FORESTLAND INTERPRETATIONS

I. Introduction

Forestland interpretations are important to good forestland management. Landowners and managers can utilize them in planning, installing and maintaining forestland management systems. The management of trees begins with an understanding of the soil(s) on which they grow or are to be grown. Some soils are suitable for growing wood crops; others barely support tree cover. Different tree species may vary in production on the same soil.

The official interpretations and associated data values and ratings can be found in the National Soil Information System (NASIS) database and are supported on a national level. Criteria for forestry interpretations is contained in the USDA-NRCS National Forestry Manual and county Soil Surveys.

II. Forestland Ordination Symbol

The Ordination Symbol has two parts: Productivity class and subclass. Example: productivity class 10, and subclass R, = Ordination Symbol 10R

(1) Productivity Class Definition

The first element of the Ordination Symbol is a number that denotes potential productivity. Potential productivity is based on site index and is expressed in terms of cubic meters of wood per hectare per year for an indicator tree species. One m^3/ha (cubic meter per hectare) equals 14.3 ft^3/ac (cubic feet per acre).

Examples: 1 means 1 cubic meter per hectare per year (14.3 ft^3/ac). 2 means 2 cubic meters per hectare per year (28.6 ft^3/ac). 10 means 10 cubic meters per hectare per year (143 ft^3/ac)

Indicator Species: The indicator species are species that are common to the area and are generally, but not necessarily, the most productive on the soil. It is the species that determines the ordination class. To make comparisons of productivity consult the Woodland Productivity Table in a county Soil Survey, which lists productivity for all species where data have been collected.

Yield Assumptions: The yield in cubic meters is calculated at the age of culmination of mean annual increment (CMAI) for fully stocked natural stands (unmanaged except for protection) as given in standard normal yield tables. Yield is the total wood produced in the boles of the trees to the top diameter specified in the volume tables. Culmination of mean annual increment is the volume at the point of the highest yearly growth.

(2) Subclass Definitions and Implications

The second element or subclass is expressed as a capital letter, which indicates certain soil or physiographic characteristics that contribute to important hazards or limitations in management.

Subclass R (relief or slope steepness): Soils that have restrictions or limitations for forest land use or management because of steepness of slope.

Subclass X (stoniness or rockiness): Soils that have restrictions or limitations for forest land use or management because of stones or rocks.

Subclass W (excessive wetness): Soils in which excessive water, either seasonally or year round, causes significant limitations for forestland use or management. These soils have restricted drainage, a high water table, or overflow hazards that adversely affect either stand development or management.

Subclass D (restricted rooting depth): Soils that have restrictions or limitations for forest land use or management because of the rooting depths. For example, shallow soils that are underlain by hard rock, hardpan, or other layers in the soil that restrict roots.

Subclass C (clayey soils): Soils that have restrictions or limitations for forestland use or management because of the kind or amount of clay in the upper part of the soil profile.

Subclass S (sandy soils): Dry, sandy soils that have little or no textural B horizon and have *Moderate* to *Severe* restrictions or limitations for forest land use or management. These soils impose equipment limitations, have low moisture holding capacity, and normally are low in available plant nutrients.

Subclass F (fragmental or skeletal soils): Soils that have restrictions or limitations for forest land use or management because the profile reveals large amounts of coarse fragments that are larger than 2 mm and smaller than 10 inches. The subclass includes very gravelly soils.

Subclass A (no limitations or *Slight* limitations): Soils that have no significant restrictions or limitations for forest land use or management.

Multiple Limitations: Some soils may have more than one limiting characteristic, but only one symbol is used. Priorities in placing each kind of soil into a subclass are in the order in which the subclasses are listed above.

III. Forestland Management and Productivity

The Woodland Management and Productivity Table, found in some published county soils surveys or in the Soil Interpretation Record (SIR), presents information about the major soil limitations, management concerns and productivity of soils for producing wood products. The information is presented by soil map unit in the soil survey area. Forestland interpretations which are covered include: erosion hazard, equipment limitations, seedling mortality, windthrow, and plant competition. Ratings of "slight", "moderate" or "severe" are used to indicate major soil limitations. Information on potential productivity includes productivity class (already discussed), site index and a list of Indicator Species and recommended trees for planting.

(1) Forestland Interpretations

The soils are also rated for a number of factors to be considered in management. The ratings *SLIGHT*, *MODERATE*, and *SEVERE* are used to indicate the degree of major soil limitations.

(a) Erosion Hazard

Definition: Erosion hazard is the probability that damage may occur as a result of site preparation and following cutting operations where the soil is exposed along roads, skid trails, fire lanes, and log handling areas (landings). Forests that are abused by fire or overgrazing are also subject to erosion.

Ratings:

Slight - Proper drainage for roads, landings, and fire lanes is always recommended. No other preventative measures are generally needed under ordinary conditions.

Moderate - Erosion control measures are needed in certain silvicultural activities.

Severe - Special precautions are needed to control erosion in most silvicultural activities.

Management Implications: May indicate need for modified road, trail, landing, and fireline construction and maintenance; need for specialized equipment and specialized operations such as cross-slope operations. Site preparation techniques and timing may need to be modified.

Factors causing erosion hazard: Erosion hazard is predicted using four factors: length of slope, percent slope, rainfall characteristics, and the erodibility of the soil. Erosion control becomes more critical as slopes increase in steepness and length, soil erodibility increases, rainfall increases in volume and intensity, and as T values decrease.

(b) Equipment Limitations

Definition: Equipment limitations are limits on the use of equipment, year round or seasonally, as a result of soil characteristics.

Ratings:

Slight - Equipment use normally is not restricted in kind or time of year because of soil factors. For soil wetness, equipment use can be restricted for a period not to exceed 3 months in a normal year.

Moderate - Equipment use is moderately restricted because of one or more soil factors. Equipment use may be limited by slope, stones, soil wetness, soil instability, extremes of soil texture (clayey and sandy soils), susceptibility to compaction, or combination of two or more factors. For soil wetness, equipment use is restricted for 3 to 6 months in a normal year.

Severe - Equipment use is severely restricted either as to kind of equipment that can be used or season of use. Steepness of slope and susceptibility to compaction are factors that may cause severe operating conditions. For soil wetness, equipment use is restricted for more than 6 months in a normal year.

Management implications: Restrictions on equipment use indicates to a manager the need for choosing the right equipment to be used and the need for timing operations to avoid seasonal limitations. The more *Severe* the limitations usually the more costly are harvesting and cultural operations.

Factors causing equipment limitations: Several soil and topographic factors affect equipment use. The most obvious is slope. As slope gradient and length increase, it becomes more difficult and less safe to use wheeled equipment. At still steeper slopes, track type equipment must be used. On the steepest gradients even track type equipment cannot operate, and more sophisticated systems must be used. Soil textures have an effect at the extremes. Loose sands and clays present problems. Wetness can *severely* limit the use of equipment, making harvesting practical only during dry periods (especially when in combination with fine textures). Rockiness and stoniness limit the use of many kinds of equipment.

(c) Seedling Mortality

Definition: Seedling mortality refers to the probability of death of naturally occurring or planted tree seedlings as influenced by kinds of soil or topographic conditions (i.e., south slopes, frost pockets, ridge tops, etc.). Plant competition and animal damage are not considered in this rating.

Ratings:

Slight - No problem is expected from mortality under usual conditions. Expected mortality is less than 25 percent.

Moderate - Some problems of mortality may be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent.

Severe - Mortality may be *Severe*. Extra precautions are important. Replanting may be necessary. Expected mortality is greater than 50 percent.

Management implications: It is important for forest managers to be cognizant of the seedling mortality hazard and of the soil feature(s) that contribute to it. To offset this hazard, it may be necessary to use special planting stock that is larger than usual or containerized, or to do special site preparation such as bedding, furrowing, or surface drainage. Reinforcement planting may be needed.

Factors causing seedling mortality:

(1) Seedling mortality is caused mainly by too much water (soil wetness) or too little water (soil droughtiness). Too much water is caused by high water tables or flooding during a significant part of the growing season. Soils that are very poorly drained or are frequently flooded have *severe* seedling mortality. Poorly drained soils have a *Moderate* hazard.

(2) Soil droughtiness is caused by several factors: lack of rainfall at the right time, low available water holding capacity, shallow rooting depth, high evaporation, or a combination of these factors. Seedlings can survive on soils with low available water holding capacity if the rains come at the right frequency and duration. If the frequency and duration of rainfall are less than optimum, the amount of water that enters the soil and that is held within the root zone becomes the critical factor that determines seedling mortality.

(3) Surface texture must be coarse enough so that water enters readily but not so coarse as to have a low available water capacity. Seedling mortality is the greatest on soils with sandy and clayey surface textures.

(4) The amount of water held in the soil for plant use is determined by the available water capacity of the soil and the effective rooting depth. The amount of water held within a 20-inch effective rooting depth is used as an indicator of droughtiness.

(5) Seedling mortality may also be affected by the high temperatures and evaporation associated with steep south slopes.

(d) Windthrow Hazard

Definition: Windthrow hazard ratings consider the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly.

Ratings:

Slight - Normally there are no trees blown down by the wind. Strong winds may break trees but do not uproot them.

Moderate - An occasional tree may blow down during periods of soil wetness with moderate or strong winds.

Severe - Many trees may be expected to blow down during periods of soil wetness with *moderate* or strong winds.

Management implications: A *Moderate* or *Severe* rating alerts the forest land manager to windthrow danger. It indicates need for more care in thinning or perhaps no thinning at all. Specialized equipment might be necessary to avoid damage to surficial root systems. A plan calling for periodic salvaging of windthrown trees might be advisable. Use special care in planning cutting areas to minimize the danger of windthrow. Seed tree systems of regeneration with isolated single trees or groups of trees are not practical for *Moderate* or *Severe* windthrow hazard areas. Plan and maintain road and trail systems to allow salvage of blown-over trees.

Factors causing windthrow hazard: Restricted rooting depth is the principal reason for increased windthrow hazard. The rooting restriction may be caused by a high water table, fragipan, bedrock, or any other restricting layer.

(e) Plant Competition

Definition: Plant competition is the likelihood of the invasion or growth of undesirable species when openings are made in the canopy. (NOTE: Plant competition is not to be used to determine Ordination subclass rating.)

Ratings:

Slight - Competition of unwanted plants is not likely to prevent the development of natural regeneration or suppress the more desirable species. Planted seedlings have good prospects for development without undue competition.

Moderate - Competition may delay natural desired trees or planted trees and may hamper stand development, but it will not prevent the eventual development of fully stocked stands.

Severe - Competition can be expected to prevent adequate natural or planted regeneration unless intensive site preparation and maintenance are provided.

Management implications: A *Moderate* or *Severe* rating indicates the need for site preparation following harvest and the possible need for release treatments to ensure development of the new crop. It alerts the forest manager to the need for establishing the new forest for tree crop production without undue delay.

Factors causing plant competition: Favorable climate and soil characteristics account for plant competition problems. In many cases, the key to predicting plant competition problems is the quantity and proximity of seed sources of undesirable plants or the quantity of unwanted brush rootstock that will re-sprout after harvesting.

(2) Potential Productivity

The potential productivity of Indicator Species on a soil is expressed as productivity class (discussed under Ordination Symbol) and site index. Variation in site index and forest productivity of a soil series can be expected when the soil series covers a range of textures, slopes, aspects, or drainage.

(a) Site index

Definition: Site index is a common expression of site quality. Generally, site index is defined as the average height dominant and co-dominant trees on a site will attain at key or "base" ages, such as 50 or 100 years.

Example: Site index 70 on a 50-year base age means the dominant and co-dominant trees will reach an average of 70 feet in height in 50 years. Site index 120 on a 100-year base age means the dominant and co-dominant trees will average 120 feet in height in 100 years.

Site indexes shown in the Forestland Productivity Table are averages based on measurements made at sites that are representative of the soil series that are free of past fire and disturbances. It is important to understand that site index varies according to species. Site index curves are prepared for individual species and cannot be directly compared between species. Any given site may have one or several site index values depending on the number of species found. When comparing site index and woodland productivity of different soils, the values for the same tree species should be compared.

The methodology for converting site index values to yields (as expressed in the productivity class) is contained in the National Forestry Handbook. Conversions exist for the following species:

Loblolly pine	Eastern redcedar	Sand pine	Shortleaf pine
Longleaf pine	Sweetgum	Pond cypress	Sweetgum
Slash pine	Water tupelo	Green ash	Yellow poplar
South Florida slash pine	Swamp tupelo	Bald cypress	Pond pine
Willow oak	Water oak	American sycamore	

(3) Indicator Species and Recommended Trees To Plant

Following is a guide for determining the tree community and the recommended trees to plant:

Soil Type(s)	Indicator Species	Trees to plant
Somewhat poorly to well drained thermic soils	Slash pine Loblolly pine Longleaf pine Beech Black cherry Hickory Magnolia Southern red oak Sweet gum Water oak	Slash pine Loblolly Pine Longleaf pine
Well to excessively well drained sandhill thermic soils	Slash pine Loblolly pine Turkey Oak Longleaf pine Bluejack oak Post Oak (west Florida)	Slash pine Loblolly Pine (loamy soils) Longleaf pine Sand pine (sandy excessively drained)
Poorly drained flatwoods hyperthermic soils	Slash pine S. Fl. slash pine Longleaf pine Loblolly pine Live oak Water oak	Slash pine S. Fl. slash pine Longleaf pine Loblolly pine (loamy soils)
Depressional hyperthermic soils	Pond cypress Bald cypress Blackgum Cabbage palm Carolina ash Loblolly bay Red Maple Sweetbay Pond pine	No recommendations due to management concerns

Soil Type(s)	Indicator Species	Trees to plant
Depressional thermic soils	Pond cypress Bald cypress Blackgum Carolina ash Red Maple Sweetbay Pond pine	No recommendations due to management concerns
Very poorly drained thermic flooded soils	Bald cypress Tupelo gum Cabbage palm (alkaline soils) Red Maple Sweetbay Pond cypress Water oak Sweet gum Laurel oak	No recommendations due to management concerns
Poorly drained thermic flooded soils	Loblolly pine Slash Pine Blackgum Red Maple Water oak Sweet gum Laurel oak	Loblolly pine* Slash pine* * – *with adequate surface drainage*
Poorly drained flatwoods thermic soils	Slash pine Longleaf pine Loblolly pine Live oak Water oak Laurel oak	Slash pine Longleaf pine Loblolly pine (loamy soils)
Poorly drained slough hyperthermic soils	Slash pine S. Fl. slash pine Longleaf pine Loblolly pine Live oak water oak Laurel oak	Slash pine* S. Fl. slash pine* * – *with adequate surface drainage*

Soil Type(s)	Indicator Species	Trees to plant
Poorly drained hyperthermic flooded soils	Bald cypress Blackgum Cabbage palm (alkaline soils) Red Maple Pond pine Water oak Sweet gum Laurel oak	No recommendations due to management concerns
Well to excessively well drained turkey oak hyperthermic soils	Slash pine Turkey oak Longleaf pine Bluejack oak	Slash pine Longleaf pine Sand pine
Somewhat poorly to well drained thermic soils	Slash pine Loblolly pine Longleaf pine Laurel oak Hickory Blackcherry Magnolia Water oak	Slash pine Loblolly Pine Longleaf pine Live oak
Well to excessively well drained scrub shrub hyperthermic sandhill soils	Sand pine Sand live oak Chapman oak Myrtle oak Bluejack oak Scrub hickory	Sand pine

IV. County Specific Forest Land Soil Interpretations

(Attach woodland interpretations for soils located in the USDA-NRCS Service Center area.)