NATIONAL FORESTRY MANUAL
190-V
AMENDMENT 2 - June 1999

This amendment transmits new or revised material for :

Part/Section	Description
Part 537.22	Added criteria-based interpretation rating guides for Potential Damage to Soil by Fire and Potential Seedling Mortality.
Part 537.31	Revised Ecological Site Description data element descriptions.
Part 537.4	Added site index curve 960, eastern arborvitae (northern white cedar). Revised Forestland Ecological Site description Example.
Appendix	Added Seral Stages terminology definition.
Table of Contents and Subject Index	Updated to reflect changes.

Filing instructions to update downloaded hard copy of National Forestry Manual:

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(190-V-NFM, 1998)

(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 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 537-13.

(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 537.32 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.

The historic climax plant community of an ecological site is not a precise assemblage of species for which the proportions are the same from place to place or from year to year. Generally, one species or a group of species dominants a site. Dominant status does not vary from place to place or year to year. Because of their stability in the 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.

At times, normally less frequently occurring plants may increase on a site, or plants not formerly found in the climax community may invade the site. The presence or abundance 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 determinations are based on the plant community that developed along with the soils. A study of several locations over several years is needed to differentiate and characterize a site.

Where changes in soils, aspect, topography, or moisture conditions are abrupt, plant community boundaries are distinct. Boundaries are broader and less distinct where plant communities change gradually along broad environmental gradients of relatively uniform soils and topography. Although some plant communities may appear to be along a continuum, distinctive plant communities can be identified and described. These communities occur with predictable regularity and are associated with concurrent differences in soil, topography, hydrology, or climate that can also be recognized.

(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

This category describes the ecological dynamics and the common plant communities comprising the various vegetation states of the site.

The different plant communities produced by an ecological site are called vegetation states. The processes that cause a shift from one state to another are called transition pathways.

This category will describe and illustrate:

- The common states that can occur on the site.
- The transition pathways that exist between and among the states.
- The conditions that must prevail for management opportunities to exercise the option to make transitions.
- The conditions under which management must avoid transition attempts in order to prevent degradation.

The first vegetation state described is the historic climax plant community, where it can be determined. From this state a "road map" to other states can be developed. These other states are those that are known to occur on the site. Each alternative state and transition should be described, incorporating as much about the characteristics of each state and transition as possible, including changes in soil properties and hydrology, if known.

Generally, only a few vegetation states or plant communities are identified and described for a single site. Each plant community has its own characteristics, benefits, values, advantages, and disadvantages depending upon the intended products and environmental effects desired from the site.

The following methods are used in determining the characteristic plant communities of an ecological site.

- Identification and evaluation of reference sites with similar plant communities and associated soil. These reference sites should not have been subjected to abnormal disturbances (or the lack of normal disturbance). Both the productivity and the species composition of the plant community should be evaluated.
- Interpolation and extrapolation of plant, soil, and climatic data from existing historic reference areas along a continuum to other points on that continuum for which no suitable reference community is available.
- Evaluation and comparison of areas that are in the same ecological site but 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 of disturbance, frequency and magnitude) provides a basis for approximating certain vegetative characteristics of the historic plant community.
- Evaluation and interpretation of research data dealing with the ecology, management, and soil of plant communities.
- Review of early historical accounts, survey and military records, and botanical literature of the area.

The plot data contained in the Ecological Site Inventory (ESI) database is helpful in identifying plant communities.

(1) Ecological Dynamics of the Site

A narrative and graphical representation (transition diagram) describing the vegetation 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.

The transition diagram illustrates the common plant communities that may occur on the site and the transition pathways between these communities. Each box represents a different plant community that could exist on the site. The position of the boxes merely identify a different plant community from the others, and no order of importance or desirability is intended.

Each transition pathway is to be identified separately and described. There can also be more than one transition pathway between the same states. In some instances transition can occur in only one direction, while in others transition can occur in both directions.

(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**.

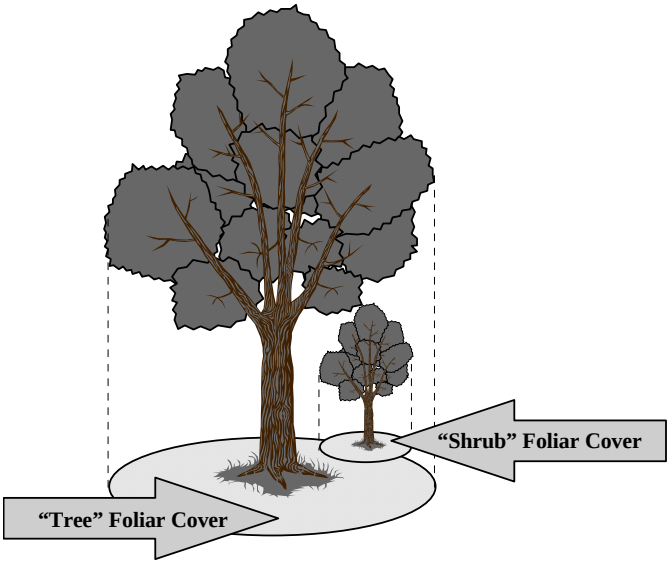
(3) Ground Cover and Structure

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- 1). 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%.

Figure 537- 1 Vegetation foliar cover



(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.

(6) Typical Site Photo

If available, a photograph of a typical site may be included for each identified vegetation state.

(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.

537.32 Ecological Site Inventory

(a) Forest Plot Data

Form ECS-005, Soil-Woodland Correlation Field Data Sheet is used to record forest plot information.

Refer to the National Forestry Handbook for detailed instructions on the collection of forest plot data, completion of forms ECS-005 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 Data

Form ECS-004, Windbreak-Soil-Species Evaluation Data Sheet is used to record plot data for conservation tree/shrub interpretations.

Refer to the National Forestry Handbook for detailed instructions on collection of conservation tree/shrub plot data, completion of Form ECS-004, and use of the Ecological Site Inventory application to record plot data.

(190-V-NFM, 1998)

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 537-13 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, sedimen-tation
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.

(190-V-NFM, 1998)

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 Subclass	**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

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	≤2	≥90, <150 OR ≥150 and frequent or occasional flooding ≥2 months during growing season with a duration of brief, long, or very long	≥1.4, ≤141.1; 0-150cm (or first restrictive layer)
1A	≥100	≥19.0	≤5	4.5-5.5	≤2		≥1.4, ≤141.1.; 0-150cm (or first restrictive layer)
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		≥1.4, ≤141.1; 0-150cm (or first restrictive layer)
1KK	≥100	≥19.0	>15, ≤40	6.5-8.4	≤4		≥1.4, ≤141.1; 0-150cm (or first restrictive layer)
1S	≥100	9.5-19.0	≤5	5.6-8.4	≤2		≥1.4, ≤141.1; 0-150cm (or first restrictive layer)
1SK	≥100	9.5-19.0	>5, ≤15	6.5-8.4	≤4		≥1.4, ≤141.1; 0-150cm (or first restrictive layer)
1SKK	≥100	9.5-19.0	>15, ≤40	7.9-8.4	≤4		≥1.4, ≤141.1; 0-150cm (or first restrictive layer)
2	≥100	≥5.0	≤5	5.6-8.4	≤2	≥45, <90 OR <90 and <3 months wet soil moisture during growing season	--
2A	≥100	≥5.0	≤5	4.5-5.5	≤2		--
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	≤2		Histosol OR texture-in-lieu-of is "mucky peat", "muck", or "peat"

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)
3	≥100	≥19.0	≤5	5.6-8.4	≤2	≥150 AND frequent or occasional flooding <2 months during growing season with a duration of brief, long, or very long	≥1.4, ≤141.1; 0-150cm (or first restrictive layer) AND bottom horizon is not sandy/gravelly
3A	≥100	≥19.0	≤5	4.5-5.5	≤2		
4	≥50	≥12.0	≤5	5.6-8.4	≤2	≥150	≥1.4, ≤141.1; 0-50cm, ≥ 20cm thick AND one or more horizons ≥0.42, <14.2; >15cm thick with a top depth >0
4A	≥50	≥12.0	≤5	4.5-5.5	≤2	≥150	
4K	≥50	≥12.0	>5, ≤15	6.5-8.4	≤4	≥150	
4C	≥50	≥9.5	≤5	5.6-7.8	≤2	≥150	≥1.4, ≤141.1; surface horizon to 20cm and ≥0.42, ≤14.2; all horizons with top depth >0 OR ≥0.42, ≤14.2; 0-150cm (or first restrictive layer)
4CA	≥50	≥9.5	≤5	4.5-5.5	≤2	≥150	
4CK	≥50	≥9.5	>5, ≤15	6.5-8.4	≤4	≥150	
4CC	≥50	≥9.5	≤5	5.6-7.8	≤2	≥150	≥1.4, ≤141.1; surface horizon to 20cm and <0.43; all horizons w/ top depth >0 OR ≤0.43; 0-150cm (or first restrictive layer)
5	≥100	9.5-19.0	≤5	5.6-8.4	≤2	≥150 AND frequent or occasional flooding <2 months during growing season with a duration of brief, long, or very long	≥1.4, ≤141.1; 0-150cm (or first restrictive layer) AND bottom horizon is not sandy/gravelly
5A	≥100	9.5-19.0	≤5	4.5-5.5	≤2		
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		

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:	System	Subsystem	Class
(Cowardin System)	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

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Acer saccharum-Betula alleghaniensis/Acer pensylvanicum/Dryopteris
F143XY001ME

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

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.

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