrator, Agricultural Stabilization and Conservation Service, USDA — Date: JAN 30 1978

Administrator, Farmers Home Administration, USDA — Date: 1/30/78

Concurred:

Chairman, Extension Committee on Organization and Policy — Date: 2-27-78

President, National Association of Conservation Districts — Date: 2 March 1978

President, National Association of Farmer Elected Committeemen — Date: Feb. 10 1978

President, Association of State College and University Forestry Research Organizations — Date: Feb. 20 1978

President, National Association of State Foresters — Date: 2/1/78

2.57 Director of Science and Education.

(a) Delegations. Pursuant to 2.19(a), subject to reservations in 2.20(a), the following delegation of authority are made by the Assistant Secretary for Conservation, Research, and Education to the Director of Science and Education:

(1) Provide national leadership and coordination for agricultural research, extension, and teaching programs in the food and agricultural y sciences (includes human nutrition, home economics, consumer services, family life, rural and community development, agricultural energy, agricultural economics, environmental quality, natural and renewable resources, forestry, range management, animal and plant production and protection, aquaculture, and the processing, distribution, marketing, and utilization of food and agricultural products) conducted or financed by the Department of Agriculture and to the maximum extent practicable, by other Federal departments and agencies pursuant to the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 3121).

(2) Administer a cooperative agricultural extension program related to agriculture, uses of solar energy with respect to agriculture and home economics under the Smith-Lever Act as amended (7 U.S.C. 341-349).

(3) Cooperate with the States for the purpose of encouraging and assisting them in carrying out research related to the problems of agriculture in its broadest aspects under the Hatch Act as amended (7 U.S.C. 361a-361i).

(4) Support agricultural research at eligible institutions in any State through Federal-grant funds to help finance physical facilities (7 U.S.C. 390-390k).

(5) Conduct research concerning domestic animals and poultry, their protection and use, causes of contagious, infectious, and communicable diseases and means for the prevention and cure of the same (7 U.S.C. 391).

(6) Conduct research related to the dairy industry and dissemination of information for the promotion of the dairy industry (7 U.S.C. 402).

(7) Conduct research and demonstrations at Mandan, N. Dak., and Lewisburg, Tenn., concerning dairy livestock breeding, growing, and feeding, and other problems pertaining to the establishment of dairy and livestock industries (7 U.S.C. 421-422).

(8) Conduct research on new uses for cotton and on cotton ginning and processing (7 U.S.C. 423-424).

(9) Conduct research into the basic problems of agriculture in its broadest aspects, including, but not limited to, production, marketing (other than statistical and economic research but including consumer and food economic research), distribution, processing, utilization of plant and animal commodities, problems of human nutrition, development of markets for agricultural commodities, discovery, introduction, and breeding of new crops, plants, and animals both foreign and native; conservation development, and development of efficient use of farm buildings, homes, and farm machinery, including the application of electricity and other forms of power and research and development related to uses of solar energy with respect to farm buildings, farm homes, and farm machinery (7 U.S.C. 427, 2201, 2204).

(10) Conduct research on varietal improvement of wheat and feed grain to enhance their conservation and environmental qualities (7 U.S.C. 428b).

(11) Administer a program for the improvement of poultry, poultry products, and hatcheries (7 U.S.C. 429).

(12) Advance the livestock and agricultural interests of the United States including the breeding of horses suited to the needs of the United States (7 U.S.C. 437).

(13) Enter into agreements with and receive funds from any State or political subdivision, organization, or person for the purpose of conducting cooperative research projects (7 U.S.C. 450a).

(14) Administer a program of competitive, special, and facilities grants to State agricultural experiment stations, colleges and universities, other research institutions and organizations, Federal agencies, private organizations or corporations and individuals to promote research in food, agricultural and related areas (7 U.S.C. 450i).

(15) Conduct research related to soil and water conservation, engineering operations and methods of cultivation to provide for the control and prevention of soil erosion (7 U.S.C. 1010. 16 U.S.C. 590a).

(16) Maintain four regional research laboratories and conduct research at such laboratories to develop new scientific, chemical, and technical uses and new and extended markets and outlets for farm commodities and products and byproducts (7 U.S.C. 1292).

(17) Conduct a special cotton research program designed to reduce the cost of producing upland cotton in the United States (7 U.S.C. 1441-note).

(18) Conduct research, educational, and demonstration work related to the distribution and marketing of agricultural products under the Agricultural Marketing Act of 1946, as amended (7 U.S.C. 1621-1627).

(19) Administer and coordinate a foreign contracts and grants program of market development research in the physical and biological sciences under section 104(b)(1) of the Agricultural Trade, Development, and Assistance Act of 1954, but excluding agricultural economics research; and administer and coordinate a foreign contracts and grants program of agricultural and forestry research under section 104(b)(3) of such act (7 U.S.C. 1704(b), (1), (3)).

(20) Conduct research in tropical and subtropical agriculture for the improvement and development of tropical and subtropical food products for dissemination and cultivation in friendly countries as provided by the Food for Peace Act of 1966 (7 U.S.C. 1736(a)(4)).

(21) Conduct research to develop and determine methods of humane slaughter of livestock (7 U.S.C. 1904).

(22) Accept gifts and order disbursements from the Treasury for the benefit of the National Agricultural Library or for carrying out any of its functions (7 U.S.C. 2264-2265).

(23) Administer in cooperation with the States a cooperative rural development and small farm research and extension program under the Rural Development Act of 1972 as amended (7 U.S.C. 2661-2670).

(24) Administer a cooperative extension program under the Farmer-to-Consumer Direct Marketing Act of 1976 (7 U.S.C. 3004).

(25) Conduct a program of grants to States to establish or expand schools of veterinary medicine (7 U.S.C. 3151).

(26) Conduct a program of (i) competitive grants to colleges and universities and (ii) predoctoral and postdoctoral fellowships, to h further education in the food and agricultural sciences (7 U.S.C. 3152).

(27) Administer the National Agricultural Research Award for research or advanced studies in the food and agricultural sciences (7 U.S.C. 3153).

(28) Make grants to colleges and universities for research on the production and marketing of alcohols and industrial hydrocarbons from agricultural commodities and forest products and agricultural chemicals and other products from coal derivatives (7 U.S.C. 3154).

(29) Administer a national food and human nutrition research and extension program under the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 3171-3177).

(30) Administer an animal health and disease research program under the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 3191-3193, 3195-3201).

(31) Support continuing agricultural and forestry extension and research at 1890 land-grant colleges including Tuskegee Institute (7 U.S.C. 3221, 3222).

(32) Administer in relation to uses of solar energy (i) a competitive research grants program, (ii) a solar energy research information system, (iii) a cooperative program with the States on model farms and demonstration projects, and (iv) a program of research, extension, and demonstration at regional solar energy research and development centers (7 U.S.C. 3241, 3251, 3261-3263, 3271, 3281-3282).

(33) Cooperate and work with national and international institutions and other persons throughout the world in the performance of agricultural research and extension activities (7 U.S.C. 3291).

(34) Conduct educational and demonstration work in cooperative farm forestry program (16 U.S.C. 568).

(35) Cooperate with the States for the purpose of encouraging and assisting them in carrying out programs of forestry research (16 U.S.C. 582a-582a-7).

(36) Authorize the use of the 4-H Club name and emblem (18 U.S.C. 707).

(37) Maintain a National Arboretum for purpose of research and education concerning tree and plant life; accept and administer gifts or devises of real and personal property for the benefit of the National Arboretum; and order disbursements from the Treasury (20 U.S.C. 191195).

(38) Conduct research on foot-and-mouth disease and other animal diseases (21 U.S.C. 113a).

(39) Conduct research on control and eradication of cattle grubs (screw-worms) (21 U.S.C. 144e).

(40) Conduct research, demonstration, and promotion activities related to farm dwellings and other buildings for the purpose of reducing costs and adapting and developing fixtures and appurtenances for more efficient and economical farm use (42 U.S.C. 1476(b)).

(41) Make grants for the support of basic scientific research at nonprofit organizations whose primary purpose is the conduct of scientific research (42 U.S.C. 1891).

(42) Conduct research on losses of livestock in interstate commerce due to injury or disease (45 U.S.C. 71 note).

(43) Administer the Virgin Islands agricultural research program (48 U.S.C. 1409m-0).

(44) Conduct research related to the use of domestic agricultural commodities for the manufacture of any material determined to be strategic and critical or substitute therefor, under section 7(b) of the Strategic and Critical Materials Stock Piling Act (50 U.S.C. 98f).

(45) Administer a cooperative agricultural extension program l related to agriculture, uses of solar energy with respect to agriculture F and home economics in the District of Columbia (D.C. Code Section 31-1719).

(46) Provide leadership and direct assistance to the Cooperative Extension Service in planning, conducting, and evaluating extension programs under a memorandum of agreement with the Bureau of Indian Affairs dated May 1956.

(47) Exercise responsibilities of the Secretary under regulations dealing with Equal Employment Opportunity in the Cooperative Extension Service (pt. 18 of this subtitle).

(48) Represent the Department on the Federal Interagency Council on Education.

(49) Develop and maintain library and information systems and networks and facilitate cooperation and coordination for the agricultural libraries of colleges, universities, Department of Agriculture, and their closely allied information gathering and dissemination units in close conjunction with private industry and other research libraries (7 U.S.C. 2201, 2203, 3126).

(50) Assure the acquisition, preservation and accessibility of all information concerning food and agriculture by providing leadership to and coordination of the acquisition programs and related activities of the library and information system, and the agencies of USDA, other Federal departments and agencies, State agricultural experiment stations, colleges and universities, and other research institutions and organizations.

(51) Formulate, write and/or prescribe bibliographic and technically related standards for the library and information services of USDA.

(52) Determine by survey and other appropriate means the information needs of the Department's scientific, professional, technical and administrative staffs, its constituencies and the general public in the areas of food, agriculture, the environment, and solar energy.

(53) Represent the Department on all library and information science matters before Congressional Committees and appropriate commissions, and provide representation to the coordinating committees of the Federal , and State governments concerned with library and information science activities.

(54) Represent the Department in international organizational activities and on international technical committees concerned with library and information science activities.

(55) Prepare and disseminate computer bibliographic files, indexes and abstracts, bibliographies, reviews, and other analytical information tools.

(56) Copy and deliver on demand selected articles and other materials from its collections by photographic reproduction or other means within the permissions, constraints and limitations of Sections 106, 107, and 108 of the Copyright Act of October 19, 1976 (Title 17, U.S. Code).

(57) Arrange for the consolidated purchasing and dissemination of indexes, abstracts, journals and other widely used information publications and services.

(58) Provide assistance and support to professional organizations concerned with library and information science matters and issues.

(59) Pursuant to authority delegated by the Administrator of the General Services Administration to the Secretary of Agriculture in 34 FR 6406, 36 FR 1293, 36 FR 18440, and 38 FR 23838, appoint uniformed armed guards as special policemen, make all needful rules and regulations, and annex to such rules and regulations such reasonable penalties, (not to exceed those prescribed in 40 (U.S.C. 318c)), as will ensure their enforcement, for the protection of persons, property, buildings, and grounds of the Arboretum, Washington, D.C.; the U.S. Meat Animal Research Center, Clay Center, Nebr.; the Agricultural Research Center, Beltsville, Md.; and the Animal Disease Center, Plum Island, N.Y., over which the United States has exclusive or concurrent criminal jurisdiction, in accordance with the limitations and requirements of the Federal Property and Administrative Services Act of 1949 (63 Stat. 377) as amended, the Act of June 1, 1948 (62 Stat. 181), as amended, and policies, procedures and controls prescribed by the General Services Administration. Any rules or

regulations promulgated under this authority shall be approved by the Director of the Office of Operations and Finance and the General Counsel prior to issuance.

(60) Control within the Department of Agriculture of the acquisition, use and disposal of material and equipment which may be a source of ionizing radiation hazard.

(61) Administer teaching funds authorized under section 22 of the Bankhead Jones Act, as amended (7 U.S.C. 329).

(62) Administer science and education programs assigned under the Defense Production Act of 1950, as amended (50 U.S.C. App. 2061 et seq.), and the Federal Civil Defense Act of 1950, as amended (50 U.S.C. App. 2251 et seq.).

2.60 Chief, Forest Service.

(a) Delegations. Pursuant to 2.19(d), the following delegations of authority are made by the Assistant Secretary for Conservation, Research, and Education to the Chief of the Forest Service:

(1) Provide national leadership in forestry. (As used here and elsewhere in this section the term "forestry" encompasses the tangible physical resources such as forests, forest-related rangeland, grassland, brushland, woodland, alpine areas, minerals, water areas, wildlife habitat, and less tangible forest-related values such as outdoor recreation, wilderness, scenery, air and water quality, economic strength, and social well-being.)

(2) Protect, manage, and administer the national forest, national forest purchase units, national grasslands, and other lands and interests in lands administered by the Forest Service, which collectively are hereby designated as the National Forest System, including the acquisition and disposition of lands and interests in lands as may be required in these programs.

(3) Conduct research programs to provide fundamental knowledge and technology, for improved policy decisions and professional management of forest and range ecosystems; increased efficiency in timber production; forest soils and watersheds; range, wildlife, and fish habitat management; forest recreation; environmental forestry; forest fire; forest insects; forest diseases; forest products utilization; forest engineering; forest resource surveys; forest products marketing; and forest economics.

(4) Administer the programs of cooperation in the protection, planning, development, conservation, multiple-purpose management, and utilization of forest and related resources.

(5) Administer forest insect, disease, and other pest control and eradication programs.

(6) Administer programs under section 23 of the Federal Highway Act (23 U.S.C. lOl(a), 202(b), 204(a)-(e), 205(a)-(d), 317).

(7) Exercise the custodianship of lands and interests in lands under lease or contract of sale to States and local agencies pursuant to title III of the Bankhead-Jones Farm Tenant Act (7 U.S.C. 1010-1012).

(8) Administer, under such general program criteria and procedures as may be established by the Soil Conservation Service, the forestry aspects of subdivisions (i), (ii), and (iii) of this subparagraph on the National Forest System and rangelands within national forest boundaries and adjacent rangelands which are administered under formal agreement and other forestlands.

(i) Cooperative river basin surveys and investigations program (16 U.S.C. 1006).

(ii) Eleven authorized watershed improvement programs and emergency flood prevention measures program under the Flood Control Act (33 U.S.C. 701b-1).

(iii) Small watershed protection program under the Pilot Watershed Protection and Watershed Protection and Flood Prevention Acts (67 Stat. 214 and 16 U.S.C. 1001-1009).

(9) Provide assistance to the Agricultural Stabilization and Conservation Service in connection with the rural environmental assistance program, the naval stores conservation program, and the cropland conversion program, authorized by sections 7-17 of the Soil Conservation and Domestic Allotment Act, as amended (16 U.S.C. 590g-590q).

(10) Coordinate mapping work of the Department, including: (i) Clearing mapping projects to prevent duplication; (ii) keeping a record of mapping done by department agencies; (iii) preparing and submitting required departmental

reports; (iv) serving as liaison on mapping with the Office of Management and Budget, Department of the Interior, and other departments and establishments; (v) promoting interchange of technical information, including techniques which

may reduce costs or improve quality; and (vi) maintenance of the mapping records formerly maintained by the Office of Plant and Operations.

(11) Enter into research agreements (grants, contracts, agreements, and cooperative aid) under the provisions of 7 U.S.C. 450i; 42 U.S.C. 1891-1893; and 16 U.S.C. 581; 7 U.S.C. 427i(a); and 7 U.S.C. 1624, for the support of applied and/or basic scientific research in forestry activities.

(12) Provide assistance to the Farmers Home Administration in connection with grants and loans under authority of the Consolidated Farm and Rural Development Act, 7 U.S.C. 1923; and consultation with the Department of Housing and Urban Development under the authority of 40 U.S.C. 461(e).

(13) Exercise responsibility, under such general program criteria and procedures as may be established by the Soil Conservation Service in connection with the forestry aspects of the resource conservation and development program authorized by title III of the Bankhead-Jones Farm Tenant Act (7 U.S.C. 1011(e)).

(14) Administer the radio frequency licensing work of the Department, including: (i) Representing the Department on the Interdepartment Radio Advisory Committee and its Frequency Assignment Subcommittee, in the office of the Director of Telecommunications Management; (ii) establishing policies, standards, and procedures for allotting and assigning frequencies within the Department and for obtaining effective utilization of them; (iii) providing licensing action necessary to assign radio frequencies for use by the agencies of the Department and maintenance of the records necessary in connection therewith; and (iv) providing inspection of the Department's radio operations to insure compliance with national and international regulations and policies for radio frequency use.

(15) Administer the Youth Conservation Corps Act (42 U.S.C. Preceed 2711 Note) for the Department of Agriculture.

(16) Establish and operate the Job Corps Civilian Conservation Centers on national forestlands as authorized by title I, sections 106 and 107 of the Economic Opportunity Act of 1964 (42 U.S.C. 2716-2717), in accordance with the terms of an agreement dated May 11, 1967, between the Secretary of Agriculture and the Secretary of Labor; and administration ; of other cooperative manpower training and work experience programs where the Forest Service serves as host or prime sponsor with other Departments of Federal, State, or local governments.

(17) Administer the Volunteers in the National Forest Act of 1972 (16 U.S.C. 558a-558d, 558a note).

(18) Provide wildfire protection assistance.

(19) Administer the program for assistance to eligible Volunteer fire departments as authorized by the Consolidated Farm and Rural Development Act, as amended (7 U.S.C. 1926(a) (13)).

(20) Administer responsibilities and functions assigned under the Defense Production Act of 1950, as amended (50 U.S.C. App. 2061 et seq.), and the Federal Civil Defense Act of 1950, as amended (50 U.S.C. App. 2251 et seq.), relating to forests and forest products, rural fire defense, and forestry research.

(b) Reservations. The following authorities are reserved to the Assistant Secretary of Agriculture for Conservation, Research, and Education.

(1) The authority to issue regulations.

(2) The authority as a member of the National Forest Reservation Commission (16 U.S.C. 513).

(3) The making of recommendations to the President with respect to the transfer of lands pursuant to the provisions of subsection (c) of section 32 of title III of the Bankhead-Jones Farm Tenant Act (7 U.S.C. lOll(a)).

(4) Making recommendations to the President for the establishing of national forest or parts thereof under the provisions of section 9 of the act of June 7, 1924 (16 U.S.C. 471).

(5) Giving final approval and submitting to the Congress the results of preliminary examinations and survey reports under the Flood Control Act of 1936, as amended and supplemented (33 U.S.C. 701a et seq.)

(6) Approving requests for apportionment of reserves pursuant to section 3679, Revised Statutes, as amended (31 U.S.C. 665), for forest pest control.

(7) Making recommendations to the President for the establishing of or adding to National Wild ant Scenic Rivers System (16 U.S.C. 12711278); National Scenic Trails System (16 U.S.C. 1241-1249); and the National Wilderness Preservation System (16 U.S.C. 1131-1136).

(8) Signing of declarations of taking and requests for condemnation. [38 FR 14949, June 7, 1973, as amended at 39 FR 16470, May 9, 1974; 40 FR 33025, Aug. 6, 1975]

2.62 Administrator, Soil Conservation Service.

(a) Delegations. Pursuant to 2.19(f), subject to reservations in 2.20(f) the following delegations of authority are made by the Assistant Secretary for Conservation, Research, and Education to the Administrator, Soil Conservation Service:

(1) Provide national leadership in the conservation, development, and productive use of the Nation's soil, water, and related resources. Such leadership encompasses soil, water, plant, and wildlife conservation; small watershed protection and flood prevention; and resource conservation and development. Integrated in these programs are erosion control, sediment reduction, pollution abatement, land use planning, multiple use, improvement of water quality, and several surveying and monitoring activities related to environmental improvement. All are designed to assure (i) quality in the natural resource base for sustained use; (ii) quality in the environment to provide attractive, convenient, and satisfying places to live, work and play; and (iii) quality in the standard of living based on community improvement and adequate income.

(2) Participate in evaluating and coordinating land use policy.

(3) Administer the basic program of soil and water conservation under Public Law 46, 74th Congress, as amended and related laws (16 U.S.C. 590 a-f, i-l, q, q-l; 42 U.S.C. 3271-3274; 7 U.S.C. 2201), including:

(i) Technical assistance to land users in carrying out locally adapted soil and water conservation programs primarily through the conservation districts in the 50 States, Puerto Rico, and Virgin Islands, but also to communities, watershed groups, Federal and State agencies, and other cooperators including such assistance as:

(a) Comprehensive planning assistance in nonmetropolitan districts.

(b) Assistance in the field of income-producing recreation on rural non-Federal lands.

(c) Forestry assistance, as a part of total technical assistance to private land owners and land users when such services are an integral part of land management and such services are not available from a State agency; and forestry services in connection with windbreaks and shelter belts to prevent wind and water erosion of lands.

(d) Assistance in developing programs relating to natural beauty.

(e) Assistance to other Department agencies in connection with the administration of their program, as follows:

(1) Agricultural Stabilization and Conservation Service in the development and technical servicing of certain programs such as the rural environmental assistance program, water bank program, Appalachian regional development program and other such similar conservation programs.

(2) Farmers Home Administration in connection with their loan programs.

(ii) Soil surveys, including:

(a) Providing leadership for the Federal part of the National Cooperative Soil Survey which includes conducting and publishing of soil surveys.

(b) Conducting soil surveys for resource planning and development.

(c) Performing the cartographic services essential to carrying out the functions of the Soil Conservation Service, including furnishing photographs, mosaics, and maps.

(iii) Conducting and coordinating snow surveys and making water supply forecasts pursuant to Reorganization Plan No. 4 of 1940 (5 U.S.C. App.).

(iv) Operating plant materials centers for the assembly and testing of plant species in conservation programs, including the use, administration, and disposition of lands under the administration of the Soil Conservation Service for such purposes under title III of the Bankhead-Jones Farm Tenant Act (7 U.S.C. 1010-1011).

(v) Providing leadership in the inventorying and monitoring of soil, water, land, and related resources of the Nation.

(4) Administer the watershed protection and flood prevention programs, including:

(i) The 11 authorized watershed projects under Public Law 534, 78th Congress, 33 U.S.C. 701b-1, except for responsibilities assigned to the Forest Service.

(ii) The emergency flood control work under section 216 of Public Law 516, 81st Congress, 33 U.S.C. 701b-1, except for responsibilities assigned to the Forest Service

(iii) The cooperative river basin surveys and investigations programs under section 6 of Public Law 566, 83rd Congress, 16 U.S.C. 1006, except for responsibilities assigned to the Forest Service. Representation on the Water Resources Council and river basin commissions created by Public Law 89-80, 42 U.S.C. 1962, and on river basin interagency s committees.

(iv) The pilot watershed projects under Public Law 46, 74th Congress, 16 U.S.C. 590a-f, and Public Law 156, 83rd Congress, except for responsibilities assigned to the Forest Service.

(v) The watershed protection and flood prevention program under Public Law 566, 83rd Congress, as

amended 16 U.S.C. 1001-1009, except for responsibilities assigned to the Farmers Home Administration and the Forest Service.

(vi) The joint investigations and surveys with the Department of the Army under Public Law 87-639, 16 U.S.C. 1009.

(5) Administer the Great Plains Conservation program under Public Law 1021, 84th Congress, as amended 16 U.S.C. 590p(b).

(6) Administer the Resource Conservation and Development program under Public Laws 46, 74th Congress, and 703, 87th Congress, as amended 16 U.S.C. 590a and 7 U.S.C. 1010-1011, except for responsibilities assigned to the Farmers Home Administration.

(7) Responsibility for entering into long-term contracts for carrying out conservation and environmental measures in watershed areas.

(8) Administer responsibilities and functions assigned under the Defense Production Act of 1950, as amended (50 U.S.C. App. 2061 et seq.), and the Federal Civil Defense Act of 1950, as amended (50 U.S.C. App. 2251 et seq.), relating to agricultural lands and water.

(b) Reservations. The following authorities are reserved to the Assistant Secretary for Conservation, Research, and Education:

(1) Executing cooperative agreements and memoranda of understanding containing representations in the name of the Secretary or the Department of Agriculture as a whole, including the cooperation of the Department with

conservation districts and other districts organized for soil and water conservation within the States, territories, and possessions.

(2) Giving final approval and transmitting to the Congress watershed work plans that require congressional approval; and approving and i transmitting to the Congress comprehensive river basin reports.

(3) Approving additions to authorized Resource Conservation and Development Projects.

(4) Land use policy evaluation and coordination. II [38 FR 14949, June 7, 1973, as amended at 40 FR 33025, Aug. 6, 1975; 41 FR 9355, Mar. 4, 1976]

2.65 Administrator, Agricultural Stabilization and Conservation Service.

(a) Delegations. Pursuant to 2.21(a), subject to the reservations in 2.22(a), the following delegations of authority are made by the Assistant Secretary for International Affairs and Commodity Programs to the Administrator of the Agricultural Stabilization and Conservation Service.

(1) Administer the acreage allotment and farm marketing quota program under the Agricultural Adjustment Act of 1938, as amended (7 U.S.C. 1301 et seq.).

(2) Coordinate and prevent duplication of aerial photographic work of the Department, including: (i) Clearing of photography projects; (ii) assigning symbols for new aerial photography, maintaining symbol records, and furnishing symbol books; (iii) recording departmental aerial photography flown and coordinating the issuance of aerial photography status maps of latest coverage; (iv) promoting interchange of technical information and techniques to develop lower costs and better quality; (v) representing the Department on the Interagency Committee on Sales Prices of Aerial Photographic and Satellite Imagery Reproductions and serving as liaison with other governmental agencies on aerial photography and

related activities including classification of departmental aerial photography but excluding mapping; and (vi) providing a Chairman for the Photography Sales Committee of the Department.

(3) Administer the rural environmental programs (except the Great Plains program) and diversion programs under Title X of the Agriculture and Consumer Protection Act of 1973 (16 U.S.C. 1501 et. seq.) and under section 7 to 17 of the Soil Conservation and Domestic Allotment Act, as amended (16 U.S.C. 590g et seq.).

(4) Administer the land stabilization conservation, and erosion program authorized by section 203 of the Appalachian Regional Development Act of 1965, as amended (40 U.S.C. App. 203) with assistance from the Soil Conservation Service.

(5) Administer the beekeeper indemnity payment program under section 804 of the Agricultural Act of 1970, as amended (7 U.S.C. 135b note).

(6) Administer the conservation reserve program under the Soil Bank Act of 1956, as amended (7 U.S.C. 1801 note).

(7) Administer the cropland adjustment program under title VI of the Food and Agriculture Act of 1965, as amended (7 U.S.C. 1938).

(8) Administer the cropland conversion program under section 16(e) of the Soil Conservation and Domestic Allotment Act, as amended (16 U.S.C. 590p(e)).

(9) Administer the dairy indemnity program under Public Law 90-484, as amended (7 U.S.C. 450j-1).

(10) Administer responsibilities and functions assigned under the Defense Production Act of 1950, as amended (50 U.S.C. App. 2061 et seq.), and the Federal Civil Defense Act of 1950, as amended (50 U.S.C. App. 2251 et seq.), relating to agricultural production; food processing, storage, and distribution; distribution of farm equipment and fertilizer; rehabilitation and use of food, agricultural and related agribusiness facilities; and resources of the Commodity Credit Corporation, on behalf of that corporation.

(11) [Reserved]

(12) Administer the emergency conservation program under Public Law 85-58, as amended (71 Stat. 177).

(13) Conduct fiscal, accounting and claims functions relating to CCC programs for which the Foreign Agricultural Service has been delegated authority under 2.68, and in participation with other agencies of the U.S. Government to

develop and formulate amendments to credit agreements under title I, Public Law 480, and the export credit sales program involving the rescheduling of amounts due from foreign countries under such agreements.

(14) Administer the feed grain program under section 105 of the Agricultural Act of 1949, as amended (7 U.S.C. 1441 note).

(15) Administer the haybank program pursuant to section 805, of the Agricultural Act of 1970 (7 U.S.C. 1339d).

(16) Serve as focal point in the Department for consultation on the leasing of federally owned farm lands to insure consistency with the Government's farm programs to reduce production of price-supported crops in surplus supply and determine and proclaim agricultural commodities in surplus supply, pursuant to Presidential memorandum of May 21, 1956.

(17) Administer assigned activities under the Strategic and Critical 7 Materials Stockpiling Act (50 U.S.C. 98-98h).

(18) Liquidate obligations incurred under the Sugar Act, as amended (7 U.S.C. 1100 et seq.).

(19) [Reserved]

(20) Supervise and direct Agricultural Stabilization and Conservation Service State and county offices, and designate functions to be performed by Agricultural Stabilization and Conservation Service State and county committees.

(21) Administer the upland cotton program under section 103 of the Agricultural Act of 1949, as amended (7 U.S.C. 1444) and the extra long staple cotton program under section 101 of the Agricultural Act of 1949, as amended (7 U.S.C. 1441(f)).

(22) Administer the waterbank program under Public Law 91-599 (16 U.S.C. 1301-1311).

(23) Administer the wheat program under section 107 of the Agricultural Act of 1949, as amended (7 U.S.C. 1445a).

(24) Administer the distress and disaster relief under section 407 of the Agricultural Act of 1949, as amended (7 U.S.C. 1427) and the Disaster Relief Act of 1970, Public Law 91-606, as amended (42 U.S.C. 4401).

(25) Administer the emergency livestock feed assistance program under section 407 of the Agricultural Act of 1949, as amended, and Public Law 86-299, as amended (7 U.S.C. 1427 and 4127 note).

(26) Determine the quantities of agricultural commodities subject to price support available for export programs. Estimate and announce the types, quantities, and varieties of food commodities to become available for distribution under clause (3) of section 416, Agricultural Act of 1949, as amended (7 U.S.C. 1431).

(27) Administer programs to stabilize support, and protect farm income and prices and to assist in the maintenance of balanced and adequate supplies of agricultural commodities, including programs to sell or otherwise dispose of and aid in the disposition of such commodities, except those specified in 2.17(d), 2.21(b), and 2.21(d).

(28) Administer procurement, processing, handling, distribution, disposition, transportation, payment, and related services on surplus removal and supply operations, under section 5(b), (c), and (d) of the CCC Charter Act (15 U.S.C. 714c

(b), (c), and (d)), section 416 of the Agricultural Act of 1949, as amended (7 U.S.C. 1431), section 210 of the Agricultural Act of 1956 (7 U.S.C. 1859), the Act of August 19, 1958, as amended (7 U.S.C. 1431 note), and section 709 of the Food and Agriculture Act of 1965, as amended (7 U.S.C. 1446a), except as specified in 2.17(d) and 2.21(d), and assist the Agricultural Marketing Service in the procurement, handling, payment, and related services under section 32 of the Act of August 23, 1935, as amended (7 U.S.C. 612c), and the National School Lunch Act of 1946, as amended (42 U.S.C. 1755).

(29) Administer commodity procurement and supply, transportation (other than from point of export except for movement to trust territories or possessions), handling, payment, and related services in connection with programs under title II of Public Law 480 (7 U.S.C. 1721-1725), and payment and related services for the Foreign Agricultural Service with respect to export subsidy and barter operations, operations under title I of Public Law 480, and the export credit sales program.

(30) Administer wool and mohair programs under section 704 of the National Wool Act of 1954, as amended (7 U.S.C. 1783), and under the authority of section 708 of that Act (7 U.S.C. 1787), conduct producer referendums, withhold funds (for advertising and promotion) from payments made to producers under section 704, and transfer such funds to the person or agency designated by the Assistant Secretary for Marketing and Consumer Services.

2.70 Administrator, Farmers Home Administration.

(a) Delegation. Pursuant to 2.23(a), subject to reservations in 2.24(a), and subject to policy guidance and direction by the Assistant Secretary for Rural Development, the following delegations of authority are made by the Assistant Secretary for Rural Development to the Administrator, Farmers Home Administration:

(1) Administration of the Consolidated Farm and Rural Development Act (Act) except (i) financing under section 306(a)(1) of the Act, 7 U.S.C. 1926(a)(1), of any rural electrification or telephone systems or facilities other than supplemental and supporting structures if they are not eligible for Rural Electrification Administration financing; (ii) the authority contained in section 342 of the Act, 7 U.S.C. 1013a; and (iii) the authority contained in section 306(a)(13) of the Act, 7 U.S.C. 1926(a)(13). This delegation includes the authority to collect, service, and liquidate loans made or insured by the Farmers Home Administration or its predecessor agencies, the Farm Security Administration, the Emergency Crop and Feed Loans Offices of the Farm Credit Administration, the Resettlement Administration, and the Regional Agricultural Credit Corporation of Washington, D.C.

(2) Administration of title V of the Housing Act of 1949 (42 U.S.C. 1471 et seq.), except those functions pertaining to research.

(3) Administration of the Rural Rehabilitation Corporation Trust Liquidation Act (40 U.S.C. 440 et seq.), and under trust, liquidation, and other agreements entered into pursuant thereto.

(4) Administration of section 8, and those functions with respect to repayment of obligations under section 4, of the Watershed Protection and Flood Prevention Act (16 U.S.C. 1006a, 1004).

(5) Administration of the Resource Conservation and Development loan program to assist in carrying out Resource Conservation and Development projects in rural areas under section 32(e) of the Bankhead-Jones Farm Tenant Act (7 U.S.C. 1011(e)).

(6) Administration of loan programs in the Appalachian region under sections 203 and 204 of the Appalachian Regional Development Act of 1965 (40 U.S.C. app. 204).

(7) Administration of Farmers Home Administration assets conveyed in trust under the Participation Sales Act of 1966 (12 U.S.C. 1717).

(8) Administration of the emergency loan and guarantee programs and the rural housing disaster program under sections 232, 234, and 253 of the Disaster Relief Act of 1970 (Public Law 91-606), the Disaster Relief Act of 1969 (Public Law 91-79), Public Law 92-385 approved August 16, 1972, and the Emergency Livestock Credit Act of 1974 (Public Law 93-357).

(9) Administration of loans to homestead or desertland entrymen and purchasers of land in reclamation projects or to an entryman under the desertland law (7 U.S.C. 1006a and 1006b).

(10) Administration of loans to Indian tribes and tribal corporations (25 U.S.C. 488-492).

(11) Administer financial assistance programs under part A of title III and part D of title I and the necessarily related functions in title VI of the Economic Opportunity Act of 1964, as amended (42U.S.C. 2763-2768, 2841-2855, 2942, 2943(b), 2961) delegated by the Director of the Office of Economic Opportunity to the Secretary of Agriculture by documents dated October 23, 1964 (29 FR 14764), and June 17, 1968 (33 FR 9850), respectively.

(12) Administer the Federal Claims Collection Act of 1966 and joint regulations issued pursuant thereto by the Attorney General and the Comptroller General with respect to claims of the Farmers Home Administration (31 U.S.C. 951, 953; 4 CFR, ch. II).

(13) Servicing, collection, settlement, and liquidation of:

(i) Deferred land purchase obligations of individuals under the Wheeler-Case Act of August 11, 1939, as amended (16 U.S.C. 590y), and under the item, "Water Conservation and Utilization Projects" in the Department of the Interior Appropriation Act, 1940 (53 Stat. 719, as amended).

(ii) Puerto Rican hurricane relief loans under the act of July 11, 1956 (70 Stat. 525).

(iii) Loans made in conformance with section 4 of the "Southeast Hurricane Disaster Relief Act of 1965." (79 Stat. 1301).

(14) Administer responsibilities and functions assigned under the Defense Production Act of 1950, as amended (50 U.S.C. App. 2061 et seq.), and the Federal Civil Defense Act of 1950, as amended (50 U.S.C. App. 2251 et seq.), relating to rural credit and financial assistance.

(b) Reservations. The following authorities are reserved to the Assistant Secretary for Rural Development:

(1) Making and issuing notes to the Secretary of the Treasury for the purposes of the Agricultural Credit Insurance Fund and the Rural Development Insurance Fund as authorized by the Consolidated Farm and Rural Development Act (7 U.S.C. 1929, 1929(a)) and the Rural Housing j Insurance Fund as authorized by title V of the Housing Act of 1949 (41 U.S.C. 1487).

(2) Administering loans for rural electrification and telephone facilities and service in rural areas of 1,500 or less as authorized by the Consolidated Farm and Rural Development Act (7 U.S.C. 1921 et seq.).

[38 FR 14953, June 7, 1973, as amended at 39 FR 33199, Sept. 16, 1974;40 FR 17829, Apr. 23, 1975; 40 FR 33025, Aug. 6, 1975; 40 FR 58127, Dec. 15, 1975]

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Exhibit 535-2 MOU Between NRCS, NASF and FS

MEMORANDUM OF UNDERSTANDING
for the Coordination of Forestry and Related Natural Resource Activities
between the
USDA Natural Resources Conservation Service,
the
USDA Forest Service,
and the
National Association of State Foresters

This Memorandum of Understanding (MOU) is made and entered into by and between the USDA Natural Resources Conservation Service, hereinafter referred to as NRCS, the USDA Forest Service, hereinafter referred to as FS, and the National Association of State Foresters, hereinafter referred to as NASF.

PRINCIPAL AUTHORITIES: The Department of Agriculture Reorganization Act of 1994, Public Law 103-354, 7 U.S.C. 6901-7014; Secretary's Memorandum 1010-1, Reorganization of the Department of Agriculture, dated October 20, 1994. Cooperative Forestry Assistance Act of 1978, as amended, Public Law 95-313, 16 U.S.C. 2101-2114. Soil Conservation and Domestic Allotment Act, Public Law 74-46, 16 U.S.C. 590a-f; Soil and Water Resources Conservation Act of 1977, Public Law 95-192, 16 U.S.C. 2001-2009. NASF By-Laws and Constitution.

BACKGROUND: The 1978 USDA Interagency Agreement on Forestry established a forum for USDA and its partners to cooperate in forestry planning, the formulation of budget proposals, the definition of agency roles, and the delivery of programs to the various clientele. Among other objectives, the agreement provides for the development of mutually supportive working relationships which contribute to a visible, effective, and persuasive demonstration of interagency coordination and cooperation at the national, State, and local levels.

In addition to the interagency coordination emphasized in the 1978 Agreement on Forestry, there is a need for a widely-based coordinating mechanism between NRCS, FS, and NASF for implementing various Federal and State forestry and related natural resource activities including, but not limited to, forest stewardship, incentive programs, conservation technical assistance, watershed planning, urban and community forestry, soil survey, forested wetlands, and agroforestry technology transfer. Therefore, this MOU establishes a general framework for increased communication, cooperation, and collaboration between the signatories.

The NRCS, through conservation districts and other partners, assists individuals, communities, and units of government to develop natural resource conservation plans and to apply integrated resource management systems that are environmentally and economically sustainable.

The FS, through State forestry agencies and other partners, assists individuals, communities, and units of government in the stewardship of rural and urban forest resources. The NASF, representing the forestry agencies of the States, territories, and the District of Columbia, promotes cooperation among the States and territories, the Federal agencies, and other partners on forestry and related natural resource matters. State forestry agencies are responsible for administering a range of programs which ensure the protection, health, and sustainabilility of forests in communities and on State and private lands.

PURPOSE

Recognize State Forestry agencies as having the primary leadership role for State and local forestry programs.

Recognize NRCS and FS as sources of interdisciplinary expertise for forestry and natural resource conservation.

Recognize that other Federal, State, and local government agencies, non-governmental organizations, and private sector professionals and individuals have key roles in the protection and sustainable management of the Nation's forest and related natural resources.

Recognize that private landowners voluntarily request assistance from the signatories and are the decisionmakers for their land.

Achieve shared leadership among the signatories in the development and implementation of forestry and related natural resource programs, projects, and activities.

Now, THEREFORE, the parties agree to:

1. Ensure opportunities for full participation at all levels in the development of forestry and related natural resource policies.

2. Promote communication, cooperation, and collaboration among the signatories and their partners and stakeholders in the delivery of forestry and related natural resource activities and services.

3. Utilize each party's authorities, resources, and expertise at all levels to coordinate and implement forestry and related natural resource programs in a cost effective manner which is responsive to customers.

4. Provide opportunities for shared training.

5. Provide opportunities for participation at all levels to committees charged with forestry and related natural resource responsibilities.

6. Integrate the forestry and related natural resource concerns, activities, resources and programs of partners and stakeholders, public and private, insofar as possible, into ongoing programs, projects, and activities.

7. Conduct joint marketing efforts to motivate landowners, communities, and units of government to access programs and services to achieve forestry and related natural resource conservation.

8. Form and support public and private partnerships and opportunities to extend assistance and minimize duplication of effort.

9. Encourage and support the development of State and local supplemental MOU's.

It is mutually agreed and understood that:

1. Specific projects or activities which involve the transfer of funds, services, or property between the parties to this MOU will require the execution of separate agreements or contracts, contingent upon the availability of funds. Each subsequent agreement or arrangement involving the transfer of funds, services, or property between the parties to this MOU must comply with all applicable statutes and regulations, including those statutes and regulations applicable to procurement activities, and must be independently authorized by appropriate statutory authority.

2. This MOU in no way restricts the NRCS, FS, or NASF from participating in similar activities or arrangements with other individuals or organizations.

3. Nothing in this MOU shall obligate the NRCS, FS, or NASF to expend appropriations or to enter into any contract or other obligations.

4. This MOU will be reviewed every 2 years and may be modified or amended upon written request of any party and the concurrence of the others. This MOU may be terminated with 60-day written notice of any party.

5. The parties will be in compliance with the nondiscrimination provisions contained in Titles VI and VII of the Civil Rights Act of 1964, as amended. The Civil Rights Restoration Act of 1987 (Public Law 100-259) and other nondiscrimination statutes, namely, Section 504 of the Rehabilitation Act of 1973. Title IX of the Education Amendments of 1972, the Age Discrimination Act of 1975, Americans with Disabilities Act of 1990, and in accordance with regulations of the Secretary of Agriculture (7CFR- 15, Subparts A & B) which provide that no person in the United States shall, on the grounds of race, color, national origin, age, sex, religion, marital status, or disability be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving Federal financial assistance from the Department of Agriculture or any agency thereof.

In witness whereof, the parties hereto have executed this MOU as of the last written date below.

12-14-95
Paul W. Johnson Date
Chief, NRCS

12/14/95
Jack Ward Thomas Date
Chief, FS

12-14-95
Stanley F. Hamilton Date
President, NASF

12-14-95
William A. Farris Date
Immediate Past President, NASF

Exhibit 535-3 Checklist For Forestry and Agroforestry Functional Appraisals.

Checklist
For
Forestry and Agroforestry
Functional Appraisals

- ☐ **Previous appraisals or reviews.**
- ☐ **Forestry and agroforestry.**
  - ☐ Acreage in forests by ownership class.
  - ☐ Extent of agroforestry activities.
  - ☐ Conservation needs.
  - ☐ Problems peculiar to the location.
- ☐ **The present staffing situation, such as comparison with states that have similar workloads and plans for strengthening forestry if appropriate.**
- ☐ **The availability of policy memorandums including the compatibility of NRCS state and national memorandums.**
- ☐ **Technical materials**
  - ☐ The forestry and agroforestry information in Sections II, III, IV, and V of the technical guide.
  - ☐ Technical notes, job sheets, and management tips.
  - ☐ Tree and plant identification aids.
  - ☐ Preparation of soil survey manuscripts. The use of soil-related forestry and/or agroforestry interpretations in planning.
  - ☐ The compatibility of NRCS forestland practice standards and specifications with those of the State forestry agency.

- ☐ The coordination of forest management plans prepared by other agencies with the conservation plan prepared by NRCS.

☐ **Broad resource planning, including:**

- ☐ NRCS forestry and agroforestry responsibilities in RC&D and PL-566.
- ☐ NRCS forestry and agroforestry responsibilities in working with cities and counties.
- ☐ NRCS forestry and agroforestry responsibilities in assisting conservation districts with long range and annual plans of work.

☐ **Information program on forestry and agroforestry activities such as:**

- ☐ News releases.
- ☐ Radio and television programs.
- ☐ Technical articles.
- ☐ Brochures.

☐ **Partnership activities such as:**

- ☐ Demonstrations, workshops, etc. on forest conservation and agroforestry practices with conservation districts.
- ☐ Demonstrations, workshops, etc. on forest conservation and agroforestry practices with state forestry agencies.
- ☐ Demonstrations, workshops, etc. on forest conservation and agroforestry practices with other agencies and organizations.

Exhibit 535-4 Performance Benchmarks.

Performance Benchmarks

Level 1 Training

This training is suggested for GS-5 and GS-7 employees who work in areas where forestry or agroforestry practices are a significant part of the workload. On completion the trainee:

- Can identify the principal forestry-related species (overstory, understory) and agroforestry-related species in the area.
- Is familiar with the principal soils in the area, understands their potentials and limitations for forestry and agroforestry use, and knows how to use published soil survey data and interpretations.
- Is proficient in the use of the zigzag transect in working with a cooperator and knows how to involve the cooperator in every detail.
- Knows how to use common forestry tools properly.
- Understands and uses the technical guide in working with cooperators.
- Can assist a cooperator in planning use and treatment of forestland, including planning for wood production, grazing resource use, recreation, and other related uses.
- Can assist a cooperator in agroforestry planning, i.e. design, layout, species selection, space requirements, maintenance, and renovation.
- Can assist a cooperator in erosion control, particularly with respect to road and trail layout, design, maintenance, and protection.
- Understands tree and shrub establishment techniques, i.e., propagule handling (storage, root pruning, inoculation, etc.), planting techniques for various propagules (bare root, container, seed, etc.), and establishment period maintenance (protection, irrigation, etc.).

Level 2 Training

This training is suggested for GS-9 soil conservationists and foresters in training toward GS-11 staff forester positions. On completion the trainee:

- Meets all the training requirements listed for level 1.
- Has trained GS-5 or GS-7 employees in the items listed for level 1 training.
- Can identify common native and introduced woody plants in the area.
- Has assisted in plot data collection activities. This includes:
  - Working as a member of a team in selecting stands, taking measurements, and recording data.
  - Working as a member of a team in selecting windbreaks and collecting and recording data.
  - Helping with the development or revision of forest and agroforestry interpretations.
  - Understanding the selection, use, and limitations of the appropriate site tables, site curves, and yield tables.
- Assists in the development of ecological site descriptions and soil-related interpretations.
- Has developed working relationships with State forestry agency personnel at the local level.
- Knows the desirable and undesirable characteristics of the principal trees and shrubs in ornamental, wildlife, and urban use in the area.
- Knows the local marketing situation for wood products, i.e., species used, size, and quality requirements.
- Has assisted an NRCS forester or other qualified person in marking trees for harvest cutting and forest improvement.

Level 3 Training

This training is suggested for GS-11 soil conservationists or foresters in training toward GS-12 staff forester positions. On completion the trainee:

- Meets all the training requirements listed for level 2.
- Conducts training sessions for soil conservationists on subjects covered at lower training levels.
- Gives public presentations on conservation forestry activities.
- Prepares articles on conservation work involving the use of trees.
- Takes leadership in conducting plot data collection activities.
- Has a working knowledge of the soil classification system and the relationship of soil to plant growth and management.
- Understands and can use the database information systems associated with plot data collection, ecological site descriptions, and soil-related interpretations:
    - Ecological Site Inventory (ESI)
    - Ecological Site Description (ESD)
    - National Soil Information System (NASIS)
- Develops ecological site descriptions and soil-related interpretations.
- Works with the State forestry agency and cooperates with other agencies and organizations in developing and applying forestry and agroforestry programs and practices to coordinate conservation planning activities.
- Assists in making environmental assessments for projected work affecting forested areas.
- Performs occasional assignments of the type normally given to a GS-12 staff forester.

Level 4 Training

This training is suggested for GS-12 staff foresters in training toward higher grade staff forester positions. On completion the trainee:

- Meets the training requirements listed for level 3 training.
- Prepares training materials and conducts training sessions for soil conservationists or other lower grade employees.
- Participates in activities of professional organizations.
- Performs occasional assignments of the type normally given to a higher grade staff forester.
- Develops working relationships with employees of the state forestry agency, consultant foresters, industry foresters and foresters with other agencies and organizations.
- Provides state and/or regional leadership in developing ecological site descriptions and soil-related interpretations. This includes expertise in the use of the associated database information systems:
    - Ecological Site Inventory (ESI)
    - Ecological Site Description (_ESD)
    - National Soil Information System (NASIS)

Part 536 - CONSERVATION PLANNING

CONTENTS

Part 536.0 - General

536.00 Introduction

This part describes planning policy with owners and users of forestland and agricultural producers using agroforestry technology.

536.01 Planning Policies

(a) General

General Manual 180, Part 409 - Planning Policy establishes NRCS policy that guides NRCS employees as they provide assistance to clients for planning and implementing resource conservation plans.

The NRCS National Planning Procedures Handbook provides guidance on the "how to" of the planning process as related to the planning policy established by the General Manual

The National Forestry Manual provides NRCS policy for forestland resource conservation planning (forestry and agroforestry).

The General Manual 450, Part 401- Technical Guides establishes NRCS Field Office Technical Guide policy. The local Field Office Technical Guide contains the technical information needed to assist clients in the development and application of conservation plans. It contains general resource information about the field office area, soil and site information, quality criteria to be met in the Resource Management Systems (RMS's), guidance documents depicting the resource management planning thought process, practice standards for all practices applicable to the local field office area, and examples of the Conservation Effects Decision Making Process.

(b) Forestry Planning Policy

The success of the forestry phase of the conservation program depends on the landowner considering forestland a part of the total operating unit. To give forested areas the same consideration and attention that is given to any other land use, the land owner or operator needs a plan that provides:

- A system for managing the forest that is consistent with and coordinated with other farm or ranch operations.
- An annual or periodic income in accordance with owner's objectives.
- Other values such as erosion control, recreation, wildlife habitat, forage production, and environmental enhancement.

(c) Providing Forestry Planning Assistance

When agreements have been developed (see Exhibit 535-1), NRCS personnel are authorized to provide forestry services beyond the normal assistance in conservation planning. Besides giving assistance on erosion control measures, properly trained personnel may provide cooperative assistance on the following:

- servicing cost-shared forestry practice referrals
- limited tree marking
- common insect and disease control methods
- location of logging roads.

Estimating timber volume should be avoided. Nevertheless, there may be occasions when volume estimates are needed to establish cutting cycles for planning purposes. Also, estimating tree volume on a few individual trees for demonstration activities is acceptable.

NRCS supports and encourages prescribed burning on rangeland, pastureland, forest land, hayland, Conservation Reserve Program (CRP) land, and wildlife land to meet specific resource management objectives. The NRCS policy on prescribed burning on grazing lands is in appendix A of this handbook. The national standard for prescribed burning is in the National Handbook of Conservation Practices. In states where prescribed burning on forestland is an acceptable practice, NRCS involvement is limited to planning assistance.

536.02 Objectives

NRCS assists people to make informed management decisions regarding their natural resources. Management considerations normally include information on the current and desired conditions of the soil, water, air, plant, and animal resources. Information is also provided on human resources and values such as; recreation potential, cultural values, economic viability, and aesthetic values.

536.03 Planning Procedures

Refer to the National Forestry Handbook, Part 636.1 for detailed forestry and agroforestry planning procedures.

PART 537 - SOIL-RELATED FORESTRY AND AGROFORESTRY INTERPRETATIONS

CONTENTS

Part 537.0 - General

537.00 Introduction

This part describes policy for the collection of data and development of soil-related interpretations to assist with forestry and agroforestry planning and management activities.

Soil-related forestry and agroforestry interpretations are to be included in field office technical guides, published soil surveys, and other documents where appropriate.

537.01 Policy

It is NRCS policy to make forestry and agroforestry interpretations for all areas in which forestland is a present or potential land use and/or agroforestry practices are a present or potential practice.

537.02 Responsibilities

(a) National Level

Forestry specialists at national headquarters and the national centers and institutes have national responsibility for assisting state conservationists in developing and maintaining soil-related forestry and agroforestry interpretations. Interstate coordination is part of this responsibility.

These forestry specialists coordinate resource assessment activities that are national in scope with the Chair of the National Soil Survey Center and the Directors of Ecological Sciences Division and Soil Survey Division in National Headquarters.

(b) State Level

State level foresters work jointly with Major Land Resource Area Project Office (MO) leaders and state soil scientists to provide technical guidance and leadership to the states in developing and maintaining soil-related forestry and agroforestry interpretations and assist in the preparation of soil survey manuscripts.

(c) Field Level

Field level foresters work jointly with resource soil scientists and/or soil survey project leaders to collect the data needed for soil-related forestry and agroforestry interpretations within their areas of responsibility and assist in developing soil-related forestry and agroforestry interpretations and soil survey manuscripts.

When field level foresters are not available, other forestry-trained personnel may be utilized.

537.03 Basic Unit of Interpretation and Forms of Information Display

(a) Basic Unit of Interpretation

The basic geographic or land unit for interpretation is the soil component. For the purposes of this manual, the soil component normally refers to a soil series or phase of a soil series that exhibits consistent behavior in terms of growth, management and response of trees and associated understory. Soil map unit delineations in published soil surveys usually contain one or more predominant soil components and a number of components as inclusions. Regardless of complexity, interpretations and supporting data have a single soil component as their base unit or point of focus.

(b) Forms of Information Display

Soil map unit descriptions and ecological site descriptions are the two major forms of display used to describe the information and interpretations known about individual soil components.

Soil map unit descriptions usually show the anticipated behavior or limitations of each soil component included in the map unit.

Ecological site descriptions show group-level interpretations for soil components that behave similarly and, where necessary, include component-level interpretations for individual soil components. For example, a group of similar soil components may have the same interpretation for overstory tree species but have different erosion hazard ratings. A group-level interpretation, when used and appropriate, allows for simplification of database relationships and forms of display.

537.04 Use of Soil-Related Information and Interpretations

NRCS collects and develops soil-related forestry and agroforestry information and interpretations alone or

jointly with other agencies and organizations under cooperative agreements. Cooperating organizations that help during the collection and development phases are to have access to such information. These organizations must be apprised of NRCS policy and procedures in the use of such information.

When NRCS receives a request for unpublished information and interpretations, the state conservationist will consult with the Director of Ecological Sciences and the Director of Soil Survey regarding the request. The state conservationist is to release the material with the understanding that the data are subject to change and that NRCS can review the technical materials in which the data are used before the materials are published.

Part 537.1 - Data Collection, Analyses, and Interpretation

537.10 General

Certain data must be collected, analyses made, and evaluations performed to accurately describe the behavior and limitations of soil components for the purposes of forestry and agroforestry. Interpretations associated with each soil component are: (1) developed from the raw field data and subsequent analyses, (2) inferred from historical data, maps or anecdotal information, or (3) derived from criteria based on soil characteristics, soil-moisture relationships, and other associated attributes.

Certain interpretations are highly dependent on the analyses of field data, e.g., Trees to Manage; Forest Productivity; Forest Understory, Ground Cover and Structure, etc. NRCS foresters are to avoid making such interpretations without adequate and properly collected data.

Other interpretations are inferred from historical data and maps, e.g., Historic Climax Plant Community or from expert criteria or rating guides, e.g., Conservation Tree/Shrub Suitability Groups. These interpretations are usually not field data dependent and can be derived from available reference materials or criteria. As such, they are approximations or expectations of an individual soil component's behavior and limitations.

537.11 Organization of Interpretations

Forestry and agroforestry interpretations are organized into two subparts:

(a) Part 537.2 - National Soil Information System (NASIS) Interpretations

This subpart presents the policy, definitions and requirements for basic forestry and agroforestry interpretations normally published in soil survey map unit descriptions and tables.

(b) Part 537.3 - Ecological Site Information System (ESIS) Interpretations

This subpart presents a discussion of ecological site concepts and the policy, definitions and requirements for (1) the collection of forestry and agroforestry plot data and (2) the development of forestland ecological site descriptions.

Part 537.2 - National Soil Information System (NASIS) Interpretations

537.20 General

This subpart presents the policy, definitions and requirements for basic forestry and agroforestry interpretations normally published in soil survey map unit descriptions and tables. The interpretations and associated data values and ratings in this section constitute the data set that is administratively and technically supported on a national level by NRCS. The National Soil Information System (NASIS) is the repository for this data set. Refer to NASIS documentation for details on adding and/or modifying interpretive elements and soil rating criteria.

537.21 Vegetation and Productivity

Land management decisions dealing with the choice of tree species and growth are normally in effect for decades. Thus, the correlation of the species of trees and their expected productivity to soil components is of significant importance to forestry and agroforestry practitioners.

These interpretations are developed from analysis of field data collected for individual soil components. NRCS foresters are to avoid making such interpretations without adequate and properly collected data.

(a) Trees to Manage

(1) Description
Trees preferred for planting, or seeding, or natural regeneration and residual trees in thinning or partial harvest operations.

(2) Element Values
Tree species listed are those that are: (1) adapted to the soil component, (2) currently valuable or commercial, and (3) if to be planted or seeded, propagule material is available. Tree species are identified by plant symbol, as listed in the National Plants Database. See part 538.12 National Plants Information System (PLANTS).

(b) Forest Productivity - CMAI

(1) Description
The site index and annual productivity of tree species described by cubic feet per acre at the age of culmination of mean annual increment (CMAI), for identified soil components. Site index and productivity values will be determined from plot data recorded in the Ecological Site Inventory database. See part

537.33 Ecological Site Inventor.

(2) Element Values

(i) Plant Symbol
Each identified tree species is identified by a plant symbol, as listed in the National Plants Database.

(ii) Productivity
The annual production of each identified species is expressed in terms of cubic feet per acre at the age of culmination of mean annual increment (CMAI).

(iii) Site Index
The site index, as determined from the identified site index curve, of each identified species is recorded.

(iv) Site Index Base
A number, as listed in the National Register of Site Index Curves, that identifies the site index curve used to determine the CMAI productivity. See

Exhibit 537-1.

(c) Forest Productivity - Other

(1) Description
The site index and annual productivity of tree species described by common units of measurement other than cubic feet per acre per year (CMAI), for identified soil components. Site index and productivity values will be determined from plot data recorded in the Ecological Site Inventory database. See part 537.33, Ecological Site Inventory.

(2) Element Values

(i) Plant Symbol

Each identified tree species is identified by a plant symbol, as listed in the National Plants Database.

(ii) Other Productivity

The annual production of each identified species is expressed in terms of an identified unit of measure.

(iii) Unit of Measure

The unit of measurement used to determine other productivity, i.e. board feet per acre, cords per acre, etc.

(iv) Site Index

The site index, as determined from the identified site index curve, of each identified species is recorded.

(v) Site Index Base

A number, as listed in the National Register of Site Index Curves, that identifies the site index curve used to determine the productivity. See

Exhibit 537-1.

537.22 Criteria-Based Interpretations

Criteria-based interpretations in this section are derived from rating guides that are used to assess a soil component's features and properties. Interpretive ratings are automatically assigned to each soil component based on an evaluation of the rating criteria through the "interpretations generator" module in NASIS. The interpretations generator affords states the ability to delete or add interpretations and/or modify the soil rating criteria of criteria-based interpretations in the nationally supported data set. State offices will be administratively and technically responsible for all state and locally developed and/or modified interpretations.

(a) Potential Erosion Hazard (Road/Trail)

(1) Description

The hazard or risk of soil loss from unsurfaced roads/trails.

(2) Considerations

(i) Ratings assess:

- The force that natural precipitation events have to dislodge and move soil materials on roads, trails and firebreaks.
- Activities on roads and trails that result in bare ground, compaction, and reshaping of the soil surface.
- Use by trucks, skidders, off-road vehicles, and other similar equipment.
- The impact on compacted, bare road, trail surface using the representative value for slope gradient of the soil component

(ii) Ratings assume:

- Roads and trails are generally linear, continuous, and narrow ranging up to 7.5 meters in width.

(iii) Ratings do not assess:

- Frozen or snow-covered soil.

(3) Ratings

Slight—Little or no erosion is likely.
Moderate—Some erosion is likely; occasional maintenance may be needed; simple erosion control measures needed.
Severe—Significant erosion can be expected; roads require frequent maintenance; costly erosion control measures are needed.

(4) Soil Rating Criteria

See Exhibit 537-2.

(b) Potential Erosion Hazard (Off-Road/Off-Trail)

(1) Description

Ratings indicate the hazard or risk of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface.

(2) Considerations

(i) Ratings assess:

- Sheet and rill erosion from exposed soil surfaces caused by various silvicultural practices, grazing, mining, fire, firebreaks, etc.
- Activities that disturb the site resulting in 50 to 75 percent bare ground in the affected area
- The use of any equipment type or size and uncontrolled grazing by livestock.

(ii) Ratings assume:

- 50 to 75% exposed, roughened mineral surface layer.

(iii) Ratings do not assess:

- Clean tillage and other similar activities that disturb up to nearly 100 percent of the area and change the character of the soil.
- Histosols.
- Individual precipitation or storm events.
- The impact of gully erosion.
- Sediment production/delivery ratio or streambank or streambed erosion for water courses on the site.
- Ground disturbing activities on the amount of surface or subsurface water runoff.

(3) Ratings

Slight—Erosion is unlikely under ordinary climatic conditions.
Moderate—Some erosion is likely; control measures may be needed.
Severe—Erosion is very likely; control measures for vegetation re-establishment on bare areas and structural measures are advised.
Very Severe—Significant erosion is expected; loss of soil productivity and off-site damages are likely; control measures are costly and generally impractical.

(4) Soil Rating Criteria

See Exhibit 537-3.

(c) Soil Rutting Hazard

(1) Description

Ratings indicate the hazard or risk of ruts in the uppermost soil surface layers by operation of forest equipment. Soil displacement and puddling (soil deformation and compaction) may occur simultaneously with rutting.

(2) Considerations

(i) Ratings assess:

- The operation of equipment on forest sites (3-10 passes) when the soil moisture is near field capacity.
- The use of standard rubber-tired vehicles (non-flotation tires).
- Year-long water tables $\leq$30cm.
- Soil displacement and puddling that may affect aesthetics, groundwater hydrology, and productivity of the site.

(ii) Ratings assume:

- Rutting depths usually range from 5 to 60cm and depends, in part, on the weight of equipment (including carried or pulled loads) and shape and size of wheels.
- Lack of organic/vegetation surface cover.
- Condition occurs on soil with slopes and other characteristics that allow use of ground-based equipment.

(iii) Ratings do not assess:

- Impacts of rutting on sloping sites that may channel surface water and effect hydrology.
- Frozen soil within 60cm of the surface.

(3) Ratings

Slight—Little or no rutting.
Moderate—Ruts are likely.
Severe—Ruts readily.

(4) Soil Rating Criteria

See Exhibit 537-4.

(d) Road Suitability (Natural Surface)

(1) Description

Suitability for using the natural surface of the soil component for roads by trucks for the transport of logs and other wood products from the site.

(2) Considerations

(i) Ratings assess:

- The efficient and safe transport of forest products from the site.
- The landscape in its natural setting.
- Frequency and duration of flooding, ponding, and depth and duration of water table.
- The use of trucks (1/2-ton to log-transport capability).
- Activities that disturb 100 percent of the soil surface area with rutting, puddling or displacement up to a depth of 45cm.

(ii) Ratings assume:

- Vegetation and debris are cleared from an area sufficient in width for the road before use begins.
- Using the natural setting of the soil without cut and fill construction.
- Slopes are less than 20 percent gradient.
- Use occurs during customary periods of such activity for the local area.

- Roads are generally less than 1.6km in length with up to a 6m wide running surface.

(iii) Ratings do no assess:

- Non-soil obstacles, e.g., slash.
- Frozen or snow-covered soils.

(3) Ratings

Well Suited—Little or no restrictions to natural road suitability.
Moderately Suited—One or more restrictions reduce site suitability.
Poorly Suited—One or more restrictions generally make the use of the site for a natural road very difficult or unsafe.

(4) Soil Rating Criteria

See Exhibit 537-5.

(e) Log Landing Suitability

(1) Description

The suitability of the soil at the forest site to serve as a log landing.

(2) Considerations

(i) Ratings assess:

- Efficient and effective use of equipment for the temporary storage and handling of logs.
- The use of grappel hooks, skidders, trucks, loaders, cable yarders, and other similar equipment.
- Activities that disturb 100 percent of the soil surface area with rutting, puddling or displacement up to a depth of 45cm.
- The landscape in its natural setting.
- Frequency and duration of flooding, ponding, and depth and duration of water table.

(ii) Ratings assume:

- Vegetation and debris are cleared from an area sufficient in size for the road or landing before use begins.
- One-half acre or less in size.

(iii) Ratings do not assess:

- Non-soil obstacles, e.g., slash.
- Frozen or snow-covered soil.

(3) Ratings

Well Suited—Little or no restrictions to road or log landing suitability.
Moderately Suited—One or more restrictions reduce site suitability.
Poorly suited—One or more restrictions generally make the use of the site for a landing very difficult or unsafe.

(4) Soil Rating Criteria

See Exhibit 537-6

(f) Construction Limitations for Haul Roads and Log Landings

(1) Description

Ratings reflect limitations for constructing haul roads and log landings.

(2) Considerations

(i) Ratings assess:

- Earth moving activities to meet standards and specifications for haul roads and log landings.
- Excavating, removal and shaping of native soil materials to develop haul roads and log landings for forest harvesting and other management activities.
- Cuts and fills less than 3m in depth.
- The use of bladed crawler tractors, excavators, graders, and other primary construction equipment.
- Year-round water tables, year-round ponding, and permafrost.
- Frequency and duration of flooding.

(ii) Ratings assume:

- Construction activities occur during customary periods of such work for the local area.
- Roads are up to 1.6km in length with up to a 6m wide running surface.

(iii) Ratings do not assess:

- Snow-covered soils.

(3) Ratings

Slight—Little or no limitations to construction activities.
Moderate—One or more limitations that cause some difficulty.
Severe—One or more limitations that make road or log landing construction very difficult or more costly.

(4) Soil Rating Criteria

See Exhibit 537-7.

(g) Harvest Equipment Operability

(1) Description
The suitability for operating harvesting equipment.

(2) Considerations
(i) Ratings assess:
- The off-road transport or harvest of logs and/or wood products by ground-based wheeled or tracked equipment.
- The use of standard rubber-tire skidders and bulldozers used for ground-based harvesting and transport.
- Activities that disturb from 35 to 75 percent of the surface area with rutting, puddling, or displacement up to a depth of 45cm.
- Year-round water tables and year-round ponding.

(ii) Ratings assume:
- Activities occur during customary periods of such work for the local area.

(iii) Ratings do not assess:
- Non-soil obstacles, e.g., slash.
- Frozen or snow-covered soils.

(3) Ratings
Well Suited—Little or no restrictions to equipment operability.
Moderately Suited—One or more restrictions reduce the effective and safe use of equipment.
Poorly suited—One or more restrictions make the use of equipment impractical or unsafe.

(4) Soil Rating Criteria
See Exhibit 537-8

(h) Mechanical Site Preparation (Surface)

(1) Description
Ratings indicate the suitability of using surface-altering soil tillage equipment.

(2) Considerations
(i) Ratings assess:
- Activities that include modifying the soil surface to prepare the site for planting or seeding.
- Activities that treat up to 50 to 75 percent of the site to 30cm in depth.
- Features and characteristics from the surface to 30cm in depth.
- The use of brush rakes, chisels, disks, and other similar types of implements pulled by bulldozers or tractors (D6/D7, 150 h.p. tractor or equivalent).
- Year-round water tables and year-round ponding.

(ii) Ratings assume:
- Activities for such work occur during customary periods for the local area.

(iii) Ratings do not assess:
- Non-soil obstacles, e.g., slash.
- Human-caused compacted layers from harvesting or other site activities (only natural restrictive layers are considered).
- Frozen or snow-covered soils.

(3) Ratings
Well Suited—Little or no restrictions to surface mechanical site preparation.
Poorly Suited—One or more restrictions reduce the effective and safe use of equipment.
Unsuited—One or more restrictions generally prevent the effective and safe use of equipment.

(4) Soil Rating Criteria
See.

(i) Mechanical Site Preparation (Deep)

(1) Description
Ratings indicate the suitability of using deep soil tillage equipment.

(2) Considerations
(i) Ratings assess:
- Activities that include subsoiling, ripping and other subsurface soil disturbance across the slope.
- Activities that treat up to 50 to 75 percent of the site to 90cm in depth to break up restrictive or compacted layers and increase infiltration for plant growth.
- Features and characteristics from the surface to 90cm in depth..

- The use of rippers, subsoilers, and other implements pulled by bulldozers (D8 or equivalent) that till at a depth greater than 30cm.
- Year-round water tables and year-round ponding.

(ii) Ratings assume:

- Activities occur during customary periods of such work for the local area.

(iii) Ratings do not assess:

- Non-soil obstacles, e.g., slash
- Human-caused compacted layers from harvesting or other site activities (only natural restrictive layers are considered).
- Frozen or snow-covered soils.

(3) Ratings

Well Suited—Little or no restrictions to deep mechanical site preparation.
Poorly Suited—One or more restrictions reduce the effective and safe use of equipment.
Unsuited—One or more restrictions generally prevent a sufficient level of deep mechanical site preparation.

(4) Soil Rating Criteria

See Exhibit 537-10.

(j) Hand Planting Suitability

(1) Description

Ratings indicate the expected difficulty of hand planting.

(2) Considerations

(i) Ratings assess:

- Activities that include the proper placement of the root systems of tree and shrub seedlings to a depth of up to 30cm.
- The use of bareroot stock, tublings, containerized stock, and cuttings.
- The use of spades, dibbles, planting bars or other similar planting tools.
- Year-round water tables and year-round ponding.

(ii) Ratings assume:

- Necessary site preparation is completed before hand planting.
- Planting activities occur during customary periods of such work for the local area.

(iii) Ratings do not assess:

- Non-soil obstacles, e.g., slash.
- Human-held powered equipment such as power augers.
- Human-caused compacted layers from harvesting or other site activities (only natural restrictive layers are considered).
- Frozen or snow-covered soils.

(3) Ratings

Well Suited—Little or no restrictions to hand planting; planting rates are not affected.
Moderately Suited—One or more restrictions that impede planting and reduce planting rates.
Poorly suited—One or more restrictions that severely impede planting and reduce planting rates.
Unsuited—Site factors and features prevent the proper planting of seedlings.

(4) Soil Rating Criteria

See Exhibit 537-11.

(k) Mechanical Planting Suitability

(1) Description

The difficulty of planting tree or shrub seedlings using a mechanical planter.

(2) Considerations

(i) Ratings assess:

- Activities that include the proper placement of the root systems of tree and shrub seedlings to a depth of up to 30cm.
- The use of bareroot stock, tublings, containerized stock, and cuttings.
- Year-round water tables and year-round ponding.
- The use of mechanical planters that create narrow furrows or trenches to a depth of 30cm and are operated on the contour or cross-slope.
- The use of mechanical planters on a 3-point hitch with coulter, shank or trench “shoe,” and packing wheel pulled by sufficiently powered equipment.

(ii) Ratings assume:

- Planting activities occur during customary periods of such work for the local area.
- Necessary site preparation is completed before mechanical planting.

- Human-caused compacted layers from harvesting or other site activities (only natural restrictive layers are considered).
- Frozen or snow-covered soils.

(3) Ratings
Well Suited—Little or no restrictions to mechanical planting; planting rates are not affected.
Moderately Suited—One or more restrictions that impede planting and reduce planting rates.
Poorly Suited - One or more restrictions that severely impede planting and reduce planting rates.
Unsuited—Site factors and features prevent mechanical planting of seedlings.

(4) Soil Rating Criteria
See Exhibit 537-12.

(l) Potential Damage to Soil by Fire

(1) Description
The potential hazard of damage to soil nutrient, physical, and biotic characteristics from fire.

(2) Considerations
(i) Ratings assess:
- The impact of fires (prescribed or wildfire) of moderate fireline intensity (116-520 btu's/sec/ft) that provide the necessary heat to remove the duff layer and consume soil organic matter in the surface layer.

(ii) Ratings assume:
- Soils with a shallow surface layer lack the capacity to safely absorb the effects of fire.
- Steep slopes are more likely to erode if the protective duff layer is removed.
- Soil texture and rock fragment content relate to soil erodibility, vegetative recovery rate, and vegetative productivity.
- Medium textured soils, with their greater inherent water holding capacity, are more likely to be cooler and provide higher productivity potential.
- Soils with large volumes of rock fragments transmit heat to a greater depth in a shorter period of time.
- Soils with less than 2 percent organic matter are more resistant to sheet and rill erosion and have greater water holding capacity.

(iii) Ratings do not assess:
- The time of year in which the fire occurs (winter versus summer).
- Fuel moisture content or volume.
- Whether conditions

(3) Ratings
Low—Little or not negative impacts to the soils characteristics are expected.
Moderate—Negative impacts to the soil characteristic may occur.
High—Negative impact to the soil characteristics are expected.

(4) Soil Rating Criteria
See Exhibit 537-1.

(m) Potential Seedling Mortality

(1) Description
The likelihood of death of naturally or artificially propagated tree seedlings, as influenced by soil characteristic, physiographic features and climatic conditions.

(2) Considerations
(i) Ratings assess:
- The impact of soil, physiographic, and climatic conditions on the survivability of newly established tree seedlings.

(ii) Ratings assume:
- Site preparation is adequate for the establishment of tree seedlings.
- Artificially propagated tree seedlings are of adequate size and quality, are adapted to the site, are planted during a time sufficient to assure initial root growth with respect to moisture and temperature, and proper planting techniques are employed.
- Near normal monthly and yearly climatic conditions.

(iii) Ratings do not assess:
- Effects of overstory tree canopy greater than 15 feet in height.
- Effects of adjacent competing plants less than 15 feet in height.
- Effects of seedling pests (rodent, herbivore, insect, etc.).

(3) Ratings

Low—Seedlings are expected to develop normally and become established.
Moderate—Root development is sufficiently retarded to cause death of some seedlings (up to 1 in 3) and establishment of surviving seedlings is delayed.
High—Seedlings are not expected to survive (at least 2 in 3 die) without special treatment or management.

(4) Soil Rating Criteria

See Exhibit 537-14.

(n) Conservation Tree/Shrub Suitability Groups (CTSG)

(1) Description

A CTSG is a physiographic unit or area having similar climatic and edaphic characteristics that control the selection and height growth of trees and shrubs.

CTSG's shall be developed to assure satisfactory species selection and adaptation to specified conditions of soil, climate, and physiography. Individual soil components are automatically placed in a CTSG based on an evaluation of the rating criteria through the "interpretations generator" module in NASIS. Analysis of CTSG Plot Data (see part 537.33, Ecological Site Inventory) for all soil components in an individual CTSG are analyzed and used to develop expected height growth at a base age for correlated species

(2) Considerations

CTSG's are a guide for selecting species best suited for different kinds of soil and for predicting height growth and effectiveness.

It is anticipated that species adaptation and predicted height growth relative to specific soil components will be automated with the release of the Vegetative Practice Design (VegSpec) software. Until this software is available, species adaptation and predicted height growth will need to be manually determined through observing and recording species performance in actual plantings.

CTSG tables will be prepared for Section II of the field Office Technical Guide for each CTS group or subgroup.

Procedures for developing these tables are contained in part 637 of the NFH.

(3) Soil Rating Criteria

See Exhibit 537-15.

Part 537.3 – Ecological Site Information System (ESIS) Interpretations

537.30 Forestland Ecological Sites

(a) Definition

Forestland landscapes are divided into ecological sites for the purposes of inventory, evaluation, and management. An ecological site is a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.

An ecological site is the product of all the environmental factors responsible for its development, and it has a set of key characteristics that are included in the ecological site description. Ecological sites have characteristic soils that have developed over time throughout the soil development process. The factors of soil development are parent material, climate, living organisms, topography or landscape position, and time.

An ecological site has a characteristic hydrology, particularly infiltration and runoff, that has developed over time. The development of the hydrology is influenced by development of the soil and plant community.

An ecological site has evolved a characteristic plant community and amount of vegetation. The development of the vegetation, the soil, and the hydrology are all interrelated. Each is influenced by the others and influences the development of the others. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species, or in total production.

An ecological site evolved with a characteristic fire regime. Fire frequency and intensity contributed to the characteristic plant community of the site.

Soils with like properties that produce and support a characteristic native plant community are grouped into the same ecological site.

An ecological site is recognized and described on the basis of the characteristics that differentiate it from other sites in its ability to produce and support a characteristic plant community.

(b) Succession and Retrogression

Succession is the process of soil and plant community development on an ecological site. Retrogression is the change in vegetation away from the historic climax plant community due to mismanagement or severe natural climatic events.

Succession occurs over time and is a result of interactions of climate, soil development, plant growth, and natural disturbances and conditions existing on the ecological site. Plant succession is defined as the progressive replacement of plant communities on an ecological site that leads to development of the historic climax plant community.

Primary succession is the formation process that begins on substrates having never previously supported any vegetation (lava flows, volcanic ash deposits, etc.). Secondary succession occurs on previously formed soil from which the vegetation has been partially or completely removed.

In some locations, primary succession was never completed before the site was disturbed by human intervention. An example is the historic lakebed of Lake Bonneville in the Great Basin area of Utah, Nevada, and Idaho.

Ecological site development, along with associated climatic conditions and normal disturbances (fire, flooding, etc.) produces a plant community in dynamic equilibrium with these conditions This plant community is referred to as the historic climax plant community. Vegetation dynamics on an ecological site includes succession and retrogression. The pathway of secondary succession is often not simply a reversal of disturbances and/or stressors responsible for retrogression and may not follow the same pathway as primary succession.

(c) Historic Climax Plant Communities

The historic climax plant community for a site in North America is the plant community that existed at the time of European immigration and settlement. It is the plant community that had developed as a result of all site forming factors and was best adapted to the unique combination of environmental factors associated with the site. The historic climax plant community was in dynamic equilibrium with its environment. It is the plant community that was able to avoid displacement by the

suite of disturbances and disturbance patterns (magnitude and frequency) that naturally occurred within the area occupied by the site. Natural disturbances, such as drought, fire, and insects were inherent in the development and maintenance of these plant communities. The effects of these disturbances are part of the range of characteristics of the site that contribute to that dynamic equilibrium. Fluctuations in plant community structure and function caused by the effects of these natural disturbances establish the boundaries of dynamic equilibrium. They are accounted for as part of the range of characteristics for an ecological site. Some sites may have a small range of variation, while others have a large range. Plant communities that are subjected to abnormal disturbances and physical site deterioration or that are protected from natural influences, such as fire, for long periods seldom typify the historic climax plant community.

(d) State and Transition Models

A state and transition model will be utilized to describe vegetation dynamics and management interactions associated with each ecological site. A state and transition model provides a method to organize and communicate complex information about vegetation response to disturbances (fire, lack of fire, drought, insects and disease) and management.

A state is a recognizable, relatively resistant and resilient complex with attributes that include a characteristic climate, the soil resource including soil biota and the associated above ground plant communities. The soil and vegetative components are inseparably connected through ecological processes that interact to produce a sustained equilibrium. The primary ecological processes are water cycle, nutrient cycle, and the process of energy capture. Each state has distinctive characteristics, benefits, and values depending upon the intended use, products, and environmental effects desired from the site.

Two important attributes of a state are resistance and resilience. Resistance refers to the capability of the state to absorb disturbance and stresses and retain its ecological structure. Resilience refers to the amount of disturbance or stress a state can endure and still regain its original function after the disturbances and stresses are removed.

States are relatively stable and resistant to change caused by disturbances up to a threshold point. A threshold is the boundary between two states such that one or more of the ecological processes has been irreversibly changed and must be actively restored before return to a previous state is possible. Additional thresholds may occur along the irreversible portion of a transition causing a change in the trajectory toward another state, as illustrated in Figure 537 - 1. Once a threshold is crossed a disequilibrium among one or more of the primary ecological processes exists and will be expressed through changes in the vegetative community and eventually the soil resource. A new stable state is formed when the system reestablishes equilibrium among its primary ecological processes.

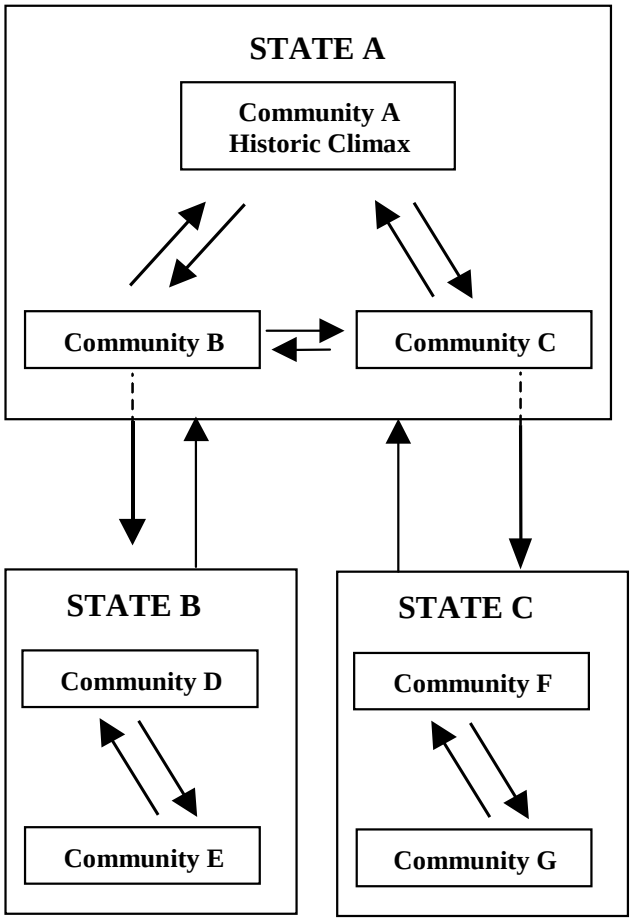
Transition is the trajectory of system change between states that will not cease before the establishment of a new state. Transitions can be triggered by natural events, management actions, or both. Some transitions may occur very quickly and others over a long period of time. Two portions of a transition are recognized: reversible and irreversible. Prior to crossing a threshold, a transition is reversible and represents an opportunity to reverse or arrest the change. Vegetation management practices and, if needed, facilitating practices are used to reverse the transition. Once a threshold is crossed, the transition is irreversible without significant inputs of management resources and energy. Significant inputs are associated with accelerating practices such as site preparation, timber stand improvement, and tree planting.

States are not static as they encompass a certain amount of variation due to climatic events, management actions, or both. Dynamics within a state do not represent a state change since a threshold is not crossed. In order to organize information for management decision making purposes, it may be desirable at times to describe these different expressions of dynamics within the states. These different vegetative assemblages within states will be referred to as plant communities and the change between these communities as community pathways.

Figure 537 - 1 illustrates the different components of a state and transition model diagram for an ecological site. States are represented by the large boxes and are bordered by thresholds. The small boxes represent plant communities with community pathways representing the cause of change between communities. The entire trajectory from one state to another state is considered a transition (i.e., from State A to State B). The portion of the transition contained within the boundary of a state is considered reversible with a minimum of input from management. Once the transition has crossed the threshold it is not reversible without substantial input (accelerating practices). The arrow returning to a

previous state (State B to State A) will be utilized to designate types of accelerating practices needed.

Figure 537 - 1 State and transition diagram example



(e) Naturalized Plant Communities

Ecological site descriptions are to be developed for all identified sites on forestland. In some parts of the country, however, the historic climax plant community has been destroyed, and it is impossible to reconstruct that plant community with any degree of reliability. In these regions, site descriptions will be developed using the naturalized plant communities for the site. The use of this option for ecological site descriptions is limited to those parts of the country where the historic climax plant community has been destroyed and cannot be reconstructed with any degree of reliability. An example of the areas in the United States where this may be used is the state of Hawaii, the Caribbean Area, and the annual grasslands of California. Approval to describe additional forestland ecological regions in this way must be obtained from the national program leader for forest ecology.

(f) Permanence and Change of Ecological Site Potential

Retrogression can occur on an ecological site resulting in a number of different states depending on the type of disturbances, the sequence of disturbances, climatic variations, and other variables. Some states that are considered vegetative expressions of degraded historic climax plant communities are stable and can persist for many years without evidence of secondary succession. This persistence may extend beyond practical timeframes for use and management planning. As long as the physical environment supporting these states remains similar to those required by the historic climax plant community, change to another ecological site is not recognized. The ecological potential for the site is not considered to have been altered merely because the present state is stable and can persist for many years.

Severe physical deterioration can permanently alter the potential of an ecological site to support the original plant community. Examples include permanently lowering the water table, severe surface drainage caused by gullying, and severe soil erosion by water or wind. When the ecological site's potential has significantly changed, it is no longer considered the same site. A change to another ecological site is then recognized, and a new site description may need to be developed on the basis of its altered potential.

Some ecological sites have been planted or seeded to introduced species. The introduced species may become well established or naturalized to the site. They may dominate the site, or they may continue to occupy part of the site even when secondary succession has restored the plant community to near historic climax conditions. In these cases a change in ecological site is not recognized because the edaphic and climatic potential for the site has not been altered.

(g) Determining Characteristic States

Where possible, the historic climax plant community for each ecological site is to be determined. Where it is not possible to determine the historic climax plant community, the naturalized plant community will be described. In addition to the historic climax plant community or naturalized plant community, other known states occurring on the site are to be included in the ecological site description.

The description of each state should be considered as an approximation subject to modification as additional knowledge is gained. Every effort should be made to examine plant communities within the ecological site's area of occurrence during different seasons and in different years. This is necessary to adequately describe the vegetation dynamics within a site.

Characteristics of a state obtained from a single source or site are not conclusive for describing the state. In evaluating plant information, consideration must be given to many factors including:

- Effects of fire or lack of fire
- Impacts of grazing or browsing animals
- Impacts of insects or diseases
- Soil erosion or deposition by wind or water
- Drought or unusually wet years
- Variations in hydrology and storm events
- Introduced plant species

The following methods are used in determining the characteristic states of an ecological site:

- Identification and evaluation of reference sites with similar plant communities and associated soils. When describing the historic climax plant community, the reference sites should not have been subjected to abnormal disturbances (or the lack of normal disturbance). The productivity and the species composition of the plant community should be evaluated.
- Evaluation and comparison of the same ecological sites occurring in different areas, but that have experienced different levels of disturbance and management. Further comparison should be made with areas that are not disturbed. Projecting the response of plant species to given disturbances and relating the present day occurrence of species on a site to past disturbances (type and extent of disturbance, frequency, and magnitude) provides a basis for approximating certain vegetative characteristics of the plant community.
- Evaluation and interpretation of research data dealing with the ecology, management, and soils of plant communities.
- Review of historical accounts, survey and military records, and botanical literature of the area.

The Ecological Site Inventory (ESI) database can provide useful data in identifying plant communities. This database can be accessed on the internet at:

http://plants.usda.gov/esis

(h) Differentiation Between Ecological Sites

The following criteria are used to differentiate one ecological site from another:

- Significant differences in the species or species groups that are in the historic climax plant community.
- Significant differences in the relative proportion of species or species groups in the historic climax plant community.
- Significant differences in the total annual production of the historic climax plant community.
- Soil factors that determine plant production and composition, the hydrology of the site, and the functioning of the ecological processes of the water cycle, mineral cycles, and energy flow.

Contrasting conditions in the soil characteristics, climate, topography, and other environmental factors known to be associated with a specific ecological site can be used as a means of identifying the site when the historic climax plant community is absent.

Generally, one species or a group of species dominates a site. Dominant status does not vary from place to place or from year to year. Because of their stability in the historic climax plant community, dominant species can often be used to distinguish sites and to differentiate one site from another. When dominant species are in equal proportion, species in minor proportions can be used to distinguish sites.

In evaluating the significance of kinds, proportion, and production of species or species groups that are dominant in a historic climax plant community, and given different soil characteristics, the relative proportion of species may indicate whether one or more ecological sites are involved. For example, in one area the historic climax plant community may consist of 60 percent green ash and 10 water oak, and in another area it may consist of 60 percent water oak and 10 percent green ash. Thus, two ecological sites are recognized. Even though the production and species are similar, the proportion's difference distinguish them as separate sites.

In identifying an ecological site, consideration must be given to its environment as a whole, as well as to the individual components. The effect of any single environmental factor can vary, depending on the influence of other factors. For example, an additional 2 inches of annual rainfall may be highly important in a

section of the country that has an arid climate, but of minor significance in a humid climate. Similarly, a difference in site index of 10 feet may be of minor importance on ecological sites capable of producing site indices of 250 feet. This difference, however, is highly significant on sites capable of producing site indices of only 60 feet. Similar variations in degree of significance apply to most factors of the environment. Consequently, in identifying an ecological site, consideration must be given to its environment as a whole, as well as to the individual components.

Where changes in soils, aspect, topography, or moisture conditions are abrupt, ecological site boundaries are distinct. Boundaries are broader and less distinct where plant communities change gradually along broad environmental gradients of relatively uniform soils and topography. Making distinctions between ecological sites along a continuum is difficult. Thus, the need for site differentiation may not be readily apparent until the cumulative impact of soil and climatic differences on vegetation is examined over a broad area. Although some plant communities may appear to be along a continuum, distinctive plant communities can be identified and described. Of necessity, boundaries between ecological sites along a continuum of closely related soils and a gradually changing climate are somewhat arbitrary.

At times, normally less frequently occurring plants may increase on a site, or the site may be invaded by plants not formerly found in the historic climax plant community. The presence or absence of these plants may fluctuate greatly because of differences in microenvironment, weather conditions, or human actions. Consequently, using them for site identification can be misleading, so they should not be used to differentiate sites. Site differentiation, characterization, and determination are based on the plant community that develops along with the soils. A study of several locations over several years is needed to differentiate and characterize a site.

(i) Native and Naturalized Pasture

Forestland ecological site descriptions will be developed for land previously managed as native and naturalized pasture where they occurred on forest soil.

If forestland ecological site descriptions have not been developed, or if they do not adequately serve the purpose, native and naturalized pasture forage suitability groups will be developed as the basic interpretive or suitability grouping for native and naturalized pasture. Native and naturalized pasture forage suitability groups consist of one or more soils capable of producing similar kinds and amounts of herbaceous natural vegetation. These soils generally are also capable of producing similar kinds and amounts of overstory trees.

Forestland ecological site descriptions used for native and naturalized pasture must have details about the herbaceous native and naturalized plant community, its production potential, and other pertinent features. The natural tree overstory part of the description will be omitted only if not known. The state forester and state grazing lands specialist, working as a team, have the responsibility of identifying and describing forestland ecological sites with native and naturalized pasture. Assistance from soil scientists and biologists will be requested as needed.

(j) Correlating Ecological Sites

Soil-ecological site correlation establishes the relationship between soil components and ecological sites. Ecological sites are correlated on the basis of soils and the resulting differences in species composition, proportion of species, and total production of the historic climax plant community. Sometimes it is necessary to extrapolate data on the composition and production of a plant community on one soil to describe the plant community on a similar soil for which no data are available. The separation of two distinct soil taxonomic units does not necessarily delineate two ecological sites. Likewise, some soil taxonomic units occur over broad environmental gradients and may support more than one distinctive historic climax plant community. Changes may be brought about by other influences, such as an increase or decrease in average annual precipitation.

Ecological sites are to be correlated between states. Only one Site ID should be given to a single site that occurs in adjacent states within the same MLRA.

The following procedures for soil-ecological site correlation are compatible with the procedures detailed in the National Soil Survey Handbook, Part 627.09.

(1) Responsibilities of State Conservationists

- Maintaining all ecological site inventory data and descriptions within their state
- Proposing and developing new sites
- Consulting with administrators of cooperating agencies for correlating all sites within their states
- Designating which state is responsible for maintaining and updating the ecological site

descriptions when a site occurs in more than one state

(2) Responsibilities of Field Personnel of All Cooperating Agencies

- Collecting the necessary documentation for each site
- Proposing draft descriptions for consideration and approval by the appropriate technical specialist of the agency responsible for the survey

(3) Guidelines for Internal Consistency of Soil-Ecological Site Correlation

- Portray each individual feature with the narrowest feasible range of characteristics that accurately describes the site. For example, portray elevation in relation to aspect. Exclude exceptions that result from unique combinations of features in the described range of characteristics. Discuss the exception in the narrative
- Check that all combinations of features are compatible with the range of characteristics that are described for each individual feature. Coordinate the soil moisture and temperature with the climatic features described. Review the compatibility of listed plant species and the soil properties listed under soil features. Check for other apparent inconsistencies.

(4) Guidelines for Correlation Between Sites

- Make and document comparisons of site descriptions when proposing new sites, reviewing existing sites, or correlating between survey areas, major land resource areas, or states.
- Compare all sites that have two or more major species in common and all sites that have the same soil family, groups of similar families, or other taxa.

537.31 Ecological Site Descriptions

An ecological site description is prepared for each ecological site identified. Descriptions should clearly present the features that characterize the site. They are to address all the resources of the site that are important for identifying, evaluating, planning, developing, managing, and monitoring forestland resources. Descriptions are developed as part of the Ecological Site Information System (ESIS) using the ecological site description format. ESIS is the official repository for all data associated with forestland ecological site descriptions. The state office is responsible for entry and maintenance of site descriptions in this database. Refer to the National Forestry Handbook, Part 637 for detailed instructions on entering data into the ESIS database. The ESIS database can be accessed on the internet at http://plants.usda.gov/esis.

The data comprising a forestland ecological site description is presented in four major categories:

- Site Characteristics
- Plant Communities
- Site Interpretations
- Supporting Information

The following describes the data presented within each of these four sections.

(a) Site Characteristics

The Site Characteristics category identifies the site and describes the physiographic, climate, soil, and water features associated with the site.

(1) Site Type

The subdivision into which forestland and rangeland are divided for study, evaluation, and management. Ecological site descriptions provide the basic data for planning the use, development, rehabilitation, and management of ecological sites.

Forestland ecological sites and rangeland ecological sites are separated based on the historic climax plant community. Where it is not possible to determine the historic climax plant community, the naturalized plant community will be used to differentiate forestland from rangeland ecological sites.

A site type of “forestland” is assigned and described where a 25% overstory canopy of trees, as determined by crown perimeter-vertical projection, dominated this historic vegetation. A tree is defined as a woody-stemmed plant that can grow to 4 meters in height at maturity on the site being described.

A site type of “rangeland” is assigned where overstory tree production was not significant in the climax vegetation. Refer to the National Range and Pasture Handbook for details on developing ecological site descriptions for "rangeland" ecological types.

To determine site type in juniper and pinyon plant communities in the western United States use the criteria contained in the publication *Inventorying, Classifying, and Correlating Juniper and Pinyon Communities to*

Soils in Western United States published September 1997 by the Grazing Lands Technology Institute, NRCS, USDA.

(2) Site Name

Descriptive text used to differentiate one forestland ecological site from another. Forestland ecological sites are named to help users recognize the different forestland sites in their locality.

Forestland ecological sites are named using the scientific names of the vegetation comprising the historic climax plant community. Where it is not possible to determine the historic climax plant community, the sites will be named using the scientific names of the vegetation comprising the naturalized plant community, or other plant communities that comprise the known steady states of vegetation.

The source for scientific names shall be the National Plants Database. The ecological site name shall consist of one or two overstory tree species, one or two understory shrubs and one or two herbaceous species. If more than one species of overstory trees, understory shrubs, or herbaceous species is named, each shall be separated by a "-". The major groupings (trees, shrubs, and herbaceous) shall be separated by a "/".

Example:

Quercus nigra-Quercus phellos/Ilex decidua/Panicum anceps-Carex

Refer to the National Range and Pasture Handbook for details on naming rangeland ecological sites.

Because the interpretive plant community may be either the historic climax plant community or, where applicable, the naturalized plant community**, the first sentence in the interpretive plant community narrative should clearly state whether the interpretive plant community described is the historic climax or the naturalized plant community**.

(3) Site ID

A unique identifier assigned to each named ecological site.

The Site ID consists of five parts:

- The first part of the ecological site id is a letter "F" if the ecological site type is forestland or the letter "R" if the ecological site type is rangeland.
- The second part is a three-digit number and a one-digit letter designating the Major Land Resource Area (MLRA). If the MLRA is only two numbers and no letters, a zero is inserted in the first space followed by the two numbers. The letters A, B, C, etc. following the MLRA represent the MLRA subdivision. An X in the fourth space denotes that there is no MLRA subdivision.
- The third part is a single letter designating the Land Resource Unit (LRU), where applicable. A Y is inserted when LRU's are not used.
- The fourth part is a three digit number representing the individual ecological site number as assigned by the state. The number 0 is placed in front of all state-assigned site numbers less than 100.
- The fifth part is the two-letter state postal code of the state developing the site description.

Examples:

F133BY083AR (forestland ecological site)

R070CY003NM (rangeland ecological site)

(4) Representative Physiographic Features

This section contains a narrative description of the physiographic features representative of the site and the data relative to the following physiographic features.

(i) Landform

Descriptive name(s) representative of the surface features of the site. Up to three landform feature names may be listed. The landform feature name(s) listed are those associated with the soil component(s) comprising the site as recorded in NASIS.

(ii) Elevation

The minimum and maximum elevation, in feet, representative of the site. The representative values should correspond to those recorded in NASIS for the soil components comprising the site.

(iii) Slope

The minimum and maximum slope percent representative of the site. The representative values should correspond to those recorded in NASIS for the soil components comprising the site.

(iv) Water Table Depth

The minimum and maximum depth to the water table, in inches, representative of the site. The representative values should correspond to those recorded in NASIS for the soil components comprising the site.

(v) Flooding
The minimum and maximum values for flooding frequency and duration representative of the site. The representative values should correspond to those recorded in NASIS for the soil components comprising the site.

(vi) Ponding
The minimum and maximum values for ponding frequency, duration, and depth representative of the site. The representative values should correspond to those recorded in NASIS for the soil components comprising the site.

(vii) Runoff Class
The minimum and maximum values of the runoff potential class representative of the site. The representative values should correspond to those recorded in NASIS for the soil components comprising the site.

(viii) Aspect
The direction toward which the surface of the soil faces, expressed as a cardinal direction - North, South, East, West, Northeast, Northwest, Southeast, and Southwest. Up to three cardinal directions may be entered. The aspect of a site is normally of importance only on sites with slopes of 15% or greater.

(5) Representative Climatic Features
This section contains a narrative description of the climatic features representative of the site and the data relative to the following climatic features.

(i) Frost-free Period
The representative minimum and maximum number of days when no frost occurs. Frost may occur even when the official temperature is above freezing as the ground can be colder than where the thermometer is located.

(ii) Freeze-free Period
The representative minimum and maximum number of days when the temperature is a above 32 degrees F.

(iii) Mean Annual Precipitation
The representative minimum and maximum average precipitation the site receives annually, in inches.

(iv) Monthly Precipitation and Temperature
The representative monthly average minimum and maximum precipitation (in inches) and temperature (in degrees Fahrenheit) on the site.

(v) Climate Stations
The unique identifier(s) and name(s) of the climate stations from which the climate data was derived. The period of record (i.e. 1954-1994) for each climate station should also be recorded.

(6) Influencing Water Features
This section contains a narrative description of the influencing water features representative of the site and the data relative to the following water features.

(i) Wetland Description
A listing of the wetland system(s) and associated subsystem(s) and class(es) representative of the site, based on the Cowardin wetland classification system.

(ii) Stream Types
A listing of the stream code(s) and associated narrative(s) describing the various stream type(s) representative of the site, based on the Rosgen classification system (applicable only when the Cowardin wetland system is classified as riverine).

(7) Representative Soil Features
This section contains a narrative description of the soil features representative of the site and the data relative to the following soil features.

(i) Predominant Parent Materials
The kind and origin of the parent material predominant on the site. These values should correspond to those recorded in NASIS for the soil components comprising the site.

(ii) Surface Texture
The representative texture class(es) and texture modifier within a specified depth of the soil surface. Up to three surface textures may be recorded. The depth should be recorded in the narrative for representative soils features. These values should correspond to those recorded in NASIS for the soil components comprising the site.

(iii) Subsurface Texture Group
A general term used to denote the predominant texture group in the soil horizons within a specified depth of the soil surface. The soil texture classes assigned to each group are: Sandy - cos, s, fs, vfs, lcos, ls, lfs, lvfs; Loamy - cosl, sl, fsl, vfsl, l, si, cl, scl, sicl; and Clayey - sc, sic, c. These values should correspond to those recorded in NASIS for the soil components comprising the site. The depth should be recorded in the narrative for representative soils features.

(iv) Surface Fragments <=3"

The representative percent of the ground covered by fragments less than or equal to 3" in size on the site. These values should correspond to those recorded in NASIS for the soil components comprising the site.

(v) Surface Fragments >3"
The representative percent of the ground covered by fragments greater than 3" in size on the site. These values should correspond to those recorded in NASIS for the soil components comprising the site.

(vi) Subsurface Rock Fragments <=3"
The representative percent by volume of the rock fragments less than or equal to 3" in size in the soil horizons to a specified depth These values should correspond to those recorded in NASIS for the soil components comprising the site. The depth should be recorded in the narrative for representative soils features.

(vii) Subsurface Rock Fragments >3"
The representative percent by volume of the rock fragments greater than 3" in size in the soil horizons to a specified depth. These values should correspond to those recorded in NASIS for the soil components comprising the site. The depth should be recorded in the narrative for representative soils features.

(viii) Drainage Class
The range of drainage classes representative of the site. This value should correspond to that recorded in NASIS for the soil components comprising the site.

(ix) Permeability Class
The range of permeability classes representative of the site. This value should correspond to that recorded in NASIS for the soil components comprising the site.

(x) Soil Depth
The representative minimum and maximum depth of the soil to the first restrictive layer, in inches. These values should correspond to those recorded in NASIS for the soil components comprising the site.

(xi) Electrical Conductivity
The representative minimum and maximum values for the electrical conductivity of the soil within 40 inches of the soil surface or to the first restrictive layer, in millimhos per centimeter. These values should correspond to those recorded in NASIS for the soil components comprising the site.

(xii) Sodium Adsorption Ratio
The representative minimum and maximum values for the sodium adsorption ration of the soil within 40 inches of the soil surface or to the first restrictive layer. These values should correspond to those recorded in NASIS for the soil components comprising the site.

(xiii) Soil Reaction (1:1 Water)
The representative minimum and maximum values for the pH of the soil as measured by the 1:1 water method within 40 inches of the soil surface or to the first restrictive layer. The 1:1 water method is general used for all soils except Histosols. These values should correspond to those recorded in NASIS for the soil components comprising the site.

(xiv) Soil Reaction (0.01M CaC12)
The representative minimum and maximum values for the pH of the soil as measured by the 0.01M calcium chloride method within 40 inches of the soil surface or to the first restrictive layer. The 0.01M calcium chloride method is general used for soils with organic horizons. These values should correspond to those recorded in NASIS for the soil components comprising the site.

(xv) Available Water Capacity
The representative minimum and maximum values for the total available water capacity within 40 inches of the soil surface or to the first restrictive layer, in inches. These values should correspond to those recorded in NASIS for the soil components comprising the site.

(xvi) Calcium Carbonate Equivalent
The representative minimum and maximum values for the percent calcium carbonate equivalent within 40 inches of the soil surface or to the first restrictive layer. These values should correspond to those recorded in NASIS for the soil components comprising the site.

(xvii) Soil Survey Associations
A listing of the soil the soil map unit symbols, soil map unit names, and soil components/phases in specified soil surveys that are associated with the site. The soil map unit symbols, soil map unit names, and soil

components/phases should correspond to those recorded in NASIS for the specified soil surveys listed.

(b) Plant Communities

Included in this category are:

- Description of the ecological dynamics of the site
- State and Transition Model diagram
- Description of the common states that occur on the site and the transitions between the states. If needed, describe the communities and community pathways within the state
- Ground cover and structure
- Overstory and understory composition and production
- Photos of each state or community

(1) Ecological Dynamics of the Site

A narrative and graphical representation (state and transition model) describing the states and transitions between the states. The narrative may include, but is not limited to a discussion of:

- The known causes of plant community changes and the patterns of succession shifts or change.
- The effects that variations in non-management type events (weather, wind, fire, flood, etc.) may have on the dynamics of the site.
- The effects that management activities (grazing, fire, silvicultural, etc.) may have on the dynamics of the site.

(2) Plant Community Narrative

This section provides a narrative description of the interpretive plant community and other common plant communities comprising the various vegetation states of the site.

The narrative should describe the structure, appearance, and function of each of the common plant communities. Include the assumptions made of how the site developed (fire, cultural activities, etc.).

Because the interpretive plant community may be either the historic climax plant community or, where applicable, the naturalized plant community**, the first sentence in the interpretive plant community narrative should clearly state whether the interpretive plant community described is the historic climax or the naturalized plant community**.

(3) Ground Cover and Structure

This section lists the percent ground cover by height class (feet) for various cover types -- tree, shrub/vine, grass/grasslike, forb, lichen, moss, microbiotic crusts, coarse fragment, bareground, and litter. The percent ground cover for living cover is the percent of the ground covered by live foliar vegetation looking from the vertical view, in order of plant layer stratification (See Figure 537 - 2). The total percentage can exceed 100%.

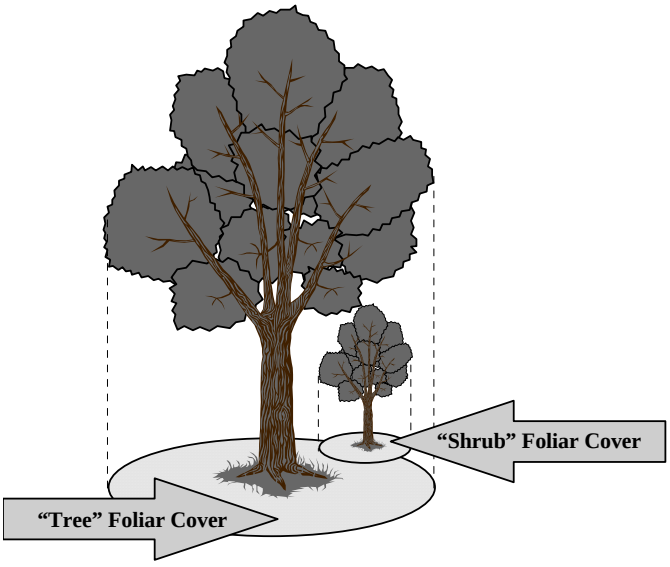
(4) Forest Overstory and Understory Composition

This section contains a narrative description and the percent composition by frequency of the overstory species. The total percent composition must equal 100%.

(5) Forest Understory

This section contains a narrative and the typical annual production of understory species under a minimum, maximum and representative canopy cover. Understory species are those 4.5 feet in height or less. The annual production is recorded in percent of composition and pounds of air-dry weight per acre.

Figure 537 - 2 Vegetation foliar cover



(6) Typical Site Photo
If available, a photograph of a typical site may be included for each state or community.

(c) Site Interpretations

This category contains interpretive information pertinent to the use and management of the site and its related resources.

(1) Forest Site Productivity
This section lists the minimum and maximum site index and annual productivity of the major tree species. The annual productivity per acre per year in cubic feet at culmination of mean annual increment (CMAI) is listed for each identified species. Annual productivity per acre per year in other common units of measurement, (boardfoot-doyle, i.e.), may also be listed for one or more of the identified species.

These values should correspond to those recorded in NASIS for the corresponding soil components and tree species.

(2) Animal Community
This section contains a narrative description of the animal communities associated with the site. The narrative should include information about the type of forage and cover the site affords specific animals, management implications, impacts, etc.

(3) Plant Preference by Animal Kind
This section contains a listing of plant preferences by various animals. For each animal, preference rating is listed for various plant species during each month of the year. Additionally, preference ratings may be listed for the different plant parts (leaf, flower, etc.) of each identified plant species.

(4) Hydrology Functions
This section contains a narrative description of the hydrology of the site. The narrative should include such information as climatic patterns (storm events, rainfall distribution, etc.), landscape position, flooding and/or ponding susceptibility, erosion potentials, concentrated flow characteristics, etc.

(5) Recreational Uses
This section contains a narrative description of the potential recreational uses that the site can support or which may influence the management of the site. List special concerns that will maintain the recreational potentials or site conditions that may limit its potential. Also, list plant species that have special aesthetic values, uses, and landscape value.

(6) Wood Products
This section contains a narrative description of the kinds of wood products the site is capable of producing and any potential impact that may influence the management of the site as a result of producing these products.

(7) Other Products
This section contains a narrative description of potential uses of other products produced on the site. These may include such things as landscape plants, biomass, mushrooms, berries, ferns, nuts, etc.

(8) Other Information
This section contains a narrative description of other pertinent, interpretive, and descriptive information relative to the site.

(d) Supporting Information

This category contains information useful in assessing the quality of the site description and its relationship to other ecological sites.

(1) Associated Sites
This section contains information about other forestland ecological sites that are commonly located in conjunction with the site. This information includes the site name and site id of each associated site and a narrative describing similarities and differences to the site being described.

(2) Similar Sites
This section contains information about other sites that resemble or can be confused with the site. This information includes the site name and site id of each similar site and a narrative describing the similarities to the site being described.

(3) State Correlation
This section contains a listing of other state(s) using the site description of the site being described.

(4) Inventory Data References
This section contains a narrative description of how data about the interpretive plant community was obtained and a listing of the site inventory plots supporting the site

description. This list records the data source and sample id of each inventory plot used in the development of the site description.

(5) Type Locality
This section contains information about the physical location of sites that typify the site being described. The latitude and longitude of each typifying site will be recorded. The township, range, section, and a general description of the location may also be recorded.

(6) Relationship to Other Established Classifications
This section contains a listing of other classification systems that describe sites similar to the site being described.

(7) Other References
This section contains a list of references used in the development of the site or references that aid in understanding the ecological dynamics of the site.

(8) Site Description Approval
This section contains the name, title, affiliation and date of the individuals that developed/revised and approved the site description.

(e) Revising Ecological Site Descriptions

Analysis and interpretation of new information about the soil, vegetation, and other on-site environmental factors may reveal a need to revise or update ecological site descriptions. Because the collection of such information through resource inventories and monitoring is a continuous process, site descriptions should be periodically reviewed for needed revision. It is especially important that site descriptions be reviewed when new data on composition, production, or response to disturbance become available. Documented production and composition data, along with related soil, climate, and physiographic data, will be the basis of the site description revisions or new site descriptions.

(f) Developing New Site Descriptions

A new site description should be prepared when data analysis or new information reveals that a different or new ecological site exists. Generally, enough land area must be identified to be of importance in the management or study of the site before a new site will be developed and described.

A new ecological site may be differentiated from an existing site when sufficient erosion or other action has occurred to significantly alter the site's potential.

537.32 Ecological Sites and Soil Surveys

NRCS policy dictates mapping of soils and the publication of soil surveys that contain essential information for use in conservation and resource planning activities. These surveys must meet the requirements of the National Cooperative Soil Survey program (see National Soil Survey Handbook, part 606).

The National Soil Survey Handbook, parts 622 and 627, establishes responsibility for planning soil surveys. Soil scientists and forestry discipline specialists work together to map soils and ecological sites in forestland areas. Essential activities include development of soil survey work plans, determination of composition of soil mapping units, preparation of map legends, determination of mapping intensity, and necessary field reviews.

(a) Using Soil Surveys to Identify Ecological Sites

Where Order II soil surveys are completed and ecological site interpretations have been made, boundaries of ecological sites can generally be determined directly from the soil map.

Order III mapping describes individual soil and plant components at association or complex levels. This requires that mapping unit descriptions be developed that describe each association component and assign locations and percentages to each. Individual ecological sites must be described at a level equivalent to the individual components of the Order III soils map.

Each ecological site will be assigned a unique number that distinguishes it from all other ecological sites. This unique 10-character number will be correlated to each soil series or taxonomic unit that occurs within the ecological site. This number and site name will be input into NASIS or other applicable soils data base.

537.33 Ecological Site Inventory

Vegetation sampling is an important activity conducted by Natural Resources Conservation Service (NRCS).

The data are used to develop inventories for planning, to monitor ecological change, to provide data to make management decisions, for the development of ecological site descriptions, and for many other purposes. An inventory is defined as the collection, assemblage, interpretation, and analysis of natural resource data for planning or other purposes. Inventories are regularly completed to determine the present status of variables important to NRCS and decisionmakers. Production and composition by species are used by NRCS in characterizing ecological sites.

(a) Forest Plot Inventory

The ESI Forest Plot Field Worksheet is used to record forest plot inventory information. Refer to the National Forestry Handbook, Part 637 for detailed instructions on the collection of forest plot data, completion of the ESI Forest Plot Field Worksheet, and use of the Ecological Site Inventory database.

(1) Minimum Forest Plots

Table 537-1 lists the minimum number of plots required for major species for each wood-producing soil component identified within a soil survey area.

Table 537- 1 Minimum plots by soil component extent

Soil Component Extent	Acreage (thousands)	No. of plots (National Comparison)
Small	<10	3
Moderate	10 - 100	5
Large	>100	8

(2) Class-determining and Local Phases

Some soil components have class-determining and/or local phases based on productivity or species composition. In such cases, the minimum standards apply for each phase. Existing conditions on certain soil components and/or phases, such as recent harvesting, may preclude obtaining sufficient data. In addition, some species do not have established site index curves. These cases are exempt from the minimum plot standards.

(3) Comparison Data

Data from other soil surveys for a particular soil component or phase may be used to determine site index values if: (1) a minimum of 3 verification plots is taken, or (2) the data source is footnoted.

(4) Measurement Integrity

For all plots on a soil component or phase, the variance of site index values for the indicator species should not exceed a standard deviation value of 10. If the standard deviation of the plots taken is greater than 10, then: (1) increase the number of plots, or (2) determine if a class-determining phase of the soil component or a new soil component is warranted.

(5) Documentation

Site index information published in soil surveys, ecological site descriptions, special reports, and other documents used by the public will list the mean site index for the soil component or phase for its entire geographic extent or for the specific soil survey area. Where the site index displayed does not meet standards of sampling and analysis, clearly note that the standards of sampling and analyses are not met.

(b) Conservation Tree/Shrub Plot Inventory

The ESI Windbreak Plot Field Worksheet is used to record plot data for conservation tree/shrub interpretations.

Refer to the National Forestry Handbook, Part 637 for detailed instructions on collection of conservation tree/shrub plot data, completion of the ESI Windbreak Plot Field Worksheet, and use of the Ecological Site Inventory application to record plot data.

(c) Ecological Site Inventory (ESI) Application

The Ecological Site Inventory (ESI) application provides the capability to enter, edit, and retrieve range, forestry, and agroforestry plot data. ESI is the official repository for all plot data collected via the ESI Forest

Plot Field Worksheet, the ESI Windbreak Plot Field Worksheet, and the Production and Composition Record For Native Grazing Lands (ECS-417).

Refer to the National Forestry Handbook, Part 637 for detailed instructions on the completion of the ESI Forest and Windbreak Plot Field Worksheets, and use of the Ecological Site Inventory database.

Refer to the National Range and Pasture Handbook for detailed instructions on the collection of range plot data.

Part 537-4 - Exhibits

Exhibit 537-1 National Register of Site Index Curves

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Abies amabilis Pacific silver fir ABAM	05 100TA Hoyer, Herman 1989	Entire Range	Not Needed								
Abies balsamea balsam fir ABBA	010 50TA Gevorkiantz 1956a	Northeast	**SI** **Years**	30 15	40 13	50 11	60 9	70 8			
	011 50TA Carmean, Hahn 1981	Lake States	**SI** **Years**	20 15	30 13	40 11					
	020 50TA Lloyd 1970a	Northeast	**SI** **Years**	30 15	40 13	50 11	60 9	70 8			
Abies concolor white fir ABCO	030 50TA Schumacher 1926	Entire Range	**SI** **Years**	30 16	40 14	50 12	60 10	70 8	80 6	90 5	
	031 50BH Cochran 1979a	East of Cascades in OR and WA	Not Needed								
	032 50BH Dolph 1987	West of Sierra Nevada Range									
	035 50BH SCS 1988a	East of Cascades in OR and WA									
	605 300TA Dunning 1942	California	**SI** **Years**	71-84 12	85-98 10	99-112 8	113+ 6				
Abies fraseri Fraser fir ABFR	020 50TA Lloyd 1970a	Entire Range	**SI** **Years**	30 15	40 13	50 11	60 9	70 8			

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Abies grandis grand fir ABGR	031 50BH Cochran 1979a	East of Cascades in OR and WA	Not Needed								
	570 50TA Haig 1932	Entire Range	**SI Years**	40 9	50 8	60 7	70 7	80 6	90 6		
Abies lasiocarpa *subalpine fir* *ABLA*	412 100BH Alexander 1967		Not Needed								
Abies magnifica California red fir ABMA	050 50TA Schumacher 1928		**SI Years**	30 16	40 14	50 12	60 10	70 8	80 6		
	055 50BH Dolph 1991	WA, OR	Not Needed								
	605 300TA Dunning 1942	California	**SI Years**	71-84 12	85-98 10	99-112 8	113+ 6				
Abies pocera noble fir ABPR	060 100BH Herman, Curtis, DeMars 1978	Entire Range	Not Needed								
Acer nigrum black maple ACNI5	070 50TA Lloyd 1971a		**SI Years**	50 5	60 4	70 3					
Acer rubrum red maple ACRU	094 50TA Lloyd 1971b	Entire Range	**SI Years**	50 5	60 4	70 3					
	095 50TA Carmean 1978	WI, MI	All Sites - 4 years								
Acer saccharinum silver maple ACSA2	070 50TA Lloyd, 1971a	Entire Range	**SI Years**	50 5	60 4	70 3					

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Acer saccharum sugar maple ACSA3	071 50TA Carmean 1978	WI, MI	All Sites - 4 years								
	075 50TA Brendemuehl, McComb, Thomson 1961	Entire Range	**SI** **Years**	50 5	60 4	70 3					
Alnus rubra red alder ALRU2	100 50TA Worthington, Johnson, Staebler, Lloyd 1960	Entire Range	All Sites - 2 years								
	105 20TA Harrigton, Curtis 1986	Western WA and northwest OR	All Sites - 1 year								
Betula alleghaniensis yellow birch BEAL2	120 50TA Lloyd 1971a	Entire Range	**SI** **Years**	50 5	60 4	70 3					
	121 50TA Carmean 1978	WI, MI	All Sites - 4 years								
Betula lenta sweet birch BELE	120 50TA Lloyd 1971a	Entire range	**SI** **Years**	50 5	60 4	70 3					

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Betula papyrifera paper birch BEPA	130 50TA Cooley 1958, 1962	Midwest	**SI Years**	50 5	60 4	70 3					
	131 50TA Carmean 1978	WI, MI	All Sites - 4 years								
	140 50TA Lloyd 1971a	Northeast	**SI Years**	50 5	60 4	70 3					
	141 50BH Gregory, Haack 1965	Alaska									
Calocedrus decurrens incense cedar CADE27	300 50BH Dolph 1983	West of Sierra Nevada Range	Not Needed								
Carya alba mockernut hickory CAAL27	157 50TA Boisen, Newlin 1910	Cumberland Mountains	**SI Years**	30 12	40 10	50 8	60 7	70 6	80 5	90 4	
	158 50TA Boisen, Newlin 1910	Mississippi Valley									
Carya cordiformis bitternut hickory CACO15	151 50TA Boisen 1910	Entire Range									

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Carya glabra pignut hickory CAGL8	153 50TA Boisen 1910	Cumberland Mountains	**SI Years**	30 12	40 10	50 8	60 7	70 6	80 5	90 4	
	154 50TA Boisen 1910	Mississippi Valley									
	155 50TA Boisen 1910	Northern Ohio									
	156 50TA Boisen 1910	Ohio Valley									
Carya illinoinensis pecan CAIL2	330 50TA Broadfoot, Krinard 1959	Entire Range	**SI Years**	55 4	65 3	75+ 2					
Carya. CARYA	150 50TA Boisen 1910	See codes 151-158	**SI Years**	30 12	40 10	50 8	60 7	70 6	80 5	90 4	
Celtis occidentalis common hackberry CEOC	820 50TA Schnur 1937	Entire Range	**SI Years**	30 7	40 6	50 5	60 4	70 3	80 2		
Chamaecyparis thyoides Atlantic white cedar CHTH2	160 50TA Korstian, Brush 1931	Entire Range	**SI Years**	20 11	30 10	40 9	50 8	60 7	70 6	80 5	
Fagus grandifolia American beech FAGR	165 50TA Hampf 1965		**SI Years**	30 9	40 7	50 6	60 5	61-85 4	86+ 3		
	166 50TA Carmean 1978	WI, MI	All Sites - 4 Years								

Scientific Name	Curve	Area	

Common Name NSPNS	Number Age Base Reference	of Use	Age Correction Factor								
Fraxinus americana white ash FRAM2	170 50TA Lloyd 1971a	Entire Range	**SI Years**	50 5	60 4	70 3					
	171 50TA Carmean 1978	WI, MI	All Sites - 4 years								
Fraxinus nigra black ash FRNI	330 50TA Broadfoot, Krinard 1959	Entire Range	**SI Years**	75 5	85 4	95 3					
	331 50Ta Carmean 1978	WI, MI	All Sites - 4 years								
Fraxinus pennsylvanica green ash FRPE	330 50TA Broadfoot, Krinard 1959	Entire Range	**SI Years**	75 5	85 4	95 3					
	332 50TA Broadfoot 1969	LA, MS, AR, TN	All Sites - 2 years								
Gymnocladus diocius Kentucky coffeetree GYDI	820 50TA Schnur 1937	Entire Range	**SI Years**	40 6	50 5	60 4	70 3	80 2			
Juglans nigra black walnut JUNI	190 50TA Kellogg 1939a	Entire Range	**SI Years**	40 5	55 4	75 3	90+ 2				
	191 25TA Losche, Schlesinger	IL (shallow flood plains)	All Sites - 4 years								
	192 25TA Losche, Schlesinger 1975	IL (deep flood plains)									

Scientific Name	Curve	Area	

Common Name NSPNS	Number Age Base Reference	of Use	Age Correction Factor								
Juniperus occidentalis western juniper JUOS	210 50BH Barrett, Sauerwein 1982	Entire Range	Not Needed								
Juniperus osteosperma Utah juniper JUOS	202 N/A Chojnacky 1986	NV									
Juniperus JUNIP Includes: • Juniperus monosperma oneseed juniper JUMO • Juniperus osteosperma Utah juniper JUOS • Juniperus scopulorum Rocky mountain juniper JUSC2 • Juniperus deppeana alligator juniper JUDE2	200 N/A Howell 1940	Pinyon-juniper in west									
Juniperus virginiana eastern redcedar JUVI	220 50TA T.V.A. 1948	Entire Range	**SI** **Years**	20 10	30 7	40 5	50 3				
Larix decidua European larch LADE2	230 50TA Stone 1957	Entire Range (plantations)	**SI** **Years**	50 6	60 5	70 4	80 3				
Larix kaempferi Japanese larch LAKA2	240 50TA Aird, Stone 1955	Entire Range (plantations)	**SI** **Years**	50 6	60 5	70 4	80 3				
Larix laricina tamarack LALA	235 50TA Gevorkiantz 1957a	Entire Range	**SI** **Years**	20 10	30 8	40 7	50 6	60 5			

Scientific Name Common Name	Curve Number	Area of	

NSPNS	Age Base Reference	Use	Age Correction Factor								
Larix occidentalis western larch LAOC	260 50TA Cummings 1937	Montana	**SI Years**	45 9	55 8	65 7					
	261 50BH Cochran 1985	East of Cascades in OR and WA	Not Needed								
	265 50TA Schmidt, Shearer, Roe 1976	West Except Montana	**SI Years**	45 9	55 8	65 7					
Liquidambar styraciflua sweetgum LIST2	330 50TA Broadfoot, Krinard 1959	South, Midwest, and West of Mountains in Northeast	**SI Years**	55 4	65 3	75+ 2					
	340 50TA Trenk 1929	Virginia and east of Mountains in Northeast	**SI Years**	40-55 5	56-75 4	76+ 3					
Liriodendron tulipifera tuliptree LITU	350 50TA Beck 1962	MLRA's 131, 133A, 133B, 134, 135, 136, 137 138, 148, 149A 149B, 152A, 153A, 153B, , 153C, 154, and 155	**SI Years**	75 5	85 4	95+ 3					
	355 50TA Schlaegel, Kulow, Baughman 1969	WV	All Sites - 3 years								
	360 50TA Beck 196	Entire Range (other than listed for curve 350)	**SI Years**	75 5	85 4	95+ 3					
Nyssa aquatica water tupelo NYAQ2	390 50TA Applequist 1959	Entire Range	All Sites - 5 years Age taken at 18 inches above butt swell								

Scientific Name Common Name	Curve Number	Area of	

NSPNS	Age Base Reference	Use	Age Correction Factor								
Nyssa biflora swamp tupelo NYBI	395 50TA Applequest 1959	Entire Range	All Sites - 5 years								
Nyssa sylvatica blackgum NYSY	390 50TA Applequist 1959										
Picea abies Norway spruce PIAB	411 50TA Wlde 1965	WI (plantations)	**SI Years**	40 17	50 15	60 13					
Picea englemannii Engelmanns's spruce PIEN	410 50T Brickell 1966	**NOTE: Code no longer available for use. Replaced by code 412.**	**SI Years**	30 16	40 14	50 12	60 10	70 8	80 6		
	412 100BH Alexander 1967	Entire Rrange	Not Needed								
Picea glauca white spruce PIGL	420 50TA Lloyd 1970a	Northeast	**SI Years**	30 15	40 13	50 11	60 10	70 9			
	421 50TA Gervorkiantz 1957b	MN	**SI Years**	20 15	30 13	40 11	60 9	70 8			
	422 50TA Carmean, Hahn 1981	MN	**SI Years**	20 15	30 13	40 11					
	430 50TA Ferber 1971	Midwest	**SI Years**	30 15	40 13	50 11	60 10	70 9			
	440 100BH Farr 1967	Alaska	Not Needed								

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Picea mariana black spruce PIMA	450 50TA Gevorkiantz 1957c	Entire Range	**SI** **Years**	20 15	30 13	40 11	50 10	60 9			
Picea pungens blue spruce PIPU	410 50TA Brickell 1966	Entire Range	**SI** **Years**	30 16	40 14	50 12	60 10	70 8	80 6		
Picea rubens red spruce PIRU	470 50TA Lloyd 1970b		**SI** **Years**	30 15	40 13	50 11	60 9	70 8			
Picea sitchensis Sitka spruce PISI	490 100TA Meyer 1937		**SI** **Years**	100 10	120 9	140 8	160 7	180 6	200 5		
	491 50BH Farr 1984	Southeast AK	Not Needed								
Pinus banksiana jack pine PIBA2	500 50TA Gevorkiantz 1956b	Entire Range	**SI** **Years**	30 9	40 8	50 7	60 6	70 5			
	501 50TA Wilde, Lyer, Tanser, Trautmann, Watterston 1965	Lake States	**SI** **Years**	30 9	40 8	50 7					
	502 50TA Wilde 1965	WI	All Sites - 4 years								
Pinus cembroides Mexican pinyon PICE	200 N/A Nowell 1940	Pinyon-juniper in West	Not Needed								

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Pinus clausa sand pine PICL	510 50TA Schumacher, Coile 1960	Entire Range	**SI Years**	40 6	50 5	60 4	70 3	80 2			
Pinus contorta Lodgepole pine PICO	520 100TA Alexander 1966		All Sites - 9 years								
Pinus coulteri Coulter's pine PICO3	600 100TA Meyer 1938		**SI Years**	<55 16	55-70 14	71-84 12	85-98 10	99-112 8	113+ 6		
Pinus echinata shortleaf pine PIEC2	530 50TA Coile, Schumacher 1953	Entire Range	**SI Years**	55 6	65 5	76+ 4					
	531 50TA Nash 1963	MO	**SI Years**	30-55 6	56-75 5	76+ 4					
	532 25TA Gilmore, Metcalf 1961	IL (plantations)	**SI Years**	<25 7	25-40 6	>40 5					
Pinus edulis twoneedle pinyon PIED	200 N/A Nowell 1940	Pinyon-juniper in West	Not Needed								

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Pinus elliottii slash pine PIEL	550 50TA USDA 1929	Entire Range	**SI** **Years**	65 4	75 3	85+ 2					
	555 25TA Barnes 1955		**SI** **Years**	<40 4	40-60 3	>60 2					
Pinus elliottii densa South Florida slash pine PIELD	540 25TA Langdon 1961		All Sites - 5 years								
	541 25TA Langdon 1959		**SI** **Years**	<40 4	40-60 3	>60 2					
Pinus jeffreyi Jeffrey Pine PIJE	600 100TA Meyer 1961		**SI** **Years**	<55 16	55-70 14	71-84 12	85-98 10	99-112 8	113+ 6		
	605 300TA Dunning 1942	CA	**SI** **Years**	71-84 12	85-98 10	99-112 8	113+ 6				
Pinus lambertiana sugar pine PILA	605 300TA Dunning 1942	Entire Range									
Pinus monophylla singleleaf pinyon PIMO	200 N/A Howell 1940	Pinyon-juniper in West	Not Needed								
	202 N/A Chojnacky 1986	NV									

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Pinus monticola western white pine PIMO3	570 50TA Haig 1932	Entire Range	**SI** **Years**	40 9	50 8	60 7	70 7	80 6	90 5		
	605 300TA Dunning 1942	CA	**SI** **Years**	71-84 12	85-98 10	99-112 8	113+ 6				
Pinus palustris longleaf pine PIPA2	580 50TA USDA 1929	Entire Range	**SI** **Years**	50-60 8	70-80 7	90 6					
Pinus ponderosa ponderosa pine PIPO	600 100TA Meyer 1938	West of Continental Divide and MT, CO, NM	**SI** **Years**	<56 16	57-70 14	71-84 12	85-98 10	99-112 8	113+ 6		
	601 100BH Minor 1964	Northern AZ	Not Needed								
	605 300TA Dunning 1942	California	**SI** **Years**	71-84 12	85-98 10	99-112 8	113+ 6				
Pinus pungens Table Mountain pine PIPU5	620 50TA Nelson, Clutter, Chaiken 1961	Entire Range	**SI** **Years**	55 6	65 5	75 4					
Pinus quadrifolia Parry pinyon PIQU	200 N/A Nowell 1940	Pinyon-juniper in West	Not Needed								

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Pinus resinosa red pine PIRE	630 50TA Gevorkiantz 1957d	Entire Range	**SI Years**	40 10	50 8	60 6	70 5				
	631 50TA Wilde 1965	WI	All Sites - 7 years								
	632 25BH Gilmore 1967	IL (plantations)	Not needed								
Pinus rigida pitch pine PIRI	635 50TA Illick, Aughanbaugh 1930	Entire range	**SI Years**	30 9	40 9	50 8	60 7	70 6	80 5	90 4	
Pinus serotina pond pine PISE	640 50TA Schumacher, Coile 1960		**SI Years**	55 5	56-75 4	76+ 3					
Pinus strobus eastern white pine PIST	650 50TA Doolittle 1960	South: IN, IL, IA, OH, WV, MD, DE, VA, KY	**SI Years**	<65 7	65-80 6	81-95 5	96+ 4				
	651 25BH Gilmore 1968	IL (plantations)	Not needed								
	660 50TA Lloyd 1970b	PA, NJ, NY, and New England	**SI Years**	40 9	50 8	60 7	70 6	80+ 5			
	670 50TA Gevorkiantz 1957e	MI, MN, WI	**SI Years**	40 14	50 12	60 10	70 8	80 6			

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Pinus taeda loblolly pine PITA	690 50TA Coile, Schumacher 1953	Entire Range	**SI Years**	<55 5	55-75 4	76+ 3					
	691 25TA Gilmore, Metcalf 1961	IL (plantations)	**SI Years**	<25 4	>35 3						
Pinus virginiana Virginia pine PIVI2	620 50TA Nelson, Clutter, Chaiken 1961	Entire Range	**SI Years**	55 6	65 5	75 4					
	621 50TA Kulow, Sowers, Heesch 1966	WV, MD, PA	**SI Years**	<45 6	45-75 5	>75 4					
Platanus occidentalis American sycamore PLOC	700 35TA Briscoe, Ferrill 1958	Entire Range	All Sites - 1 year								
Populus deltoides eastern cottonwood PODE3	710 30TA Broadfoot 1960		**SI Years**	<76 2	76+ 1						
	711 25TA Neebe, Boyce 1959	IL	All Sites -2 years								
	712 25TA Brendemuehl 1965	IA									
Populus deltoids monilifera plains cottonwood PODEM	740 50TA BCFS 1977	Pacific Northwest	**SI Years**	<70 2	70+ 1						

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Populus grandidentata bigtooth aspen POGR4	720 50TA Gevorkiantz 1956c	Northeast and Midwest	All Sites - 4 years								
	721 25TA Carmean 1978	WI, MI									
Populus tremuloides quaking aspen POTR5	720 50TA	Northeast and Midwest									
	725 50TA Gregory, Haack 1965	Alaska									
	730 50TA Baker 1925	West Except Alaska	**SI Years**	<44 6	44-55 5	56-77 4	78+ 3				
	735 80BH Edminster, Mowrer, Shepperd 1985	CO, Southern WY, and Northeastern UT	Not Needed								
Prunus serotina black cherry PRSE2	750 50TA Defler 1937	Entire Range	**SI Years**	40 6	50-70 5	80 4	90+ 3				
	751 50TA Carmean 1978	WI, MI	All Sites - 4 years								
	752 50TA Auchmoody, Rexrode 1984	PA									

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Psuedotsuga menziesii Douglas-fir PSME	031 50BH Cochran 1979a	East of Cascades in OR and WA	Not Needed								
	605 300TA Dunning 1942	CA	**SI Years**	71-84 12	85-98 10	99-112 8	113+ 6				
	780 100BH Curtis, Herman, DeMars 1974	**NOTE: Code no longer available for use. Replaced by code 781.**	Not needed								
	781 100BH DeMars, Herman 1987	Cascade Mountains Elevation 1000+ in WA Elevation 3000+ in OR Cryic Soils									
	790 100TA McArdle, Meyer, Bruce 1961	West of Cascade Mountains Except for Code 780	**SI Years**	<95 10	110 9	140 8	170 7	185+ 6			
	795 50BH King 1966	West of Cascade Mountains in WA or OR Mesic and Frigid Soils	Not Needed								

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Psuedotsuga menziesii glauca Rocky Mountain Douglas-fir PSMEG	600 100TA Meyer 1938	**NOTE: Code no longer available for use.**	**SI Years**	<56 16	56-70 14	71-84 12					
	765 50BH SCS 1988b	East of Cascades in OR and WA	Not Needed								
	770 50TA Brickell 1968	East of Cascades and Sierras Except CO, NM, eastern WA	**SI Years**	30 16	40 14	50 12	60 10	70 8	80 6		
	771 50BH Monserud 1985	Northern ID and Northwestern MT	Not Needed								
	775 100BH Edminster Jump 1976	CO, NM, AZ	Not Needed								
Quercus agrifolia California live oak QUAG	811 50BH DeLasaux Pillsbury 1987	CA	Not Needed								
Quercus alba white oak QUAL	802 50TA McQuilkin 1974, 1978	MI	All Sites - 2 years								
	803 50TA Graney, Bower 1971	AR	All Sites - 3 years								
	804 50TA Carmean 1971, 1972	OH, KY, IN, IL, MO									

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor
Quercus coccinea scarlet oak QUCO2	802 50TA McQuilkin 1974, 1978	MI	All Sites - 2 years
	805 50TA Carmean 1971, 1972	OH, KY, IN, IL, MO	All Sites - 3 years
Quercus douglasii blue oak QUDO	811 50BH DeLasaux, Pillsbury 1987	CA	Not Needed
Quercus kelloggii California black oak QUKE	880 50BH Powers 1972	Entire Range	
Quercus pagoda cherrybark oak QUPA5	840 50Ta Broadfoot 1961	Entire Range	**SI Years**: 40: 6; 50: 5; 60: 4; 70: 3; 80: 2
Quercus garyana Oregon white oak QUGA4	812 50TA Sauerwein 1983	OR, WA, CA	Unknown
Quercus prinus chestnut oak QUPR2	806 50TA Carmean 1971, 1972	OH, KY, IN	All Sites - 3 years
Quercus rubra northern red oak QURU	801 50TA Grane, Bower 1971	AR	

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Quercus L Upland Oaks QUERC Includes: • *Quercus alba* white oak - QUAL • Quercus coccinea scarlet oak QUCO • *Quercus snuata sinuata* bastard Oak QUSIS • *Quercus ellipsoidalis* northern pin oak QUEL • *Quercus falcalta* southern red oak QUFA • *Quercus macrocarpa* bur oak QUMA2 • *Quercus marilandica* blackjack oak QUMA3 • *Quercus muhlenbergii* chinkapin oak QUMU • *Quercus prinus* chestnut oak QUPR2 • *Quercus rubra* northern red oak QURU • *Quercus stellata* post oak QUST • *Quercus velutina* black oak QUVE	807 50TA Carmean 1978	WI, MI	All Sites - 2 years								
	800 50TA Gevorkiantz, 1957f	MW, MI, WI	**SI Years**	30 7	40 6	50 5	60 4	70 3	80 2		
	810 50TA Olson 1959	East of Mississippi River in South	**SI Years**	30 7	40 6	50 5	60 4	70 3	80 2		
	820 50TA Schnur 1937	Northeast Midwest Except MN, MI, WI: West of Mississippi River in South									

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor								
Quercus L. Bottom Oaks QUERC Includes: • *Quercus laurifolia* laurel oak QULA3 • *Quercus lyrata* overcup oak QULY • *Quercus michauxii* swamp chestnut oak QUMI • *Quercus nigra* water oak QUNI • *Quercus texana* Nuttall oak QUTE • *Quercus palustris* pin oak QUPA2 • *Quercus phellos* willow oak QUPH • *Quercus shumardii* Shumard's oak QUSH	860 50Ta Broadfoot 1963	Entire Range	**SI Years**	40 6	50 5	60 4	70 3	80 2			
Quercus velutina black oak QUVE	801 50TA Grane, Bower 1971	AR	All Sites - 3 years								
	802 50TA McQuilkin 1974, 1978	MI									
	808 50TA Carmean 1971, 1972	OH, KY, IN, MO									
Robinia pseudoacacia black locust ROPS	900 50TA Kellogg 1939b	Entire Range	**SI Years**	30-45 3	46-65 2	66+ 1					
Sequoia sempervirens redwood SESE3	930 100BH Lindquist, Palley 1963		Not needed								

Scientific Name Common Name NSPNS	Curve Number Age Base Reference	Area of Use	Age Correction Factor							
Tilia americana American basswood TIAM	800 50TA Gevorkiantz 1957f	Entire Range	**SI Years**	30 7	40 6	50 5	60 4	70 3	80 2		
	809 50TA Carmean 1978	WI, MI	All Sites - 4 years								
Thuja occidentalis eastern arborvitae (northern white cedar) THOC2	960 50TA Gevorkiantz 1957g	Entire Range	**SI Years**	20 20	30 15	40 15	50 15	60 10			
Tsuga canadensis eastern hemlock TSCA	991 50TA Frothingham 1915	NY, MI, Southern Appalachian Mountains	All Sites - 6 years								
Tsuga heterophylla western hemlock TSHE	491 50BH Farr 1984	Southeast AK	Not Needed								
	990 100TA Barnes 1962	Entire Range	All Sites - 7 years								
	995 50BH Wiley 1978	Western WA	Not Needed								
Ulmus americana American elm ULAM	820 50TA Schnur 1937	Entire Range	**SI Years**	40 6	50 5	60 4	70 3				
Ulmus rubra slippery elm ULRU											

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Exhibit 537-2 Soil Rating Criteria for Potential Erosion Hazard (Road/Trail)

FACTOR	SLOPE %			FEATURE	IMPACT
	SLIGHT	MODERATE	SEVERE		
Soil Erodibility Factor K_w < .22 (thickest mineral horizon 0-15cm)				Slope; erodibility	Erosion and sedimentation; increased maintenance; land base loss
Rock Fragments (weighted average for layers 0-30cm by volume)					
>75mm in size, <15%	<5	5-15	>15		
>75mm in size, ≥15%	<10	10-25	>25		
Soil Erodibility Factor K_w > .22 (thickest mineral horizon 0-15cm)					
Rock Fragments (weighted average for layers 0-30cm by volume)					
>75mm in size, <15%	<3	3-8	>8		
>75mm in size, ≥15%	<5	5-15	>15		

Criteria Notes: Certain parent materials (e.g., decomposed granite), high R factors (e.g., >200), snowmelt influences during Spring thaw and other factors may require changes to slope values in the table or adjustment of ratings to one class more limiting.

(190-V-NFM, 1998)

Exhibit 537-3 Soil Rating Criteria for Potential Erosion Hazard (Off-Road/Off-Trail)

FACTOR	SLOPE %				FEATURE	IMPACT
	SLIGHT	MODERATE	SEVERE	VERY SEVERE		
Soil Erodibility Factor (thickest mineral horizon 0-15cm) $K_w < 0.35$ $K_w \geq 0.35$	 0-14 0-9	 15-35 10-25	 36-50 26-40	 >50 >40	Slope; erodibility	Erosion and sedimentation; increased maintenance; land base loss

Criteria Notes: Certain parent materials (e.g., decomposed granite), high R factors (e.g., >200), snowmelt influences during Spring thaw and other factors may require changes to slope values in the table or adjustment of ratings to one class more limiting.

(190-V-NFM, 1998)

Exhibit 537-4 Soil Rating Criteria for Soil Rutting Hazard

FACTOR	Unified Classification Group (thickest layer with upper boundary ≤ 10cm of the surface)			FEATURE	IMPACT
	SLIGHT	MODERATE	SEVERE		
Water Table Maximum depth to wet layer ≤30cm for 12 months of the year	--	--	All Groups	Wetness	Reduced efficiency, soil damage, equipment damage
Rock Fragments				Low strength	
>75mm in size, <20% by volume	GW, GP, GM, GW-GM, GC-GM, GW-GC, GP-GM, GP-GC	GC, SW, SP, SM, SC, SW-SM, SW-SC, SP-SM, SP-SC, SC-SM	CL, CH, CL-ML, ML, MH, OL, OH, PT		
>75mm in size, ≥20% by volume OR >3% to <10% surface cover, >75mm in size OR depth to top of bedrock paralithic, bedrock lithic, or duripan restrictive layer =<15cm	GW, GP, GM, GW-GM, GC-GM, GW-GC, GP-GM, GP-GC, GC, SW, SP, SM, SC, SW-SM, SW-SC, SP-SM, SP-SC, SC-SM	CL, CH, CL-ML, ML, MH, OL, OH, PT	--		
>10% surface cover	All Groups	--	--		

Criteria Notes: Steeper slope classes (e.g., > 20%) may shift ratings to one class more limiting.

(190-V-NFM, 1998)

Exhibit 537-5 Soil Rating Criteria for Road Suitability (Natural Surface)

FACTOR	WELL SUITED	MODERATELY SUITED	POORLY SUITED	FEATURE	IMPACT
Slope %	<6%	6-12%	>12%	Slope	Reduced efficiency; unsafe operation
Rock Fragments **Percent Surface Cover** ≥75mm to <250mm in size ≥250mm to <600mm in size ≥600mm in size	<15% <3% <0.1%	15-50% 3-15% 0.1-3%	>50% >15% >3%	Stoniness	Obstruction
Plasticity Index Greatest value for uppermost thickest mineral horizon in the upper 15cm	<30	≥30	--	Stickiness	Reduced efficiency
Particle Size Separates Percent retained on #200 sieve for layers ≥7cm thick in the upper 15cm	<85%	≥85%	--	Too sandy	
Unified Classification Group ≥7cm thickness in the upper 15cm	--	CL, CH, CL-ML, ML, MH	OL, OH, PT	Low strength	
Ponding and/or Flooding **Frequency** (months) None, Rare Occasional Frequent/Very Frequent	 12 1-2 0	 -- 3-5 1-2	 -- 6-12 3-12	Ponding and/or Flooding	Reduced efficiency; unsafe operation
Soil Slippage Potential	Low	Medium	High	Landslides	Landing failures; unsafe operation
Water Table Maximum depth to wet layer ≥2 consecutive months	>60cm	60cm to 30cm	<30cm	Wetness	Reduced efficiency

Criteria Notes: If road suitability is "moderately suited" or "poorly suited," refer to Construction Limitations for Haul Roads and Log Landings interpretation.

(190-V-NFM, 1998)

Exhibit 537-6 Soil Rating Criteria for Log Landing Suitability

FACTOR	WELL SUITED	MODERATELY SUITED	POORLY SUITED	FEATURE	IMPACT
Slope %	<6%	6-12%	>12%	Slope	Reduced efficiency; unsafe operation
Rock Fragments **Percent Surface Cover** ≥75mm to <250mm in size ≥250mm to <600mm in size ≥600mm in size	<15% <3% <0.1%	15-50% 3-15% 0.1-3%	>50% >15% >3%	Stoniness	Obstruction
Plasticity Index (greatest value for uppermost thickest mineral horizon in the upper 15cm)	<30	≥30	--	Stickiness	Reduced efficiency
Particle Size Separates Percent retained on #200 sieve for layers ≥7cm thick in the upper 15cm	<85%	≥85%	--	Too sandy	Reduced efficiency
Unified Classification Group ≥7cm thickness in the upper 15cm	--	CL, CH, CL-ML, ML, MH	OL, OH, PT	Low strength	Reduced efficiency
Ponding and/or Flooding **Frequency** (months) None, Rare Occasional Frequent/Very Frequent	 12 1-2 0	 -- 3-5 1-2	 -- 6-12 3-12	Ponding and/or Flooding	Reduced efficiency; unsafe operation
Soil Slippage Potential	Low	Medium	High	Landslides	Landing failures; unsafe operation
Water Table Maximum depth to wet layer ≥2 consecutive months	>60cm	60cm to 30cm	<30cm	Wetness	Reduced efficiency

Criteria Notes: If log landing suitability is considered "moderately suited" or "poorly suited," refer to the Construction Limitations for Haul Roads and Log Landing interpretation.

(190-V-NFM, 1998)

Exhibit 537-7 Soil Rating Criteria for Construction Limitations for Haul Roads and Log Landings

FACTOR	SLIGHT	MODERATE	SEVERE	FEATURE	IMPACT
Slope %	<15%	15-30%	>30%	Slope	Reduced efficiency
Soil Slippage Potential	Low	Medium	High	Landslides	Road or landing failure; increased costs
Flooding **Frequency** (months) None, Rare Occasional Frequent/Very Frequent	 1-2 1-2 0	 -- 3-5 1-2	 -- 6-12 3-12	Flooding	Road damage; increased costs
Texture Texture modifier "permanently frozen" or texture in-lieu-of "consolidated permafrost"	--	--	True	Permafrost	Increased costs
Plasticity Index Greatest value for any layer thicker than 15cm and: within 30cm on <15% slopes or within 90cm on 15-30% slopes or within 150cm on >30% slopes	<30	≥30	--	Stickiness	Reduced efficiency, increased construction costs
Particle Size Separates Percent retained on #200 sieve for layers ≥15cm thick and: within 30cm on <15% slopes, within 90cm on 15-30% slopes, or within 150cm on >30% slopes	<85%	≥85%	--	Sandiness	Increased construction costs

FACTOR	SLIGHT	MODERATE	SEVERE	FEATURE	IMPACT
Unified Classification Group Layers ≥15cm thick and: within 30cm on <15% slopes or within 90cm on 15-30% slopes or within 150cm on >30% slopes	--	CL, CH, CL-ML, ML, MH	OL, OH, PT	Low strength	Increased construction costs
Texture (depth to Layer) **Very or Extremely Stony** <15% slopes 15-30% slopes **Very or Extremely Bouldery** <15% slopes 15-30% slopes	 >50cm to ≤75cm >75cm >100cm >150cm	 ≤50cm ≤75cm ≥50cm to ≤100cm ≥75cm to <150cm	 -- -- <50cm <75cm	Stoniness	Reduced efficiency; equipment damage; increased costs
Rock Fragments Percent surface cover ≥250cm in size	<3%	3-15%	>15%	Stoniness	Obstruction
Restrictive Layer Depth to bedrock lithic or any restriction with hardness of indurated <15% slopes 5-30% slopes	 >100cm >150cm	 ≥50cm to ≤100cm ≥75cm to <150cm	 <50cm <75cm	Restrictive layer	Reduced efficiency; increased construction costs
Water Table Minimum depth to wet layer for 12 months of the year	>60cm	60cm to 30cm	<30cm	Wetness	Reduced efficiency
Ponding Number of months with occasional or frequent ponding	--	--	12		

Exhibit 537-8 Soil Rating Criteria for Harvest Equipment Operability

FACTOR	WELL SUITED	MODERATELY SUITED	POORLY SUITED	FEATURE	IMPACT
Slope %	<20%	20-35%	>35%	Slope	Reduced efficiency; unsafe operation
Rock Fragments **Percent Surface Cover** ≥75mm to <250mm in size ≥250 to <600cm in size ≥600cm in size	<15% <3% <0.1%	15-50% 3-15% 0.1-3%	>50% >15% >3%	Stoniness	Obstruction
Plasticity Index Highest value for uppermost thickest mineral horizon in the upper 15cm	<30	≥30	--	Stickiness	Reduced efficiency
Particle Size Separates Percent retained on #200 sieve for layers ≥7cm thick in the upper 15cm	<85%	≥85%	--	Too sandy	Reduced efficiency
Unified Classification Group ≥7cm thickness in the upper 15cm	--	CL, CH, CL-ML, ML, MH	OL, OH, PT	Low strength	Reduced efficiency
Water Table Minimum depth to wet layer for 12 months of the year	>60cm	60cm to 30cm	<30cm	Wetness	Reduced efficiency
Ponding Number of months with occasional or frequent ponding	--	--	12		

Exhibit 537-9 Soil Rating Criteria for Mechanical Site Preparation (Surface)

FACTOR	WELL SUITED	POORLY SUITED	UNSUITED	FEATURE	IMPACT
Slope %	<15%	15-35%	>35%	Slope	Reduced efficiency
Restriction Hardness (depth to layer) **Strongly or Very Strongly Cemented** **Indurated**	>30cm --	<30cm --	-- <30cm	Restrictive layer	Reduced efficiency
Plasticity Index Greatest value for any layer within 30cm of the surface	<30	≥30	--	Stickiness	Reduced efficiency
Rock Fragments **Within 30cm of Surface** (greatest value for any layer by volume) >75mm in size 2mm to 75mm in size **Percent Surface Cover** ≥75mm to <250mm in size ≥250mm to <600mm in size ≥600mm in size	<15% <35% <15% <3% <0.1%	15-60% ≥35% 15-50% 3-15% 0.1-3%	> 60% -- >50% >15% >3%	Stoniness	Obstruction
Water Table Minimum depth to wet layer for 12 months of the year	≥30cm	<30cm	--	Wetness	Reduced efficiency
Ponding Number of months with occasional or frequent ponding	--	--	12		

Exhibit 537-10 Soil Rating Criteria for Mechanical Site Preparation (Deep)

FACTOR	WELL SUITED	POORLY SUITED	UNSUITED	FEATURE	IMPACT
Slope %	<15%	15-35%	>35%	Slope	Reduced efficiency
Restriction Hardness (depth to layer) **Very Strongly Cemented** ≥10 and ≤20cm Thick Layer >20cm Thick Layer **Indurated**	 -- -- >90cm	 <90cm -- 50cm to 90cm	 -- <90cm <50cm	Restrictive layer	Reduced efficiency
Rock Fragments **Within 90cm of surface** (greatest value for any layer by volume) >75mm in size **Percent Surface Cover** >250cm in size	 <35% <3%	 35-60% 3-15%	 > 60% >15%	Stoniness	Obstruction
Water Table Minimum depth to wet layer for 12 months of the year	--	--	<60cm	Wetness	Reduced efficiency; soil degradation
Ponding Number of months with occasional or frequent ponding	--	--	12		

Exhibit 537-11 Soil Rating Criteria for Hand Planting Suitability

FACTOR	WELL SUITED	MODERATELY SUITED	POORLY SUITED	UNSUITED	FEATURE	IMPACT
Slope	< 35%	35-80%	> 80%	--	Slope	Reduced efficiency
Restriction Hardness (depth to layer) **Moderately Cemented or Bedrock (paralithic)** **Strongly, Very Strongly Cemented, Indurated or Bedrock (lithic)**	>30cm --	20cm to 30cm --	<20cm --	-- <30cm	Restrictive layer	Obstruction
Particle Size Separates Percent retained on #200 sieve for layers ≥7cm thick within 30cm of the surface	--	>85%	--	--	Sandiness	Sloughing
Plasticity Index Greatest value for any layer within 30cm of the surface	<20	20-30	>30	--	Stickiness	Reduced efficiency
Rock Fragments **Within 30cm of the surface** (greatest value for any layer by volume) >75mm in size 2mm to 75mm in size **Percent Surface Cover** >75mm in size	 < 15% <35% <3%	 15-35% 35-75% 3-15%	 36-75% >75% 16-50%	 > 75% -- >50%	Coarse fragments	Obstruction
Water Table Minimum depth to wet layer for 12 months of the year	≥30cm	<30cm	--	--	Wetness	Reduced efficiency
Ponding Number of months with occasional or frequent ponding	--	--	12			

Exhibit 537-12 Soil Rating Criteria for Mechanical Planting Suitability

FACTOR	WELL SUITED	MODERATELY SUITED	POORLY SUITED	UNSUITED	FEATURE	IMPACT
Slope	<5%	5-15%	15-25%	>25	Slope	Reduced efficiency
Restriction Hardness (depth to layer) **Strongly or Very Strongly Cemented** **Indurated**	≥30cm --	<30cm --	-- --	-- <30cm	Restrictive layer	Reduced efficiency
Particle Size Separates Percent retained on #200 sieve for layers ≥7cm thick within 30cm of the surface	--	>85%	--	--	Texture	Sloughing
Plasticity Index Greatest value for any layer within 30cm of the surface	<20	20-30	> 30	--	Stickiness	Reduced efficiency
Rock Fragments **Within 30cm of Surface** (greatest value for any layer by volume) >75mm in size 2mm to 75mm in size **Percent Surface Cover** ≥75mm by size	 < 5% <15% <0.1%	 5-15% 15-35% 0.1-3%	 16-35% 36-60% 3-15%	 > 35% >60% >15%	Stoniness	Obstruction
Water Table Minimum depth to wet layer for 12 months of the year	≥30cm	15cm to 30cm	<15cm	--	Wetness	Reduced efficiency
Ponding Number of months with occasional or frequent ponding	--	--	--	12		

Exhibit 537-13 Soil Rating Criteria For Potential Damage to Soil by Fire

FACTOR	LOW	MODERATE	HIGH	FEATURE	IMPACT
	ASPECT				
Surface Layer >20cm thick				Texture and/or coarse fragments	Loss of soil productiv-ity
Texture sl, fsl, vfsl, l, sil, cl (<35% clay)					
Rock fragments <35%, >2mm					
Organic matter					
≥2%	≥0 and ≤360	--	--		
<2%	--	≥0 and ≤360	--		
Rock fragments 35-60%, >2mm					
Organic matter					
≥2%	>270 or ≤90	>90 and ≤270	--		
<2%	--	>270 or ≤90	>90 and ≤270		
Rock fragments >60%, >2mm					
Organic matter					
≥2%	--	≥0 and ≤360	--		
<2%	--	--	≥0 and ≤360		
Texture cl (≥35%), si, scl, sicl, sc, sic, c, pumice					
Organic matter					
≥2%	>270 or ≤90	>90 and ≤270	--		
<2%	--	>270 or ≤90	>90 and ≤270		
Texture cos, s, fs, vfs, lcos, ls, lfs, lvfs, cosl					
Organic matter					
≥2%	--	≥0 and ≤360	--		
<2%	--	--	≥0 and ≤360		
Surface layer ≥10 to ≤20cm thick				Texture, coarse fragments	Loss of organic matter
Slope <30%					
Texture sl, fsl, vfsl, l, sil, cl (<35% clay)					
Rock fragments <35%, >2mm					
Organic matter					
≥2%	≥0 and ≤360	--	--		
<2%	--	≥0 and ≤360	--		
Rock fragments 35-60%, >2mm					
Organic matter					
≥2%	>270 or ≤90	>90 and ≤270	--		
<2%	--	>270 or ≤90	>90 and ≤270		
Rock fragments >60%, >2mm					
Organic matter					
≥2%	--	≥0 and ≤360	--		
<2%	--	--	≥0 and ≤360		
Texture cl (≥35%), si, scl, sicl, sc, sic, c, pumice					
Organic matter					
≥2%	>270 or ≤90	>90 and ≤270	--		
<2%	--	>270 or ≤90	>90 and ≤270		
Texture cos, s, fs, vfs, lcos, ls, lfs, lvfs, cosl					
Organic matter					
≥2%	--	≥0 and ≤360	--		
<2%	--	--	≥0 and ≤360		

FACTOR	LOW	MODERATE	HIGH	FEATURE	IMPACT
	ASPECT				
Slope ≥30%				Texture, slope, coarse fragments	Loss of organic matter, sedimentation
Texture sl, fsl, vfsl, l, sil, cl (<35% clay)					
Rock fragments <35%, >2mm					
Organic matter					
≥2%	>270 or ≤90	>90 and ≤270	--		
<2%	--	>270 or ≤90	>90 and ≤270		
Rock fragments 35-60%, >2mm					
Organic matter					
≥2%	--	≥0 and ≤360	--		
<2%	--	--	≥0 and ≤360		
Rock fragments >60%, >2mm					
Organic matter					
≥2%	--	>270 or ≤90	>90 and ≤270		
<2%	--	--	≥0 and ≤360		
Texture cl (≥35%), si, scl, sicl, sc, sic, c, pumice					
Organic matter					
≥2%	--	≥0 and ≤360	--		
<2%	--	--	≥0 and ≤360		
Texture cos, s, fs, vfs, lcos, ls, lfs, lvfs, cosl					
Organic matter					
≥2%	--	>270 or ≤90	>90 and ≤270		
<2	--	--	≥0 and ≤360		
Surface layer ≤10cm thick				Texture, surface depth, coarse fragments	Loss of organic matter
Slope <30%					
Texture sl, fsl, vfsl, l, sil, cl (<35% clay)					
Rock fragments <35%, >2mm					
Organic matter					
≥2%	>270 or ≤90	>90 and ≤270	--		
<2%	--	>270 or ≤90	>90 and ≤270		
Rock fragments 35-60%, >2mm					
Organic matter					
≥2%	--	≥0 and ≤360	--		
<2%	--	--	≥0 and ≤360		
Rock fragments >60%, >2mm					
Organic matter					
≥2%	--	>270 or ≤90	>90 and ≤270		
<2%	--	--	≥0 and ≤360		
Texture cl (≥35%), si, scl, sicl, sc, sic, c, pumice					
Organic matter					
≥2%	--	≥0 and ≤360	--		
<2%	--	--	≥0 and ≤360		
Texture cos, s, fs, vfs, lcos, ls, lfs, lvfs, cosl					
Organic matter					
≥2%	--	>270 or ≤90	>90 and ≤270		
<2%	--	--	≥0 and ≤360		

FACTOR	LOW	MODERATE	HIGH	FEATURE	IMPACT
	ASPECT				
Slope ≥30%				Texture, slope, surface depth, coarse fragments	Loss of organic matter sedimen-tation
Texture sl, fsl, vfsl, l, sil, cl (<35% clay)					
Rock fragments <35%, >2mm					
Organic matter					
≥2%	--	≥0 and ≤360	--		
<2%	--	--	≥0 and ≤360		
Rock fragments 35-60%, >2mm					
Organic matter					
≥2%	--	>270 or ≤90	>90 and ≤270		
<2%	--	--	≥0 and ≤360		
Rock fragments >60%, >2mm					
Texture cl (≥35%), si, scl, sicl, sc, sic, c, pumice	--	--	≥0 and ≤360		
Organic matter					
≥2%	--	>270 or ≤90	>90 and ≤270		
<2%	--	--	≥0 and ≤360		
Texture cos, s, fs, vfs, lcos, ls, lfs, lvfs, cosl	--	--	≥0 and ≤360		

Criteria Notes:
High or moderate ratings may indicate the need to consider winter burning, alternate lighting techniques, monitoring of fuel moisture content, yarding of unmerchantable material, elimination of prescribed burns, or erosion control measures following burning.

Surface layer is considered to have a texture of "pumice" if either of the following conditions exist:
(1) the texture modifier is paragravelly, very paragravelly, or extremely paragravelly and fragment kind is pumice
(2) the texture in-lieu-of is paragravel and fragment kind is pumice

Rock fragments are percent volume, whole soil.

Exhibit 537-14 Soil Rating Criteria For Potential Seedling Mortality

FACTOR	LOW	MODERATE	HIGH	FEATURE	IMPACT
Flooding and/or Ponding Duration	None, Extremely Brief, Very Brief, Brief	Long	Very Long or Long and frequency is frequent	Wetness	Reduced root respiration
Water Table Depth to wet layer	>45cm, Jan-Dec	>15cm to <45cm and not for ≥2 consecutive months, Oct-Feb or for ≥1 months, Mar-Sept	≤15cm for ≥1 month, Jan-Dec OR >15cm to ≤45cm for ≥2 consec-utive months, Oct-Feb or for ≥1 months, Mar-Sept		
CaCO3 Equivalent Greatest value for any layer within 30cm of the surface	--	15-40	>40	High lime	Nutrient imbalance
Soil Reaction Greatest value for any layer within 30cm of the surface	>4.4-7.8	7.9-8.4 OR 3.5-4.4	>8.4-<3.5	Soil reaction	
Electrical Conductivity Greatest value for any layer within 30cm of the surface (mhos/cm)	<4	4-8	>8	Salinity	Reduced moisture supply; toxicity

FACTOR		LOW		MODERATE		HIGH		FEATURE	IMPACT
Available Water Capacity		**Total AWC Within 50cm of the Surface (cm) Slopes >15%**						Low available water	Poor moisture supply
Moisture Class	**Temperature Regime**	**South Aspect (90-270)**	**North Aspect (270-90)**	**South Aspect (90-270)**	**North Aspect (270-90)**	**South Aspect (90-270)**	**North Aspect (270-90)**		
Udic	Any	--	≤2.5	>2.5	--	≤2.5--	--		
Aridic	Frigid or Mesic	--	≥6.5	--	<6.5	<6.5	--		
Xeric or Ustic	Thermic	--	≥7-<10	≥10	<7	<10	--		
	Mesic or Frigid, or Cryic	--	≥5-<9	≥9	<5	<9	--		
		Total AWC Within 50cm of the Surface (cm) Slopes ≤15%						Low available water	Poor moisture supply
Udic	Any	>2.5		≤2.5		--			
Aridic	Frigid or Mesic	--		≥6.5		<6.5			
Xeric or Ustic	Thermic	≥10		≥7-<10		<7			
	Mesic or Frigid, or Cryic	≥9		≥5-<9		<5			

Exhibit 537-15 Conservation Tree/Shrub Group (CTSG) Criteria

GROUP	Soil Depth (cm)	Available Water Capacity (cm)	$CaCO_3$ Equivalent (%, 0- 30cm)	pH (0-30cm)	Elec. Cond. (mmhos, 0-30cm)	Depth to Growing Season Water Table (cm)	Saturated Hydraulic Conductivity ($\mu m\ s^{-1}$) (see notes)
1	≥100	≥19.0	≤5	5.6-8.4	≤4	≥90, <150 **OR** ≥150 and frequent or occasional flooding ≥2 months during growing season with a duration of brief, long, or very long	**0-150cm (or 1st restrictive layer)** Min low ≥1.4 Max high ≤142
1A	≥100	≥19.0	≤5	4.5-5.5	≤4		
1H	≥50	≥19.0	--	≤7.8	≤4		Histosol **OR** texture-in-lieu-of is "peat", "muck", or "mucky peat"
1K	≥100	≥19.0	>5, ≤15	6.5-8.4	≤4		**0-150cm (or 1st restrictive layer)** Min low ≥1.4 Max high ≤142
1KK	≥100	≥19.0	>15, ≤40	6.5-8.4	≤4		
1S	≥100	9.5-19.0	≤5	5.6-8.4	≤4		
1SK	≥100	9.5-19.0	>5, ≤15	6.5-8.4	≤4		
1SKK	≥100	9.5-19.0	>15, ≤40	7.9-8.4	≤4		
2	≥100	≥5.0	≤5	5.6-8.4	≤4	≥45, <90 **OR** <90 and temp regime is cryic or pergelic and <1 month wet soil moisture during growing season or temp regime is isofrigid, frigid, or mesic and <2 consecutive and <3 total months wet soil moisture during growing season or any other temp regime and <3 total months wet soil moisture during growing season	--
2A	≥100	≥5.0	≤5	4.5-5.5	≤4		--
2K	≥100	≥5.0	>5, ≤15	6.5-8.4	≤4		--
2KK	≥100	≥5.0	>15, ≤40	6.5-8.4	≤4		--
2H	≥100	≥19.0	--	≤7.8	≤4		Histosol **OR** texture-in-lieu-of is "mucky peat", "muck", or "peat"
3	≥100	≥19.0	≤5	5.6-8.4	≤4	≥150 **AND** frequent or occasional flooding <2 months during growing season with a duration of brief, long, or very long	**0 -150cm (or 1st restrictive layer)** Min low ≥1.4 Max high ≤142 **AND** **Bottom horizon is not sandy or gravelly**
3A	≥100	≥19.0	≤5	4.5-5.5	≤4		

GROUP	Soil Depth (cm)	Available Water Capacity (cm)	$CaCO_3$ Equivalent (%, 0- 30cm)	pH (0-30cm)	Elec. Cond. (mmhos, 0-30cm)	Depth to Growing Season Water Table (cm)	Saturated Hydraulic Conductivity ($\mu m\ s^{-1}$) (see notes)
4	≥50	≥12.0	≤5	5.6-8.4	≤4	≥150 **OR** <150cm for <2 months during growing season	**0-50cm, ≥ 20cm thick** Low ≥1.4 High ≤142 **AND** **One or more horizons >15cm thick with a top depth >0** Low ≥0.42, ≤1.43 High <14.3
4A	≥50	≥12.0	≤5	4.5-5.5	≤4		
4K	≥50	≥12.0	>5, ≤15	6.5-8.4	≤4		
4C	≥50	≥9.5	≤5	5.6-8.4	≤4		**Surface horizon to 20cm** Min low ≥1.4 Max high ≤142 and **All horizons with top depth >0** Min low ≥0.42, <1.43 Max high ≤14.3 **OR** **0-150cm (or 1st restrictive layer)** Min low ≥0.42, ≤1.43 Max high ≤14.3
4CA	≥50	≥9.5	≤5	4.5-5.5	≤4		
4CK	≥50	≥9.5	>5, ≤15	6.5-8.4	≤4		
4CC	≥50	≥9.5	≤5	5.6-8.4	≤4		**Surface horizon to 20cm** Min low ≥1.4 Max high ≤142 and **One or more horizons >15cm thick with a top depth >0** High <0.43 and **>100cm to root restrictive layer** **OR** **0-150cm (or 1st restrictive layer)** Max High ≤0.43
5	≥100	9.5-19.0	≤5	5.6-8.4	≤4	≥150 **AND** frequent or occasional flooding <2 months during growing season with a duration of brief, long, or very long	**0-150cm (or 1st restrictive layer)** Min low ≥1.4 Max high ≤142 **AND** **Bottom horizon is not sandy/gravelly**
5A	≥100	9.5-19.0	≤5	4.5-5.5	≤4		
5K	≥100	9.5-19.0	>5, ≤15	6.5-8.4	≤4		
5KK	≥100	9.5-19.0	>15, ≤40	6.5-8.4	≤4		

GROUP	Soil Depth (cm)	Available Water Capacity (cm)	$CaCO_3$ Equivalent (%, 0- 30cm)	pH (0-30cm)	Elec. Cond. (mmhos, 0-30cm)	Depth to Growing Season Water Table (cm)	Saturated Hydraulic Conductivity ($\mu m\ s^{-1}$) (see notes)
6	≥50	5.0-9.5	≤5	5.6-8.4	≤4	≥150 **OR** <150cm for <2 months during growing season	**Surface horizon to 20cm** Min low ≥1.4 Max high ≤142 **AND** **Bottom horizon is:** Sandy/gravelly or; High >141 or; Restrictive layer between 50-150cm **AND** **Drainage Class is E, SE, or W**
6A	≥50	5.0-9.5	≤5	4.5-5.5	≤4		
6K	≥50	5.0-9.5	>5, ≤15	6.5-8.4	≤4		
6KK	≥50	5.0-9.5	>15, ≤40	6.5-8.4	≤4		
6D	50-100	≥9.5	≤5	5.6-8.4	≤4		**Surface horizon to 20cm** Min low ≥1.4 Max high ≤43 **AND** **There is a root restrictive layer between 50-150cm**
6DA	50-100	≥9.5	≤5	4.5-5.5	≤4		
6DK	50-100	≥9.5	>5, ≤15	6.5-8.4	≤4		
6G	≥50	≥9.5	≤5	5.6-8.4	≤4		**Surface horizon to 20cm** Min low ≥1.4 Max high ≤142 **AND** **Bottom horizon is sandy/ gravelly or high ≥141** **AND** **Drainage Class is not E**
6GA	≥50	≥9.5	≤5	4.5-5.5	≤4		
6GK	≥50	≥9.5	>5, ≤15	6.5-8.4	≤4		
6GKK	≥50	≥9.5	>15, ≤40	6.5-8.4	≤4		
7	≥100	≥5.0	≤5	5.6-8.4	≤4	≥150 **OR** <150cm for <2 months during growing season	**0-150cm (or 1st restrictive layer)** Min low ≥42 **AND** **All horizons 0-150cm have sandy texture**
7A	≥100	≥5.0	≤5	4.5-5.5	≤4		
8	≥100	≥19.0	>5, ≤15	6.5-8.4	≤4	≥150 **OR** <150cm for <2 months during growing season	**0-150cm (or 1st restrictive layer)** Min low ≥1.4 Max high ≤142
8K	≥100	≥19.0	>15, ≤40	6.5-8.4	≤4		

GROUP	Soil Depth (cm)	Available Water Capacity (cm)	Sodium Adsorption Ratio (0-30cm)	pH (0-30cm)	Elec. Cond. (mmhos, 0-30cm)	Depth to Growing Season Water Table (cm)	Saturated Hydraulic Conductivity ($\mu m\ s^{-1}$) (see notes)
9C	≥50	≥9.5	--	--	4-16	≥150 **OR** <150cm for <2 months during growing season	**Surface horizon to 20cm** Min low ≥1.4 Max high ≤142 and **All horizons with top depth >0** Min low ≥0.42, ≤1.43 Max high ≤14.3 **OR** **0-150cm (or 1st restrictive layer)** Min low ≥0.42, ≤1.43 Max high ≤14.3
9L	≥50	≥9.5	--	--	4-16	≥150 **OR** <150cm for <2 months during growing season	**0-150cm (or 1st restrictive layer)** Min low ≥1.4 Max high ≤43 **OR** **0-20cm** Min low ≥1.4 Max high ≤43 and **20-150cm (or 1st restrictive layer)** Min low ≥0.42 Max high ≤1.43 **OR** **0-50cm** Min low ≥1.4 Max high ≤43 and **50-150cm (or 1st restrictive layer)** Min low ≥0.42 Max high ≤1.43
9N	≥50	≥5.0	>13, <25 any layer	--	0-16		--
9NW	≥50	≥5.0	>13, <25 any layer	--	0-16	≥45, ≤150	--
9W	≥50	≥5.0	--	--	4-16	≥45, ≤150	--
10	Place soil components in CTSG 10 if any of the following conditions exist: • Soil Depth <50cm • Available Water Capacity <5.0cm • CaCO3 Equivalent >40%, 0- 30cm • pH <4.0 or >8.4, 0-30cm • Elec. Cond. >16mmhos, 0-30cm • Sodium Adsorption Ratio ≥25					• Depth to Growing Season Water Table <45cm • Depth to growing season water table is <90cm and: Temperature Regime — Months Wet Cryic or Pergelic ..... >0 Isofrigid, Frigid, or Mesic ..... ≥2 consecutive or ≥3 total Thermic, Hyperthermic, Isothermic, Isohyperthermic, or Isomesic ..... ≥3	

Exhibit 537-15 Notes/Definitions

Available Water Capacity—The total potential available water capacity of the soil to the first restriction. Total potential available water capacity is derived by multiplying the available water capacity of each horizon in the soil profile by the horizon thickness and summing the products.

$CaCO_3$ Equivalent—Percent of free lime is by weight per soil unit in the upper 30 centimeters. For automated interpretations using NASIS, the average representative CaCO3 Equivalent value within 30cm of the soil surface is used.

Depth to Growing Season Water Table—Depth to a layer with a moisture status of "wet" during all or part of the growing season. See ***Growing Season***.

Electrical Conductivity—The standard measure, in millimhos per centimeter, of salinity or amount of salts in a soil as determined by the electrolytic conductivity of an extract from saturated soil paste; <2 mmhos/cm indicates little or no salinity; <4 mmhos/cm indicates a very slightly saline soil; 4 to 8 mmhos/cm indicates slightly saline; and greater than 8 mmhos/cm indicates moderately to strongly saline soil. For automated interpretations using NASIS, the maximum representative EC value within 30cm of the soil surface are used.

Group—The symbol identifies groups of similar soil. Characteristics of each group significantly affect the selection and height growth of trees and shrubs. Letters used in a symbol represent key soil characteristics for the group: A = acid, B = basic, C = clay, D = restrictive layer to roots, K and KK = carbonates, G = gravel/sand, H = histosols, L = loamy, N = Natric, S = sandy, and W = wetness.

Growing Season—For automated interpretations using NASIS, the growing season corresponding to a soil component is determined by its taxonomic temperature regime as follows:

Taxonomic Temperature Regime	Growing Season Months
Cryic or pergelic	Jul and Aug
isofrigid, frigid or mesic	May, Jun, Jul, Aug, and Sep
thermic or hyperthermic	Apr, May, Jun, Jul, Aug, Sep, and Oct
isothermic, isohyperthermic, or isomesic	Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, and Nov

Histosols—A soil component is determined to be a Histosol if its taxonomic order is Histosols or if it has a substitute term used in lieu of texture of muck, peat, or mucky peat.

pH—A numerical expression of the relative acidity or alkalinity of a soil sample. The most common laboratory method for measurement of pH is the 1:1 soil-to-water ratio method, however, the 0.01M calcium chloride method is commonly used to measure pH in Histosols. Values less than 4.5 indicate an ultra or extremely acid soil; 4.5 to 5.5 indicates very strongly to strongly acid; 5.6 to 7.8 indicates moderately acid to slightly alkaline; 7.9 to 8.4 indicates moderately alkaline; and greater than 8.4 indicates strongly or very strongly alkaline soil. For automated interpretations using NASIS, the minimum representative pH value within 30cm of the soil surface is used.

Root Restrictive Layer—A nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly reduce the movement of water and air through the soil or that otherwise provides an unfavorable root environment. For automated interpretations using NASIS, the possible restrictive properties are: abrupt textural change; bedrock (lithic and paralithic); densic material; duripan; fragipan; natric; ortstein; permafrost; petrocalcic; petroferric; petrogypsic; placic; plinthite; salic; strongly contrasting textural stratification; and sulfuric.

Sandy Horizon Texture—The horizon of a soil component is determined to be sandy if the texture class of the horizon is coarse sand (cos), sand (s), fine sand (fs), very fine sand (vfs), loamy course sand (lcos), loamy sand (ls), loamy fine sand (lfs), or loamy very fine sand (lvfs).

Sandy/Gravelly Horizon—The horizon of a soil component is determined to be sandy/gravelly if the percent passing the #10 sieve times the percent passing the #200 sieve divided by 100 is less than or equal to 15 percent.

Saturated Hydraulic Conductivity (K_{sat})—The amount of water that would move downward through a unit area of saturated in-place soil in unit time under unit hydraulic gradient., in micrometers per second.

Sodium Adsorption Ratio (SAR)—A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste, expressed as a percentage. For automated interpretations using NASIS, the maximum representative SAR value within 30cm of the soil surface is used.

Soil Depth—Depth to first restrictive layer measured from the top of the uppermost mineral horizon (or surface for Histosols) to the top of the restrictive layer.

Exhibit 537-15 Conservation Tree/Shrub Group Descriptions

Group 1

Soil depth to a restrictive layer[1] is at least 40 inches (100 cm). The depth to a water table during the growing season[1] is at least 3 feet (90 cm) but less than 5 feet (150 cm). If the soil is frequently or occasional flooded for 2 or more months during the growing season, with a duration of brief, long, or very long, then the depth to a water table during the growing season[1] may exceed 5 feet. The available water capacity[1] is greater than 7.5 inches (19 centimeters). In the upper 12 inches (30 cm) of the soil profile free carbonates do not exceed a concentration of 5 percent calcium carbonate equivalent[1], the range of pH[1] is between 5.6 and 8.4, and electrical conductivity[1] is 4 mmhos/cm or less. For all horizons to a depth of 5 feet (150 cm), or to the first restrictive layer[1], the minimum low Ksat is 0.2 inches/hour (1.4 micrometers per second) or greater and the maximum high Ksat is 20 inches/hour (142 micrometers per second) or less.

Group 1A

Soil criteria is the same as Group 1 except:
- In the upper 12 inches (30 centimeters) of the soil profile the range of pH[1] is between 4.5 and 5.5.

Group 1H

Soil criteria is the same as for Group 1 except:
- Soil depth to a restrictive layer[1] is at least 20 inches (50 cm).
- In the upper 12 inches (30 cm) of the soil profile, free carbonates are not considered and the pH[1] is 7.8 or less.
- The soil taxonomic order is histosol or texture-in-lieu-of is peat, muck, or muck peat.

Group 1K

Soil criteria is the same as Group 1 except:
- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 5 and 15 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 1KK

Soil criteria is the same as Group 1 except:
- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 15 and 40 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 1KK

Soil criteria is the same as Group 1 except:
- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 15 and 40 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 1S

Soil criteria is the same as Group 1 except:
- The available water capacity[1] is between 3.75 and 7.5 inches (9.5 and 19 cm).

Group 1SK

Soil criteria is the same as Group 1 except:
- The available water capacity[1] is between 3.75 and 7.5 inches (9.5 and 19 cm)
- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 5 and 15 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 1SKK

Soil criteria is the same as Group 1 except:
- The available water capacity[1] is between 3.75 and 7.5 inches (9.5 and 19 cm)
- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 15 and 40 percent calcium carbonate equivalent[1] and the range of pH[1] is between 7.9 and 8.4.

Group 2

Soil depth to a restrictive layer[1] is at least 40 inches (100 cm). The depth to a water table during the growing season[1] is at least 1.5 feet (45 cm) but less than 3 feet (90 cm). The depth to a water table may be less than 3 feet (90 cm) if it is for less than 3 months during the growing season[1]. The available water capacity[1] is greater than 2 inches (5 cm). In the upper 12 inches (30 cm) of the soil profile free carbonates do not exceed a concentration of 5 percent calcium carbonate equivalent[1], the range of pH[1] is between 5.6 and 8.4, and electrical conductivity[1] is 4 mmhos/cm or less.

Group 2A

Soil criteria is the same as Group 2 except:
- In the upper 12 inches (30 cm) of the soil profile the range of pH[1] is between 4.5 and 5.5.

Group 2K

Soil criteria is the same as Group 2 except:
- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 5 and 15 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 2KK

Soil criteria is the same as Group 2 except:
- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 15 and 40 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 2H

Soil criteria is the same as for Group 2 except:
- The available water capacity[1] is 7.5 inches (19 cm) or greater.
- In the upper 12 inches (30 cm) of the soil profile free carbonates are not considered and the pH[1] is 7.8 or less.
- The soil taxonomic order is histosol or texture-in-lieu-of is peat, muck, or muck peat.

Group 3

Soil depth to a restrictive layer[1] is at least 40 inches (150 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). If the soil is frequently or occasional flooded with a duration of brief, long, or very long, it must be for less than 2 months during the growing season[1]. The available water capacity[1] is at least 7.5 inches (19 cm). In the upper 12 inches (30 cm) of the soil profile free carbonates do not exceed a concentration of 5 percent calcium carbonate equivalent[1], the range of pH[1] is between 5.6 and 8.4, and electrical conductivity[1] is 4 mmhos/cm or less. For all horizons to a depth of 5 feet (150 cm), or to the first restrictive layer[1], the minimum low Ksat is 1.4 micrometers per second (0.2 inches/hour) or greater and the maximum high Ksat is 142 micrometers per second (20 inches/hour) or less. The bottom horizon is not sandy or gravelly[1].

Group 3A

Soil criteria is the same as Group 3 except:
- In the upper 12 inches (30 cm) of the soil profile the range of pH[1] is between 4.5 and 5.5.

Group 4

Soil depth to a restrictive layer[1] is at least 20 inches (50 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). The depth to a water table may be less than 5 feet (150 cm) if it is for less than 2 months during the growing season[1]. The available water capacity[1] is at least 5 inches (12 cm). In the upper 12 inches (30 cm) of the soil profile free carbonates do not exceed a concentration of 5 percent calcium carbonate equivalent[1], the range of pH[1] is between 5.6 and 8.4, and electrical conductivity[1] is 4 mmhos/cm or less. In the first 20 inches (50 cm) of the soil profile there is at least one layer that is a minimum of 8 inches (20 cm) thick with a low Ksat of 1.4 micrometers per second (0.2 inches/hour) or greater and a high Ksat of 142 micrometers per second (20 inches/hour) or less. Below the first 20 inches (50 cm) of the profile there is at least one layer that is a minimum of 6 inches (15 cm) thick with a low Ksat between 0.42 and 1.43 micrometers per second (0.6 and 0.2 inches/hour) and a high Ksat of 14.3 micrometers per second (2.0 inches/hr) or less.

Group 4A

Soil criteria is the same as Group 4 except:

- In the upper 12 inches (30 cm) of the soil profile the range of pH[1] is between 4.5 and 5.5.

Group 4K

Soil criteria is the same as Group 4 except:

- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 5 and 15 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 4C

Soil depth to a restrictive layer[1] is at least 20 inches (50 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). The depth to a water table may be less than 5 feet (150 cm) if it is for less than 2 months during the growing season[1]. The available water capacity[1] is at least 3.75 inches (9.5 cm). In the upper 12 inches (30 cm) of the soil profile free carbonates do not exceed a concentration of 5 percent calcium carbonate equivalent[1], the range of pH[1] is between 5.6 and 8.4, and electrical conductivity[1] is 4 mmhos/cm or less. The soil profile falls into one of the following scenarios with respect to Ksat:

1) In the first 8 inches (20 cm) of the soil profile the minimum low Ksat is 1.4 micrometers per second (0.2 inches/hour) or greater and the maximum high Ksat is 142 micrometers per second (20 inches/hour) or less. Below the first 20 inches (50 cm) all horizons have a minimum low Ksat between 0.42 and 1.43 micrometers per second (0.6 and 0.2 inches/hour) and a high Ksat of 14.3 micrometers per second (2.0 inches/hr) or less.
2) All horizons to a depth of 5 feet (150 cm), or the fist restrictive layer[1], have a minimum low Ksat between 0.42 and 1.43 micrometers per second (0.6 and 0.2 inches/hour) and a maximum high Ksat of 14.3 micrometers per second (2.0 inches/hr) or less.

Group 4CA

Soil criteria is the same as Group 4C except:

- In the upper 12 inches (30 cm) of the soil the range of pH[1] is between 4.5 and 5.5.

Group 4CK

Soil criteria is the same as Group 4C except:

- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 5 and 15 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 4CC

Soil criteria is the same as Group 4C except:

- The soil profile falls into one of the following scenarios with respect to Ksat:
  1. In the surface horizon (within 20cm) the minimum low Ksat is 1.4 micrometers per second (0.2 inches/hour) or greater and the maximum high Ksat is 142 micrometers per second (20 inches/hour) or less. Below the first 8 inches (20 cm) of the profile there is at least one layer that is a minimum of 6 inches (15 cm) thick with a high Ksat less than 0.43 (0.6 inches/hour).
  2. All horizons to a depth of 5 feet (150 cm), or the fist restrictive layer[1], have a maximum high Ksat of 0.43 micrometers per second (0.06 inches/hour) or less.
- There is no root restrictive layer within 100cm of the surface.

Group 5

Soil depth to a restrictive layer[1] is at least 40 inches (100 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). If the soil is frequently or occasional flooded with a duration of brief, long, or very long, it is for less than 2 months during the growing season[1]. The available water capacity[1] is at between 3.75 and 7.5 inches (9.5 and 19 cm). In the upper 12 inches (30 cm) of the soil profile free carbonates do not exceed a concentration of 5 percent calcium carbonate equivalent[1], the range of pH[1] is between 5.6 and 8.4, and electrical conductivity[1] is 4 mmhos/cm or less. For all horizons to a depth of 5 feet (150 cm), or to the first restrictive layer[1], the minimum low Ksat is 1.4 micrometers per second (0.2 inches/hour) or greater and the maximum high Ksat is 142 micrometers per second (20 inches/hour) or less. The bottom horizon is not sandy or gravelly[1].

Group 5A

Soil criteria is the same as Group 5 except:

- In the upper 12 inches (30 cm) of the soil profile the range of pH[1] is between 4.5 and 5.5.

Group 5K

Soil criteria is the same as Group 5 except:

- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 5 and 15 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 5KK

Soil criteria is the same as Group 5 except:

- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 15 and 40 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 6

Soil depth to a restrictive layer[1] is at least 20 inches (50 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). The depth to a water table may be less than 5 feet (150 cm) if it is for less than 2 months during the growing season[1]. The available water capacity[1] is between 2 and 3.75 inches (5 and 9.5 cm). In the upper 12 inches (30 cm) of the soil profile free carbonates do not exceed a concentration of 5 percent calcium carbonate equivalent[1], the range of pH[1] is between 5.6 and 8.4, and electrical conductivity[1] is 4 mmhos/cm or less. In the surface horizon (within 20cm) the minimum low Ksat is 1.4 micrometers per second (0.2 inches/hour) or greater and the maximum high Ksat is 142 micrometers per second (20 inches/hour) or less. The bottom horizon is either sandy or gravelly[1] or the high Ksat is greater than 141 micrometers per second (20 inches/hour) or there is a root restrictive layer between 40 and 60 inches (50 and 150 cm). The drainage class for the soil is either excessively, somewhat excessively, or well drained.

Group 6A

Soil criteria is the same as Group 6 except:

- In the upper 12 inches (30 cm) of the soil profile the range of pH[1] is between 4.5 and 5.5.

Group 6K

Soil criteria is the same as Group 6 except:

- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 5 and 15 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 6KK

Soil criteria is the same as Group 6 except:

- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 15 and 40 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 6D

Soil depth to a restrictive layer[1] is between 20 and 40 inches (50 and 100 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). The depth to a water table may be less than 5 feet (150 cm) if it is for less than 2 months during the growing season[1]. The available water capacity[1] is at least 3.75 inches (9.5 cm). In the upper 12 inches (30 cm) of the soil profile free carbonates do not exceed a concentration of 5 percent calcium carbonate equivalent[1], the range of pH[1] is between 5.6 and 8.4, and electrical conductivity[1] is 4 mmhos/cm or less. In the surface horizon (within 20cm) the minimum low Ksat is 1.4 micrometers per second (0.2 inches/hour) or greater and the maximum high Ksat is 43 micrometers per second (6 inches/hour) or less. There is a root restrictive layer[1] between 20 and 60 inches (50 and 150 cm).

Group 6DK

Soil criteria is the same as Group 6D except:

- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 5 and 15 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 6G

Soil depth to a restrictive layer[1] is at least 20 inches (50 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). The depth to a water table may be less than 5 feet (150 cm) if it is for less than 2 months during the growing season[1]. The available water capacity[1] is at least 3.75 in (9.5 cm). In the upper 12 inches (30 cm) of the soil profile free carbonates do not exceed a concentration of 5 percent calcium carbonate equivalent[1], the range of pH[1] is between 5.6 and 8.4, and electrical conductivity[1] is 4 mmhos/cm or less. In the surface horizon (within 20cm) the minimum low Ksat is 1.4 micrometers per second (0.2 inches/hour) or greater and the maximum high Ksat is 142 micrometers per second (20 inches/hour) or less. The bottom horizon is either sandy or gravelly[1] or the high Ksat is greater than 141 micrometers per second (20inches/hour). The drainage class for the soil is something other than excessively drained.

Group 6GA

Soil criteria is the same as Group 6G except:

- In the upper 12 inches (30 cm) of the soil profile the range of pH[1] is between 4.5 and 5.5.

Group 6GK

Soil criteria is the same as Group 6G except:

- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 5 and 15 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 6GKK

Soil criteria is the same as Group 6G except:

- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 15 and 40 percent calcium carbonate equivalent[1] and the range of pH[1] is between 6.5 and 8.4.

Group 7

Soil depth to a restrictive layer[1] is at least 40 inches (100 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). The depth to a water table may be less than 5 feet (150 cm) if it is for less than 2 months during the growing season[1]. The available water capacity[1] is at least 2 inches (5 cm). In the upper 12 inches (30 cm) of the soil profile free carbonates do not exceed a concentration of 5 percent calcium carbonate equivalent[1], the range of pH[1] is between 5.6 and 8.4, and electrical conductivity[1] is 4 mmhos/cm or less. For all horizons to a depth of 5 feet (150 cm), or to the first restrictive layer[1], the minimum low Ksat is at least 42 micrometers per second (6 inches/hour) and all horizons have a sandy texture[1].

Group 7A

Soil criteria is the same as Group 7 except:

- In the upper 12 inches (30 cm) of the soil profile the range of pH[1] is between 4.5 and 5.5.

Group 8

Soil depth to a restrictive layer[1] is at least 40 inches (100 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). The depth to a water table may be less than 5 feet (150 cm) if it is for less than 2 months during the growing season[1]. The available water capacity[1] is at least 7.5 inches (19 cm). In the upper 12 inches (30 cm) of the soil profile free carbonates range between 5 and 15 percent calcium carbonate equivalent[1], the range of pH[1] is between 6.5 and 8.4, and electrical conductivity[1] is 4 mmhos/cm or less. For all horizons to a depth of 5 feet (150 cm), or to the first restrictive layer[1], the minimum low Ksat is 1.4 micrometers per second (0.2 inches/hour) or greater and the maximum high Ksat is 142 micrometers per second (20 inches/hour) or less.

Group 8K

Soil criteria is the same as Group 8 except:

- In the upper 12 inches (30 cm) of the soil profile free carbonates range between 15 and 40 percent calcium carbonate equivalent[1].

Group 9C

Soil depth to a restrictive layer[1] is at least 20 inches (50 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). The depth to a water table may be less than 5 feet (150 cm) if it is for less than 2 months during the growing season[1]. The available water capacity[1] is at least 3.75 inches (9.5 cm). In the upper 12 inches (30 cm) of the soil profile, the range of electrical conductivity[1] is between 4 and 16 mmhos/cm. The soil profile falls into one of the following scenarios with respect to Ksat:

1) In the first 8 inches (20 cm) of the soil profile the minimum low Ksat is 1.4 micrometers per second (0.2 inches/hour) or greater and the maximum high Ksat is 142 micrometers per second (20 inches/hour) or less. Below the first 8 inches (20 cm) all horizons have a minimum low Ksat between 0.42 and 1.43 micrometers per second (0.6 and 0.2 inches/hour) and a high Ksat of 14.3 micrometers per second (2.0 inches/hr) or less.
2) All horizons to a depth of 5 feet (150 cm), or the fist restrictive layer[1], have a minimum low Ksat between 0.42 and 1.43 micrometers per second (0.6 and 0.2 inches/hour) and a maximum high Ksat of 14.3 micrometers per second (2.0 inches/hr) or less.

Group 9L

Soil depth to a restrictive layer[1] is at least 20 inches (50 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). The depth to a water table may be less than 5 feet (150 cm) if it is for less than 2 months during the growing season[1]. The available water capacity[1] is at least 3.75 inches (9.5 cm). In the upper 12 inches (30 cm) of the soil profile, the range of electrical conductivity[1] is between 4 and 16 mmhos/cm. The soil profile falls into one of the following scenarios with respect to Ksat:

1) All horizons to a depth of 5 feet (150 cm), or the first restrictive layer[1], have a minimum low Ksat of 1.4 micrometers per second (0.2 inches/hour) or greater and a maximum high Ksat of 43 micrometers per second (6.0 inches/hr) or less.

2) In the first 8 inches (20 cm) of the soil profile the minimum low Ksat is 1.4 micrometers per second (0.2 inches/hour) or greater and the maximum high Ksat is 43 micrometers per second (6.0 inches/hour) or less and. Below the first 8 inches (20 cm) all horizons to 5 feet (150 cm), or to the first restrictive layer[1], have a minimum low Ksat of 0.42 micrometers per second (0.6 inches/hour) or greater and a maximum high Ksat of 1.43 micrometers per second (0.2 inches/hr) or less.
3) In the first 20 inches (50 cm) of the soil profile the minimum low Ksat is 1.4 micrometers per second (0.2 inches/hour) or greater and the maximum high Ksat is 43 micrometers per second (6.0 inches/hour) or less. Below the first 20 inches (50 cm) all horizons to 5 feet (150 cm), or to the first restrictive layer[1], have a minimum low Ksat of 0.42 micrometers per second (.06 inches/hour) or greater and a maximum high Ksat of 1.43 micrometers per second (0.2 inches/hr) or less.

Group 9N

Soil depth to a restrictive layer[1] is at least 20 inches (50 cm). The depth to a water table during the growing season[1] is at least 5 feet (150 cm). The depth to a water table may be less than 5 feet (150 cm) if it is for less than 2 months during the growing season[1]. The available water capacity[1] is at least 2 inches (5 cm). In the upper 12 inches (30 cm) of the soil profile the sodium adsorption ratio[1] ranges between 13 and 25 percent, and electrical conductivity[1] is 16 mmhos/cm or less.

Group 9NW

Soil criteria is the same as Group 9N except:

- The depth to a water table during the growing season[1] is between 1.5 and 5 feet (45 and 150 cm).

Group 9W

Soil depth to a restrictive layer[1] is at least 20 inches (50 cm). The depth to a water table during the growing season[1] is between 1.5 and 5 feet (45 and 150 cm). The available water capacity[1] is at least 2 inches (5 cm). In the upper 12 inches (30 cm) of the soil profile electrical conductivity[1] is between 4 and 16 mmhos/cm.

Group 10

Soils have one or more characteristics that are severely imitating to the planting and growth of trees and shrubs: soil depth is less than 20 inches (50 cm); available water capacity is less than 2 inches (5.0 cm); depth to a water table during the growing season[1] is less than 1.5 feet (45 cm) or occurs for longer than 3 months during the growing season[1]; in the upper 12 inches (30 cm) of the soil profile free carbonates are greater than 40 percent calcium carbonate equivalent[1], pH is less than 4.0 or greater than 8.4, electrical conductivity[1] is greater than 16 mmhos/cm, or sodium adsorption ratio[1] is 25 percent or greater. When using NASIS to automate CTSG grouping, soils will be placed in group 10 if: no taxonomic temperature is recorded; the component kind is recorded as “miscellaneous area”; or no data are recorded in the horizon table.

[1]Refer to Exhibit 537-15 Notes/Definitions for definitions and information on how the property is derived when NASIS is used to automate CTSG groupings.

Exhibit 537-16 Forestland Ecological Site Description Example

The following is an example of a forestland ecological site description. It is presented as an example of content and format only. The data presented do not represent an actual ecological site.

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

ECOLOGICAL SITE DESCRIPTION

ECOLOGICAL SITE CHARACTERISTICS

Site Type: Forestland

Site Name: *Acer saccharum-Betula alleghaniensis/Acer pensylvanicum/Dryopteris* (sugar maple-yellow birch/striped maple/woodfern)

Site ID: F143XY001ME

Major Land Resource Area: 143 - Northeastern Mountains

Physiographic Features

This site is on gently sloping, well drained, very deep soils on the crests of drumlin-shaped glacial till ridges that are generally oriented in a northwest-to-southeast direction.

Landform: (1) drumlin

	Minimum	Maximum
Elevation (feet):	600	2800
Slope (percent):	15	35
Water Table Depth (inches):	24	40
Flooding:		
Frequency:	none	none
Duration:	none	none
Ponding:		
Depth (inches):	0	0
Frequency:	none	none
Duration:	none	none
Runoff Class:	high	high

Aspect: (1) NW
(2) SW

Climatic Features

Precipitation is well distributed throughout the year. Of the total annual precipitation, about one-half occurs in April through September. The winters are cold and summers are moderately warm with occasional hot spells. Thunderstorms occur about 18 days each year. Average seasonal snowfall is 92 inches with at least 78 days of at least 1 inch of snow on the ground. The sun shines 60 percent of the time possible in summer and 55 percent in winter.

	Minimum	Maximum
Frost Free Period (days):	110	152
Freeze Free Period (days):	142	183
Mean Annual Precipitation (inches):	37	50

Monthly Precipitation (inches) and Temperature (^{0}F):

Month	Jan	Feb	Mar	Apr	Mar	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precip. Min.	1.24	1.44	1.73	2.34	1.95	2.18	2.41	2.25	1.92	2.55	2.61	1.84
Precip. Max.	4.39	4.24	4.78	4.59	5.01	5.27	5.23	5.00	5.14	5.69	6.11	5.60
Temp. Min.	6.9	7.8	19.1	30.3	40.7	50.2	55.3	53.1	45.4	35.7	27.1	12.4
Temp. Max.	27.1	30.3	38.9	51.7	65.3	74.4	79.2	76.7	68.4	57.1	43.2	30.3

Climate Station(s): (1) ME12345, Ramfer, Maine. Period of record 1954-1984.
(2) ME3444, Merkett, Maine. Period of record 1964-1994.

Influencing Water Features

The following water features are associated with this site.

Wetland Description: (Cowardin System)	System	Subsystem	Class
	none	none	none

Stream Types: none
(Rosgen System)

Representative Soil Features

The following soil features are associated with this site. The surface textures recorded represents those found within 8 inches of the soil surface. The subsurface texture group recorded represents the group at a depth between 8 and 20 inches.

Predominant Parent Materials:
Kind: supraglacial till
Origin: granite

Surface Texture: (1) fine sandy loam
(2) very fine sandy loam
Subsurface Texture Group: loamy
Surface Fragments <=3" (% Cover): 5
Surface Fragments >3" (% Cover): 5
Rock Fragments <=3" (% Volume): 20
Rock Fragments >3" (% Volume): 10
Drainage Class: well
Permeability Class: moderate

	Minimum	Maximum
Depth (inches):	60	60
Electrical Conductivity (mmhos/cm):	0	0
Sodium Adsorption Ratio:	13	30
Calcium Carbonate Equivalent (percent):	1	4
Soil Reaction (1:1 Water):	3.6	6.0
Soil Reaction (.0-1M CaCl2):	NA	NA
Available Water Capacity (inches):	3.95	10.79

Soil Survey Associations:
This ecological site is associated with the map units and soil components in the following soil surveys. Future updates to this soil survey may affect these associations. For up-to-date associations between soil components and this ecological site, refer to NASIS. Associations between ecological sites and soil components are maintained in NASIS via the ecological site ID.

Soil Survey	Map Unit Symbol	Map Unit Name Soil Components
Oxcart County, Maine, 1992		
	MeD	Marlow fine sandy loam, 15 to 35 percent slopes, very stony Marlow
	MaD	Marlow fine sandy loam, 15 to 25 percent slopes Marlow
	DXD	Dixfield-Marlow association, moderately steep, very stony Marlow
Deurboniux County, Maine, 1981		
	DuD	Marlow-Vines complex, 15 to 25 percent slopes, very stony Marlow
	ErD	Erloin fine sandy loam, 15 to 25 percent slopes Erloin
	EvD	Erloin-Vercouse association, moderately steep, very stony Erloin

PLANT COMMUNITIES

Ecological Dynamics of the Site

Sugar maple, yellow birch and American beech are the predominant climax overstory species on this site. Assuming site conditions are favorable, the major factor influencing the establishment of the sugar maple, yellow birch, American beech forest is disturbance. In well-drained upland sites, the formation of this climax forest will be assured if no further natural or human disturbance takes place.

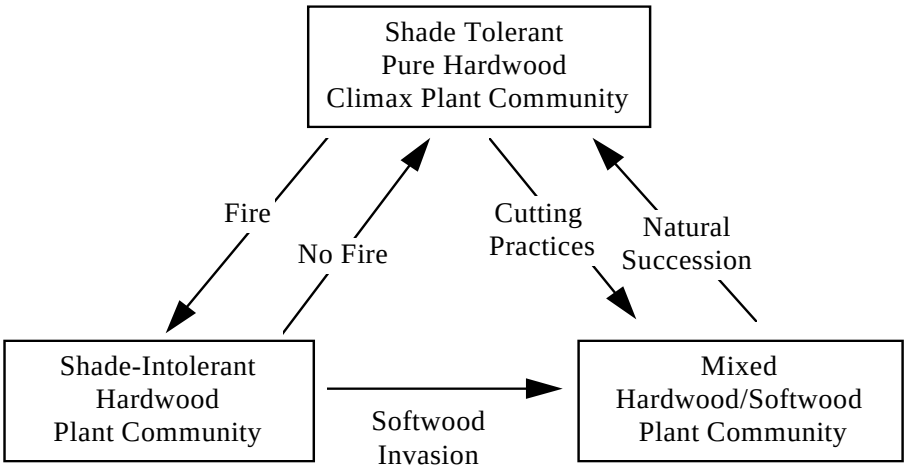
Vegetation succession is of a secondary nature, brought about by fire, cutting, insect infestation or substrate disturbance (colluvium activity). Fire within this well-drained, upland forest habitat would probably result in a successional shade-intolerant hardwood stand consisting of red maple, bigtooth aspen, white ash, and yellow birch. These species are able to develop from sucker growth.

Eventually the shade-tolerant hardwoods would intrude into the understory and gradually displace the shade-intolerant species. Shade-tolerant softwood species, such as red spruce and eastern hemlock, may also become locally established during this successional sequence.

Cutting practices within this forest habitat could produce a shift from a pure shade-tolerant hardwood forest to a mixedwood stand. Depending on the degree and time of cutting, red spruce and eastern white pine could regenerate with the red maple and white ash. Over time, this successional sequence will probably, if left undisturbed, revert to the original shade-tolerant hardwood forest.

The site can maintain itself indefinitely by a process of gap replacement. Insect infestation does not appear to affect this site as a whole. Insects do, however, greatly influence individual species.

The Nectria–Cryptococcus association (“Beech Scale”) has brought about a dramatic decline in the number of beech. Birch dieback (believed to be a stress-related disorder) and several minor pests have also caused a reduction in the vigor and distribution of yellow birches.



Interpretive Plant Community

The interpretive plant community for this site is the historic climax plant community. An overstory canopy of sugar maple, yellow birch, and American beech dominates the historic climax plant community. The dominant shrub species in the understory are striped maple and eastern hophornbeam. Western brackenfern, eastern hayscented fern, woodfern, American starflower, and Canada beadruby are the dominant herbaceous species. Sweet birch, paper birch, red maple, white ash, sessileleaf bellwort, and clubmoss are also commonly found on this site.

Ground Cover and Structure:

	Percent Ground Cover by Height Class (feet)								
Cover Type	<.5	.5-1	>1-2	>2-4.5	>4.5-13	>13-40	>40-80	>80-120	>120
Grass/Grass Like	-	5	5	-	-	-	-	-	-
Forb	-	-	-	-	-	-	-	-	-
Shrub/Vine	-	-	5	5	-	-	-	-	-
Tree	-	2	5	5	5	10	15	90	-
Lichen	-	-	-	-	-	-	-	-	-
Moss	10	-	-	-	-	-	-	-	-
Litter	75	-	-	-	-	-	-	-	-
Course Fragment	10	-	-	-	-	-	-	-	-
Bare Ground	1	-	-	-	-	-	-	-	-

Forest Overstory Composition:
The typical forest overstory composition of the historic climax community.

Common Name	Scientific Name	Percent Composition (percent by frequency)
American Beech	*Fagus grandifolia*	35
eastern hemlock	*Tsuga canadensis*	02
paper birch	*Betula papyrifera*	01
red maple	*Acer rubrum*	01
sugar maple	*Acer saccharum*	30
white ash	*Fraxinus americana*	01
yellow birch	*Betula alleghaniensis*	30
Total		100

Forest Understory Composition:
The typical annual production of understory species to a height of 4.5 feet (excluding boles of trees) under low, high, and representative canopy covers.

		Annual Production Per Acre Percent and Pounds (air-dry weight)					
		Canopy Cover Percent					
		80		90		100	
Common Name	Scientific Name	%	lbs.	%	lbs.	%	lbs.
American Beech	*Fagus grandifolia*	10	150	15	150	20	140
American starflower	*Trientalis borealis*	2	30	2	20	2	14
Canada beadruby	*Maianthemum canadense*	2	30	2	20	2	14
clubmoss	*Lycopodium*	2	30	2	20	2	14
eastern hayscented fern	*Dennstaedtia punctilobula*	2	30	2	20	2	14
eastern hemlock	*Tsuga canadensis*	5	75	5	50	5	35
eastern hophornbeam	*Ostrya virginiana*	10	150	10	100	5	35
red maple	*Acer rubrum*	10	150	5	50	5	35
sessileleaf bellwort	*Uvularia sessilifolia*	3	45	3	30	3	21
striped maple	*Acer pensylvanicum*	10	150	10	100	5	35
sugar maple	*Acer saccharum*	15	225	15	150	15	105
sweet birch	*Betula lenta*	5	75	3	30	2	14
western brackenfern	*Pteridium aquilinum*	2	30	2	20	2	14
white ash	*Fraxinus americana*	5	75	3	30	0	0
woodfern	*Dryopteris*	15	225	10	100	10	70
yellow birch	*Betula alleghaniensis*	2	30	2	20	0	0
Total Annual Production		100	1500	91	1000	80	700

Typical Climax Community

Shade-Intolerant Hardwood Plant Community

Fire within this well-drained, upland forest habitat would probably result in a successional shade-intolerant hardwood stand consisting of red maple, paper birch and bigtooth aspen, as these species are able to develop from sucker growth. Eventually the shade-tolerant hardwoods comprising the climax plant community would intrude into the understory and gradually displace the shade-intolerant species. Shade-tolerant softwood species, such as eastern hemlock, red spruce and balsam fir, may also become locally established during this vegetation stage.

Ground Cover and Structure:

	Percent Ground Cover by Height Class (feet)								
Cover Type	<.5	.5-1	>1-2	>2-4.5	>4.5-13	>13-40	>40-80	>80-120	>120
Grass/Grass Like	-	5	5	-	-	-	-	-	-
Forb	-	-	-	-	-	-	-	-	-
Shrub/Vine	-	5	5	5	-	-	-	-	-
Tree	-	2	5	5	5	10	15	90	1
Lichen	-	-	-	-	-	-	-	-	-
Moss	15	-	-	-	-	-	-	-	-
Litter	60	-	-	-	-	-	-	-	-
Course Fragment	10	-	-	-	-	-	-	-	-
Bare Ground	1	-	-	-	-	-	-	-	-

Forest Overstory Composition:
The typical forest overstory composition of the shade-intolerant hardwood plant community.

Common Name	Scientific Name	Percent Composition (percent by frequency)
balsam fir	*Abies balsamea*	5
bigtooth aspen	*Populus grandidentata*	15
eastern hemlock	*Tsuga canadensis*	5
paper birch	*Betula papyrifera*	30
red maple	*Acer rubrum*	40
red spruce	*Picea rubens*	5
Total		100

Forest Understory Composition
The typical annual production of the understory species to a height of 4.5 feet (excluding boles of trees) under low, high, and representative canopy covers.

		Annual Production Per Acre Percent and Pounds (air-dry weight)					
		Canopy Cover Percent					
		75		85		95	
Common Name	Scientific Name	%	lbs.	%	lbs.	%	lbs.
American Beech	*Fagus grandifolia*	15	225	15	150	20	140
American starflower	*Trientalis borealis*	2	30	2	20	2	14
balsam fir	*Abies balsamea*	10	150	15	225	15	225
bigtooth aspen	*Populus grandidentata*	5	75	1	15	0	0
Canada beadruby	*Maianthemum canadense*	2	30	2	20	1	7
clubmoss	*Lycopodium*	3	45	2	20	1	7
eastern hayscented fern	*Dennstaedtia punctilobula*	3	45	2	20	2	14
eastern hemlock	*Tsuga canadensis*	5	75	5	50	5	35
eastern hophornbeam	*Ostrya virginiana*	5	75	5	50	5	35
paper birch	*Betula papyrifera*	2	30	0	0	0	0
red maple	*Acer rubrum*	5	75	0	0	0	0
red spruce	*Picea rubens*	10	150	10	150	15	225
sessileleaf bellwort	*Uvularia sessilifolia*	2	30	5	50	2	14
striped maple	*Acer pensylvanicum*	5	75	10	100	5	35
sugar maple	*Acer saccharum*	10	150	15	150	15	105
sweet birch	*Betula lenta*	5	75	1	10	0	0
western brackenfern	*Pteridium aquilinum*	2	30	3	30	2	14
white ash	*Fraxinus americana*	3	45	2	20	0	0
woodfern	*Dryopteris*	3	45	5	50	10	70
yellow birch	*Betula alleghaniensis*	3	45	0	0	0	0
Total Annual Production		100	1500	100	1000	100	700

Typical Shade-Intolerant Hardwood Plant Community

Mixed Hardwood/Softwood Plant Community

Cutting practices within this forest habitat could produce a shift from a pure shade-tolerant hardwood forest to a mixed wood stand. Depending on the degree and time of cutting, a component of red spruce, balsam fir, and eastern white pine could regenerate with the red maple and paper birch. Over time, this vegetation stage will probably, if left undisturbed, revert to the original shade-tolerant hardwood forest. The forest can maintain itself indefinitely by a process of gap replacement.

Ground Cover and Structure:

	Percent Ground Cover by Height Class (feet)								
Cover Type	<.5	.5-1	>1-2	>2-4.5	>4.5-13	>13-40	>40-80	>80-120	>120
Grass/Grass Like	-	5	5	-	-	-	-	-	-
Forb	-	-	-	-	-	-	-	-	-
Shrub/Vine	-	5	5	10	-	-	-	-	-
Tree	-	5	5	10	5	10	20	90	1
Lichen	-	-	-	-	-	-	-	-	-
Moss	10	-	-	-	-	-	-	-	-
Litter	50	-	-	-	-	-	-	-	-
Course Fragment	10	-	-	-	-	-	-	-	-
Bare Ground	1	-	-	-	-	-	-	-	-

Forest Overstory Composition:
The typical forest overstory composition of the mixed softwood/hardwood plant community.

Common Name	Scientific Name	Percent Composition (percent by frequency)
balsam fir	*Abies balsamea*	10
bigtooth aspen	*Populus grandidentata*	10
eastern hemlock	*Tsuga canadensis*	10
eastern white pine	*Pinus strobus*	10
paper birch	*Betula papyrifera*	20
red maple	*Acer rubrum*	20
red spruce	*Picea rubens*	20
Total		100

Forest Understory Composition

The typical annual production of the understory species in this seral stage to a height of 4.5 feet (excluding boles of trees) under low, high, and representative canopy covers.

		Annual Production Per Acre Percent and Pounds (air-dry weight)					
		Canopy Cover Percent					
		75		85		95	
Common Name	Scientific Name	%	lbs.	%	lbs.	%	lbs.
American Beech	*Fagus grandifolia*	2	30	5	50	15	105
American starflower	*Trientalis borealis*	2	30	2	20	2	14
balsam fir	*Abies balsamea*	15	225	20	300	15	225
bigtooth aspen	*Populus grandidentata*	3	45	2	30	0	0
Canada beadruby	*Maianthemum canadense*	2	30	2	20	1	7
clubmoss	*Lycopodium*	3	45	2	20	1	7
eastern hayscented fern	*Dennstaedtia punctilobula*	3	45	2	20	2	14
eastern hemlock	*Tsuga canadensis*	10	150	5	50	5	35
eastern hophornbeam	*Ostrya virginiana*	3	45	5	50	5	35
eastern white pine	*Pinus strobus*	3	45	2	20	0	0
paper birch	*Betula papyrifera*	2	30	2	30	0	0
red maple	*Acer rubrum*	10	150	5	75	0	0
red spruce	*Picea rubens*	10	150	10	150	15	225
sessileleaf bellwort	*Uvularia sessilifolia*	3	45	3	30	2	14
striped maple	*Acer pensylvanicum*	3	45	5	50	10	70
sugar maple	*Acer saccharum*	10	150	15	150	15	105
sweet birch	*Betula lenta*	5	75	3	30	0	0
western brackenfern	*Pteridium aquilinum*	2	30	3	30	2	14
white ash	*Fraxinus americana*	3	45	2	20	0	0
woodfern	*Dryopteris*	3	45	5	50	10	70
yellow birch	*Betula alleghaniensis*	3	45	0	0	0	0
Total Annual Production		100	1500	100	1000	100	700

Typical Mixed Hardwood/Softwood Plant Community

ECOLOGICAL SITE INTERPRETATIONS

Forest Site Productivity

		Site Index		Annual Productivity (per acre per year) Cubic Feet (CMAI)		Other Units		
Common Name	Scientific Name	Low	High	Low	High	Low	High	Unit
American Beech	*Fagus grandifolia*	55	65	40	45	-	-	
eastern white pine	*Pinus strobus*	60	66	110	115	375	395	International 1/4
paper birch	*Betula papyrifera*	60	65	70	73	-	-	
red maple	*Acer rubrum*	55	65	40	45	-	-	
red spruce	*Picea rubens*	48	55	98	105	-	-	
sugar maple	*Acer saccharum*	55	65	40	45	-	-	
white ash	*Fraxinus americana*	65	68	40	45	-	-	
yellow birch	*Betula alleghaniensis*	55	65	40	45	-	-	

Animal Community

This climax hardwood forest has rich soils that support a diverse soil fauna, including philomycid slugs and minute snails, such as *Planogyra astericus* and *Striatura exigua*. Rotting logs provide good habitat for beetles and other insects. Insects are also important in the canopy. Wood frogs and salamanders are common, as are warblers and woodpeckers. The fallen trees can provide dens for bear in the winter. A large diversity of birds inhabit the tree canopy.

Plant Preference by Animal Kind

Animal Kind: White-tailed Deer

			Forage Preferences											
Common Name	Scientific Name	Plant Part	J	F	M	A	M	J	J	A	S	O	N	D
American Beech	*Fagus grandifolia*	leaves	U	U	U	U	U	U	U	U	U	U	U	U
		fruit/seed	N	N	N	N	N	N	N	P	P	P	N	N
American starflower	*Trientalis borealis*	entire plant	N	N	N	N	D	D	D	D	D	U	N	N
balsam fir	*Abies balsamea*	entire plant	U	U	U	U	U	U	U	U	U	U	U	U
bigtooth aspen	*Populus grandidentata*	leaves	N	N	D	D	D	D	D	D	N	N	N	N
Canada beadruby	*Maianthemum canadense*	leaves	N	N	D	D	D	D	D	D	D	N	N	N
clubmoss	*Lycopodium*	entire plant	N	N	P	P	P	P	P	P	P	N	N	N
eastern hayscented fern	*Dennstaedtia punctilobula*	entire plant	N	N	P	P	P	P	P	P	P	N	N	N
eastern hemlock	*Tsuga canadensis*	leaves	D	D	D	N	N	N	N	N	N	N	N	D
eastern hophornbeam	*Ostrya virginiana*	leaves	N	N	N	D	D	D	D	U	N	N	N	N
eastern white pine	*Pinus strobus*	stems	D	D	N	N	N	N	N	N	N	N	N	D
paper birch	*Betula papyrifera*	leaves	N	N	N	P	P	P	P	P	P	N	N	N
red maple	*Acer rubrum*	entire plant	N	N	N	D	D	D	D	D	D	N	N	N
red spruce	*Picea rubens*	leaves	U	U	U	U	U	U	U	U	U	U	U	U

			Forage Preferences											
Common Name	Scientific Name	Plant Part	J	F	M	A	M	J	J	A	S	O	N	D
sessileleaf bellwort	*Uvularia sessilifolia*	flower	N	N	N	N	D	D	D	D	D	U	N	N
striped maple	*Acer pensylvanicum*	leaves	N	N	N	P	P	P	P	P	P	N	N	N
sugar maple	*Acer saccharum*	leaves	N	N	N	P	P	P	P	P	P	N	N	N
sweet birch	*Betula lenta*	entire plant	N	N	N	P	P	P	P	P	P	N	N	N
western brackenfern	*Pteridium aquilinum*	entire plant	N	N	P	P	P	P	P	P	P	N	N	N
white ash	*Fraxinus americana*	leaves	N	N	N	D	D	D	D	D	D	D	N	N
woodfern	*Dryopteris*	entire plant	N	N	P	P	P	P	P	P	P	N	N	N
yellow birch	*Betula alleghaniensis*	leaves	N	N	N	D	D	D	D	D	D	N	N	N

Legend: P=Preferred, D=Desirable, U=Undesirable, N=Not Consumed, E=Emergency, T=Toxic, X=Used, but degree of utilization unknown

Hydrology Functions

The hydrology of this site is characterized by moderate intensity thunderstorms during the summer months and heavy snowmelt runoff in the spring. From 45% to 50% of the annual moisture occurs during the summer months. Frost action on the site poses limitations for construction of roads relative to forest activities. The site is oval or elongated and in places is dissected by drainageways. Rapid surface runoff combined with steep slopes poses a severe erosion hazard when perennial vegetation covers is insufficient to protect the site.

Recreational Uses

This site is used primarily for hunting in the fall and winter. Other recreational activities, such as hiking and camping, are possible but are somewhat limited by the steep slopes.

Wood Products

Potential wood products associated with this site include veneer logs, sawtimber, boltwood for the wood-turning industry, pulpwood, firewood for residential use, and wood chips for energy production.

Other Products

None

Other Information

None

SUPPORTING INFORMATION

Associated Sites

Site Name	Site ID	Site Narrative
Betula papyrifera-Betula alleghaniensis/Acer pensylvanicum/Dryopteris (paper birch-yellow birch/striped maple/woodfern	F143XY002ME	Similar understory vegetation but overstory dominated by paper birch and yellow birch.

Similar Sites

Site Name	Site ID	Site Narrative
Acer saccharum-Betual alleghaniensis/Viburnum acerifolium/ Calamagrostis coarctata (sugar maple-yellow birch/mapleleaf viburnum/artic reedgrass)	F143XY003ME	This site is found on gravely, unstable spurs along stream ravines and previously logged slopes.

State Correlation

This site has been correlated with the following states:

NH

Inventory Data References

The historic climax plant community has been determined by study of forest relict areas, or areas protected from excessive harvest operations. The following data collection plots also document this site. There are 23 data collection plots relative to the soil components comprising this site.

	Sample ID			
Data Source	Number	Year	State	County
ESI Forestland	12	73	23	017
ESI Forestland	14	73	23	017
ESI Forestland	22	73	23	017
ESI Forestland	21	73	23	017
ESI Forestland	4	82	23	017
ESI Forestland	8	82	23	017
ESI Forestland	6	82	23	017
ESI Forestland	9	82	23	017
ESI Forestland	12	82	23	017
ESI Forestland	8	89	23	017
ESI Forestland	10	71	23	017
ESI Forestland	12	71	23	017
ESI Forestland	13	71	23	017
ESI Forestland	4	86	23	017

Type Locality

	Site #1	Site #2
Latitude:	44^0 33' 13"	44^0 31' 13"
Longitude:	70^0 33' 05"	70^0 33' 05"
State:	ME	ME
County:	Oxcart	Oxcart
General Description:	2 miles north and 1 mile east of Ruebin, Maine.	1 mile south of intersection of Maine Routes 133 and 920 in Oxcart County, Maine.

Relationship to Other Established Classifications

1. Potential Natural Vegetation of the Conterminous United States (A. W. Kηchler, 1964) Unit 106 Northern Hardwoods
2. Forest Cover Types of the United States and Canada (F.H. Eyre, Society of American Foresters, 1980) Sugar Maple-Beech-Yellow Birch type.

Other References

1. Pfister, R. D. and S. F. Arno, 1980. Classifying forest habitat types based on potential climax vegetation. Forest Sci., vol 26, No. 1, pp 52-70.

Site Description Approval

Author	Date	Approval	Date
Don Henson, Forester, NRCS	10/28/96	Lyle Banner, State Staff Forester, NRCS	01/28/96
Floyd Peters, Forester, USFS	7/5/97	Lyle Banner, State Staff Forester, NRCS	08/01/97
Floyd Peters, Forester, USFS	11/9/97	Lyle Banner, State Staff Forester, NRCS	03/21/98

Part 538 - INFORMATION SYSTEMS

CONTENTS

Part 538.0 - General

538.00 Introduction

Various software applications are available that aid managers in the management of forestland ecosystems. In general, these applications fall into one of the following categories:

- Database Information Systems
- Decision Support Systems
- Utility Software

The following sections in this part describe several software applications in each of the above categories.

NRCS mandates some of the applications described for use such as the National Soil Information System (NASIS) and the Ecological Site Information System (ESIS). Other applications are described for informational purposes and their inclusion is not an endorsement of their use.

NRCS state offices determine the use of non-NRCS software applications within their administrative jurisdiction.

(190-V-NFM, 1998)

Part 538.1 - Database Information Systems

538.10 General

Database information systems are primarily designed as a repository for data. Users, depending upon their authorizations, can enter, edit, or retrieve data from these systems. The user, however, must normally perform analysis of the data, either manually or with the aid of other software applications such as decision support systems.

538.11 National Soil Information System (NASIS)

NASIS is the official repository for NRCS soil-related data. It is the official NRCS information system for managing the National Cooperative Soil Survey data. It is mandated for use in collection of soil data at NRCS project soil survey offices, the management of soil data at the NRCS area, state , and MLRA levels, and the dissemination of soil information at the regional and national levels.

NASIS is the official NRCS vehicle for delivery of soil data to NRCS field offices for use by the Field Office Computing System (FOCS).

NASIS is the official source of soil data for use by several NRCS software applications, including Vegetative Practice Design (VegSpec) and Grazing Land Application (GLA).

NASIS is the official source of soil data and criteria used in the development of forestry and agroforestry soil-related interpretations.

For detailed information on the use of NASIS, refer to the NASIS user documentation.

538.12 National Plants Information System (PLANTS)

PLANTS is the official repository for NRCS plant-related data.

PLANTS is the source of taxonomic and plant attribute data used in other database information systems (NASIS and ESIS) and in NRCS decisions support system software (VegSpec and GLA).

NASIS is the official NRCS vehicle for delivery of plants data to NRCS field offices for use by the Field Office Computing System (FOCS).

PLANTS provides plant information to NRCS, NRCS partners, clients, cooperators, and the general public through the World Wide Web at http://plants.usda.gov.

538.13 Ecological Site Information System (ESIS)

ESIS is the official NRCS repository for ecological site data used in the development of ecological site descriptions and for forestry and agroforestry plot data.

ESIS is organized into two applications and associated databases -- Ecological Site Description (ESD) and Ecological Site Inventory (ESI).

The Ecological Site Information System, and the corresponding ESD and ESI applications are accessed through the Internet at http://plants.usda.gov.

Part 537 describes the use of ESIS and the associated ESD and ESI applications. Refer to the National Forestry Handbook for details on the entry, edit, and retrieval of forestry-related ESIS data.

538.14 Ecological Site Description (ESD)

The Ecological Site Description (ESD) application provides the capability to produce automated ecological site descriptions from the data stored in its database.

ESD is the official repository for all data associated with the development of forestland and rangeland ecological site descriptions. See part 537-31 for a detailed discussion of ESD.

The ESD application can be accessed via the Internet at http://plants.usda.gov.

Refer to the National Forestry Handbook for details on entry, edit, and retrieval of ESD data.

538.15 Ecological Site Inventory (ESI)

The Ecological Site Inventory (ESI) database is the official repository for forest and windbreak plot data.

ESI is the official source of forest and windbreak field plot data used in support of forestry and agroforestry soil-related interpretations and forestland ecological site descriptions. See part 537.33 for a detailed discussion of ESI.

The ESI application can be accessed via the Internet at http://plants.usda.gov.

Refer to the National Forestry Handbook for details on entry, edit, and retrieval of ESI data.

538.16 NRCS Database Administration

(a) National Level

The assigned Natural Resource Database managers and computer specialists are responsible for the overall system operation and maintenance of the various NRCS databases.

The forestry discipline leaders at NRCS national centers, institutes, and national headquarters are responsible for the overall administration and maintenance of the forestry-related data elements in NASIS, PLANTS, and ESIS.

The forestry interpretations leader at the National Soil Survey Center is responsible for ensuring the accuracy and compatibility of the forestry-related data in NASIS and ESIS across state and regional boundaries.

(b) State Level

The forestry discipline leaders at this level are responsible for the quality of the forestry-related data entered in NASIS and ESIS.

They are also responsible for the administration and maintenance of locally developed forestry or agroforestry soil-related interpretations and associated soil criteria in NASIS.

Part 538.2 - Decision Support Systems

538.20 General

Decision support systems are software applications that managers can use to develop and evaluate ecosystem planning alternatives.

These systems analyze the available ecosystem data and produce outputs based on defined rules. The data used by decision support systems for analysis can be internal to the program, supplied by the user, supplied from external sources like PLANTS, NASIS, or ESIS, or any combination of the above.

The quality of the alternatives and evaluations produced by these decision support systems is directly related to the quality of the data supplied and the accuracy and validity of the rules used to analyze the data.

538.21 Vegetative Practice Design (VegSpec)

VegSpec is a decision support system developed to assist land managers in the planning and design of vegetative establishment practices.

VegSpec is a Internet-based application that utilizes soil, plant, and climate data to select plant species that are (1) site-specifically adapted, (2) suitable for the selected practice, and (3) appropriate for the purposes and objectives for which the planting is intended.

The application also employs a set of expert rules and criteria to aid in the design and implementation of a number of vegetative establishment practices.

The ability of this decision support system to determine site-specific adaptability of plant species negates the need for forestland interpretive groups and thus Woodland Suitability Groups (WSG's) are no longer included in the set of nationally supported forestry interpretations.

Vegspec can be accessed from the Plants homepage at: http://plants.usda.gov.

538.22 Grazing Lands Applications (GLA)

GLA is a decision support software package developed for the grazing land planner/operator to aid in the inventory of land units, calculate stocking rates, calculate multiple species stocking rates (livestock and wildlife), determine nutritional requirements for grazing livestock and analyze the economic value of treatment alternatives.

The application includes a Management Evaluation Program, Multi-species Calculator and a Nutritional Balancing Analyzer.

538.23 Northeast Decision Model/Stand Inventory Processor and Simulator (NED/SIPS)

NED/SIPS is a decision support system that provides a means of creating, managing, and analyzing forest inventory records at the stand level. It provides a host of tools to analyze stand inventory data and generates reports describing the vegetation structure, timber value, and economics of the stand.

NES/SIPS was developed at the USDA, USFS Northeastern Forest Experiment Station. The software is in the public domain and is provided "as is", without warranty of any kind. The user assumes all responsibility for the accuracy and suitability of this program for a specific application.

The software is available for download at: http://www.fsl.uvm.edu/ned/product.htm.

538.24 TWIGS

TWIGS 3.0 is a growth and yield simulation program developed as a microcomputer application of STEMS, a mainframe program for use in the North Central United States.

TWIGS variants for several regions of the U.S. are currently available. Lake States TWIGS was developed for use in Minnesota, Michigan, and Wisconsin; the Central States variant is intended for use in Indiana, Illinois, and Missouri; the Northeast variant is for use in Connecticut, Delaware, Kentucky, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, and West Virginia; and Southeast TWIGS is for use in Georgia, South Carolina, and Alabama.

As an individual-tree growth model, TWIGS projects the growth and death of individual trees in the context of

a stand, thus enabling it to grow stands of mixed species and sizes. It is a tool that enables forest managers and planners, even those inexperienced with computers, to use a computer to interactively "manage" and "grow" existing stands.

Designed to look at the "future" of a forest, one stand at a time, TWIGS assists in evaluating the productivity and economic effects of different silvicultural prescriptions.

Information regarding the software can be obtained at: http://www.forsonline.org/.

538.25 The Landscape Management System (LMS)

The Landscape Management System (LMS) is a decision support application designed to assist in landscape level analysis and planning of forest ecosystems by automating the tasks of stand projection, graphical and tabular summarization, stand visualization, and landscape visualization. LMS coordinates the activities of other programs (projection models, visualization tools, etc.) that makeup the overall system.

LMS is comprised of many separate programs that make projections, produce graphical or tabular displays, store inventory information, and connect these diverse programs into a cohesive system.

Various stand and landscape-level tables, charts, and graphs viewed internally within LMS on projected stand information can be exported to other software for further analysis.

LMS was developed at the Silviculture Laboratory, College of Forest Resources, University of Washington, Seattle, WA.

The software is available for download at: http://silvae.cfr.washington.edu/lms/lms.html

538.26 The Stand Visualization System (SVS)

SVS generates graphic images depicting stand conditions represented by a list of individual stand components, e.g., trees, shrubs, and down material

SVS provides the capability to:

- Display stand information represented by a list of individual plant and log components in a realistic, although abstract, fashion.
- Display stand information in a manner that communicates the overall structural diversity present within the stand.
- Differentiate between stand components using different plant forms, colors, or other types of marking.
- Provide overhead, profile and perspective views of a stand.

SVS allow the user to:

- Vary the parameters controlling all views.
- Define plant forms and colors based on species, plant type, and plant position within the canopy.
- Provide tabular and graphical summaries of stand information before and after a silvicultural treatment.
- Display information describing individual stand components as they are selected by the user.
- Design silvicultural treatments by "marking" stand components and specifying a treatment.

SVS was developed at the USDA, USFS Pacific Northwest Research Station. The software is in the public domain and is provided “as is”, without warranty of any kind. The user assumes all responsibility for the accuracy and suitability of this program for a specific application.

The software is available for download at: http://forsys.cfr.washington.edu/svs.html

538.27 UTOOLS

UTOOLS is geographic analysis software developed for watershed-level planning. The system provides a flexible framework for spatial analyses and can be used to address a variety of problems.

Spatial databases created by UTOOLS can serve multiple analysis functions. Some example functions include:

- producing basic acreage summaries
- identifying areas that are of critical interest within the project area
- data validation
- simulating the effects of management alternatives
- providing functions to help organize and reformat data for export to specialized programs to perform complex spatial analyses

UTOOLS is a public domain software package developed at the USDA, USFS Umatilla National Forest and the Pacific Northwest Research Station.

The software is available for download at:
http://forsys.cfr.washington.edu/utools.html

538.28 WBECON

WBECON is a decision support program for analyzing the economic benefits of field windbreaks for crop production.

WBECON is a public domain software package developed jointly by the University of Nebraska and the Prairie Farm Rehabilitation Administration Shelterbelt Centre in Saskatchewan, Canada.

Part 538.3 - Utility Software

538.30 General

Utility software applications are computer programs that are generally limited in scope. They are primarily devoted to one task such as word processing, mathematical calculations, graphic arts, etc. While these types of programs are quite useful, they do not offer the analytical capabilities of decision support systems or the comprehensive data storage and retrieval capabilities of data base information systems.

538.31 SITEQUAL

SITEQUAL predicts site index for 14 hardwood tree species: cottonwood, green ash, pecan, sycamore, sweetgum, yellow poplar, hackberry, sugarberry, cherrybark oak, Nuttall oak, Shumard oak, water oak, willow oak, and swamp chestnut oak.

The program was developed from the Baker and Broadfoot field guides and evaluates soil and site conditions such as soil depth, texture, structure, compaction, past use, present vegetative cover, etc. to predict the site quality (site index) for the 14 species above at the same time.

538.32 QUICK-SILVER

Quick-Silver analyzes returns of forest management investments. Each analysis is based on an investment case that describes costs, revenues, and management activities. The case may describe one acre, one forest stand, or a group of several stands.

It allows the user to include or exclude the effects of inflation, analyze cases up to 150 years long with 200 cash flows, choose up to five real or nominal discount rates, compute federal income taxes, capitalize or amortize re-forestation costs, consider reforestation investment tax credits, combine control and treatment cases for a marginal analysis, and include real changes in cost and prices.

Quick-Silver produces five different financial reports for each investment case. Each report is concise, complete, and easy to understand. You can get any or all of the reports and financial information for each investment case. The five reports are: 1) list of all scheduled management activities, 2) detailed cash flow report and summary, 3) before and after tax financial returns, 4) replacement costs and future discounted values, and 5) operating statement in dollars and percents.

Information regarding the software can be obtained at: http://www.forsonline.org/.

538.33 BIOPAK

BIOPAK is a package of computer programs that calculate the biomass, area, height, length, or volume of plant components (leaves, branches, stem, crown, and roots) using prediction equations. It has application in ecosystem study for calculating biomass allocation, productivity, and leaf area. It can be used to estimate browse for wildlife, biomass components for studies of plant resource allocation, and leaf area for plant process studies.

BIOPAK is public domain software distributed by the Forest Resources Systems Institute (FORS).

The software is available for download at: http://www.fsl.orst.edu/rogues/meansj/biopak.htm

538.34 UVIEW

UVIEW is a display system designed to produce two- and three-dimensional images of digital terrain models (DTM), attribute data stored in PARADOX spatial databases, and vegetation patterns at landscape scales. UVIEW combines the capabilities of a relational database with a simple terrain viewing system to provide a flexible analysis and display tool. Images produced by UVIEW provide a readily understood visualization depicting existing or desired landscape conditions.

UVIEW provides a flexible system for viewing a digital terrain model (an organized data set describing the ground surface consisting of a regularly spaced grid of elevations).

UVIEW models vegetation patterns to simulate existing or desired landscape conditions. The primary goal in the vegetation modeling is to simulate overall landscape texture and pattern rather than specific, detailed vegetation structure patterns over an entire landscape.

UVIEW is a public domain software package developed the USDA, USFS Pacific Northwest Research Station as part of UTOOLS.

The software is available for download at:
http://forsys.cfr.washington.edu/uview.html.

Appendix

National Forestry Manual Terminology

Air-Dry Weight -- The weight of a substance, usually vegetation, after it has been allowed to dry to equilibrium with the atmosphere, usually without artificial heat.

Basal Area -- The cross sectional area of the stem or stems of a plant or of all plants in a stand. Herbaceous and small woody plants are measured at or near the ground level; large woody plants are measured at breast or other designated height.

Climax -- See Historic Climax Plant Community

Climax Plant Community -- See Historic Climax Plant Community.

CMAI -- See Culmination of Mean Annual Increment.

Community (Plant) -- An assemblage of plants occurring together at any point in time, while denoting no particular ecological status. A unit of vegetation.

Culmination of Mean Annual Increment --The point in the growth cycle of a tree or stand at which the mean annual increment for height, diameter, basal area, or volume is at a maximum. At this point M.A.I. (mean annual increment) equals P.A.I. (periodic annual increment).

Ecological Site -- A distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.

ESD -- Ecological Site Description is an Internet-based application and associated database used in the development of ecological site descriptions for forestland and rangeland. ESD, together with ESI, comprise the Ecological Site Information System (ESIS).

ESI -- Ecological Site Inventory is an Internet-based application and associated database used for storage and retrieval of forest and agroforest plot data. ESI, together with ESD, comprise the Ecological Site Information System (ESIS).

ESIS -- The Ecological Site Information System (ESIS) is a automated information system for the collection and retrieval of forestry and agroforestry plot data and the development of forestland ecological site descriptions. ESIS is organized into two applications and associated databases -- Ecological Site Description (ESD) and Ecological Site Inventory (ESI).

Forest Canopy -- The more or less continuous cover of branches and foliage formed collectively by adjacent tree crowns. Canopy is measured as the vertical projection downward of the aerial portion of the tree's vegetation, usually expressed as a percent of the ground so occupied.

Forest Canopy Cover -- The percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of a tree. Small openings within the canopy are included.

Forest Overstory -- The layer of foliage in a forest canopy consisting of the crowns of dominant, codominant, and intermediate trees that rise above the shorter understory foliage.

Forest Understory -- In the context of forestland ecological sites, understory refers to plants growing beneath the forest canopy.

Forestland -- For the purpose of developing ecological site descriptions, a spatially defined site where the historic climax plant community was dominated by a 25% overstory canopy of trees, as determined by crown perimeter-vertical projection.

Herbaceous -- Vegetative growth with little or no woody component. Non-woody vegetation, such as graminoids and forbs.

Historic Climax Plant Community -- The plant community that was best adapted to the unique combination of factors associated with the ecological site. It was in a natural dynamic equilibrium with the historic biotic. abiotic, climatic factors on its ecological site in North America at the time of European immigration and settlement.

LRU -- Land Resource Units (LRU) define major land resource areas based on significant statewide differences in climate, water resources, land use, potential natural vegetation, or other natural resource conditions that contribute to significant differences in use and management of the units. The state conservationist establishes the procedures for developing and maintaining land resource unit boundaries and descriptions.

Major Land Resource Areas (MLRA) -- Broad geographicaly land areas characterized by a particular pattern of soils, geology, climate, water resources, and land use. A unit can be one continuous area or several separate nearby areas.

NASIS -- The National Soil Information System (NASIS) is an automated tool for storing all information about and for soil surveys.

NSPS --The National Scientific Plant Symbol is a unique five-letter symbol used by the PLANTS database to distinguish the genus and/or species of a plant.

Naturalized Plant Community -- A plant community composed entirely or partially of non-native species that have become adapted to a particular site and is capable of perpetuating itself without cultural treatment.

Naturalized Species -- An introduced species that has become adapted to a new climate, different ecological site, or a different environment and can perpetuate itself in the community without cultural treatment.

Seral Stages -- The developmental stages of an ecological succession.

Site Index -- A measure of the quality of a site based on the height of dominate trees at a specified age.

Soil Component -- Soil components are (1) the named soils or miscellaneous areas that are dominant and co-dominant within a soil map unit, (2) similar soils or miscellaneous areas in a soil map unit that may be extensive but not as extensive as the named component, and (3) dissimilar soils or miscellaneous areas within a map unit that are minor in extent. There are six kinds of soil components; family, miscellaneous area, series, taxadjunct, taxon above family, and variant.

Soil Map Unit -- A soil map unit is a collection of soil areas or miscellaneous areas delineated in a soil survey and identified by a unique symbol within a survey area.. Soil map units may encompass one or more kinds of soil or one or more kinds of soil and miscellaneous area. There are for kinds of soil map units; associations, complexes, consociations, and undifferentiated groups.

Soil Miscellaneous Areas -- Areas that have essentially no soil and supports little or no vegetation. They can result from active erosion, washing by water, unfavorable soil conditions, or human activities. Examples are: dumps; lava flows; riverwash; rock outcrop; and urban areas.

Soil Reaction -- Numerical expression in pH units of the relative acidity or alkalinity or a soil. The range in soil pH is 1.8 to 11.0. A pH of 7.0 is neutral.

Succession -- The progressive replacement of plant communities on an ecological site that leads to the climax plant community.

Tree -- For the purpose of developing ecological site descriptions, a woody-stemmed perennial plant, usually single stemmed, that can grow to 4 meters in height at maturity.

Vegetation States -- The various plant communities produced by an ecological site within given site characteristics.

SUBJECT INDEX

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