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Classification and Evaluation of Forest Sites on the Natchez Trace State Forest, State Resort Park, and Wildlife Management Area in West Tennessee

Glendon W. Smalley

SUMMARY

A comprehensive forest site classification system for the 45,084-acre Natchez Trace State Forest, State Resort Park, and Wildlife Management Area in the highly dissected and predominantly hilly Upper Coastal Plain of west Tennessee is presented. Although devised for a specific tract of land, the system is applicable to an estimated 1.65 million acres in west Tennessee and possibly to additional acreage in northeastern Mississippi and northwestern Alabama. Twenty-five landtypes are identified on the basis of landforms, aspect, soils, parent material, vegetation, presence or absence of erosion, and degree of gully stabilization. Each landtype is defined in terms of nine elements, and each is evaluated on the basis of productivity for selected species of trees and species desirability for timber production. In addition, each landtype is rated for five problems and hazards that affect forest management operations.

ACKNOWLEDGMENTS

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> "If the land as a whole is good, then every part is good, whether we understand it or not. If the biota has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering."—Aldo Leopold, 1887–1948

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INTRODUCTION

Forest sites on the 45,084-acre Natchez Trace State Forest, State Resort Park, and Wildlife Management Area (NTSF) (fig. 1) in west Tennessee are classified and evaluated for the management of several commercially valuable tree species. Foresters and other resource professionals can use the land classification system to subdivide forest land into logical segments (landtypes), to rate productivity, and to identify any limitations and hazards that the landtypes impose on forest management activities. Although soils information is an integral part of the system, users will not need to identify and classify soils or make laboratory determinations. Forest management interpretations are oriented to timber production because timber use is a major management objective; however, landtypes also can be the basis for the management and interpretation of other forest resources; e.g., wildlife habitat.

Much published information on geology, physiography, soils, site, and yields is used in this paper. In many cases, data specific to NTSF were not available, and information was extrapolated from adjacent regions. Extrapolation was particularly necessary with productivity data. All sources of data are documented so that the user can gauge the accuracy and reliability of the information. Information on productivity and management problems is presented in a format that follows the outline used by the USDA Soil Conservation Service (SCS) in the Woodland Suitability sections of county soil surveys. This similarity should facilitate the integration of information contained in county soil surveys into this classification system.

The best information and collective judgment now available are represented in this paper, but new, more definitive information will become available. Forest managers, after applying this site classification system, are encouraged to make the author aware of any shortcomings or needed revisions.

The rationale and methodology (Sims 1987; Smalley 1979a, 1984a, 1986c, 1989, 1991) of this site classification system are similar to those used to develop a series of six regional guides for the Cumberland Plateau and Highland Rim-Pennyroyal physiographic provinces in Alabama, Tennessee, Georgia, Kentucky, and Virginia (Smalley 1979b, 1980, 1982, 1983, 1984b, 1986a). A combined edition of the six regional guides received limited distribution (Smalley 1986b). Vegetation has a position of major importance to describe and identify landtypes on NTSF in this report.

Although this system was devised specifically for NTSF, it is applicable to about 1.65 million acres in west Tennessee, encompassing 925,800 acres in soil association C11 (Ruston-Lexington-Providence) and 724,300 acres in soil association C21 (Shubuta-Cuthbert-Dulac) (Springer and Elder 1980). It also may apply to 300,000 to 500,000 acres in some or all of soil associations U25 (Smithdale-Lexington-Providence), U27 (Smithdale-Sweatman-Ora), and U28 (Smithdale-Sweatman-Providence) in northeastern Mississippi (USDA Soil Conservation Service 1974) and soil associations 42 (Smithdale-Luverne-Flomaton), 43 (Smithdale-Luverne-Troup), and 44 (Smithdale-Troup-Lucedale-Luverne) in northwestern Alabama (Hajek and other 1975).

Users of this site classification guide should be aware that landtypes other than those described for NTSF probably occur in this expanded area.

HISTORICAL INFORMATION

The NTSF began in 1935 when the Resettlement Administration of the Federal government purchased 42,730 acres in Henderson, Carroll, Benton, and Decatur Counties as a land reclamation project (Tennessee Department of Conservation 1987). Before the purchase, the area consisted of marginal and submarginal farms. Most of the cleared land had sustained

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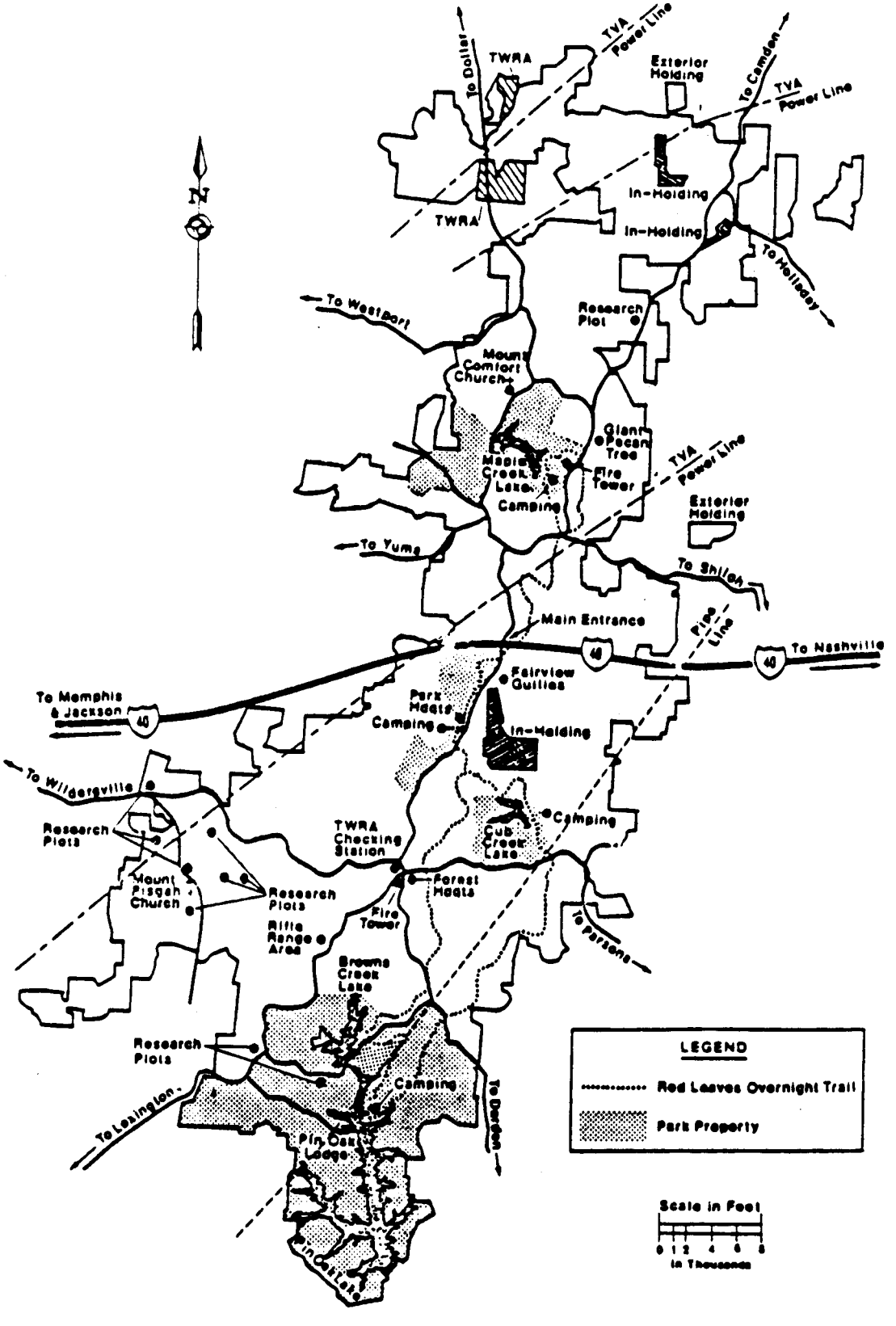

Figure 1.—*Natchez Trace State Forest, State Resort Park, and Wildlife Management Area.*

severe sheet and gully erosion; in places, it was no longer possible to grow row crops because of deep gullies. Forests on acres not cleared had also been mistreated and were in poor condition. High-grading was the accepted logging practice, wildfire was prevalent, and wooded areas were grazed by domestic livestock.

In 1939, NTSF was leased to the Tennessee Department of Conservation for 50 years with an option for renewal; the Tennessee Division of Forestry (TDF) was designated as the administering agency. This lease was terminated on 14 October 1955, and the entire property was deeded to the State of Tennessee.

After the Federal government bought the property, many families leased their homes and land and some remained for nearly 20 years. By 1959, all families had relocated; their homes and outbuildings were moved, sold, or demolished.

From 1935 to 1939, the Resettlement Administration made major improvements—two lookout towers, an extensive road system, ranger residences, rental cabins, a lodge, and other recreational facilities. Three dams were built, creating Cub Lake (53 acres), Browns Lake (172 acres), and Maple Lake (88 acres). More recently, the 629-acre Pin Oak Lake was impounded.

From 1939 to 1949 all activities were administered by TDF. On 31 July 1949, administration of recreational facilities was transferred to the Department of Parks and Recreation (DPR). This transfer was amended on 23 December 1970 and again on 2 October 1973. Because of these transfers of land to DPR, plus the easements for Interstate 40 to the Department of Transportation and subsequent acquisitions, TDF administers 35,625 acres, and DPR is responsible for 9,083 acres. There are five interior holdings totaling 551 acres (fig. 1).

Since the early 1950's, the Tennessee Wildlife Resources Agency (TWRA) has been responsible for the management of wildlife on NTSF. This responsibility was formalized in the June 1980 Memorandum of Understanding that placed both the forest and park property into a wildlife management area. TWRA manages Brown Lake and Maple Lake under its State Lakes Programs. TWRA owns two tracts adjoining NTSF, totaling 376 acres (fig. 1).

Following its designation as the administering agency in 1939, TDF concentrated its efforts on controlling wild fires and erosion and on improving existing forests. Thousands of acres of eroded land were planted with loblolly pine. Intermediate cuts were made in upland hardwood stands to improve the less-than-desirable stand conditions that resulted from grazing, wildfire, and high-grading. Several clearcuts were made to determine whether this method could be used to regenerate mature upland hardwood species. Pine plantations were thinned as they reached merchantable size.

During the late 1970's and early 1980's, conflicts arose between TDF and various interest groups over timber management policies. Factors contributing to these conflicts were (1) increased access following construction of Interstate 40, (2) increased use of the State Resort Park following expansion of facilities, and (3) increased awareness of NTSF by special interest groups and the general public.

Prompted by these conflicts, TDF prepared a new State Forest System Plan in 1984. This plan addresses the collective role of all State forests with emphasis on structure, issues, goals, objectives, and management policies. Currently, TDF is preparing a new management plan for NTSF within the broad guidelines established in the system plan. "An Assessment of Resources for Natchez Trace State Forest" (Tennessee Department of Conservation 1987) has been prepared as background information for groups and individuals who may want to provide input to the planning process. TDF has an excellent opportunity for practicing intensive multiple-use management on NTSF.

ENVIRONMENT

Physiography, Geology, and Topography

NTSF occupies a portion of the Red Hills Belt of the East Gulf Coastal Plain section of the Coastal Plain physiographic province (Fenneman 1938). The geologic history of this area dates back some 550 million years, during which recurring cycles of uplift, erosion, down-warping, inundation, and sedimentation have shaped the landscape (Luther 1977). The most recent major episode was the deposition of several feet of loess during the Pleistocene epoch.

Two major strata of the Cretaceous period underlie NTSF; both strata are members of the Ripley Formation (Miller and others 1966). The most widespread is the McNairy Sand—predominantly medium- to coarse-grained sand interbedded in places with thin layers of silty, light gray clays. It is fine-grained at the base and locally contains heavy minerals. Thickness is about 300 feet. Occurring along the eastern side of NTSF is the Coon Creek Formation—fossiliferous, micaceous sand, silty and glauconitic; locally fossiliferous sandy clay at the base. Siderite (iron carbonate) concretions are common in the upper part. Thickness is about 140 feet. There is a regional dip of these strata to the west. Also present to a minor degree are Quaternary period alluvial deposits of sand, silt, clay, and gravel in Blunt, Birdsong, Cub, and Browns Creeks. About 2 to 3 feet of loess covers the sediments.

The area is highly dissected and predominantly hilly, characterized by narrow, winding ridgetops;

short, steep sideslopes; and relatively sluggish streams and rivers traversing fairly wide flood plains.

Extending the length of NTSF in a nearly north-south direction is a dividing ridge. On the west, streams empty into the Big Sandy River, which drains north and joins the Tennessee River (Kentucky Lake) east of Paris, Tennessee. On the east, streams drain directly into the Tennessee River.

The ridges are mostly long, narrow, and winding and seldom exceed 300 feet in width, although in places they range up to 1,000 feet in width. Elevation of ridgetops is 550 to 650 feet; a few, such as Maple Creek Lookout, approach 700 feet. The sideslopes are short and moderately steep, with gradients ranging from 8 to 30 percent. The elevation of streambottoms at the NTSF boundary varies from 420 to 480 feet. Local relief seldom exceeds 100 feet.

Most drainages on NTSF are first and second order; a few are third order. Consequently, the gradient of headwater streams is sufficient to promote rapid drainage. However, the gradient quickly lessens because of sediment from extensive sheet and gully erosion that has occurred in very recent times.

Soils

Most of NTSF is included in soil association C11 (Ruston-Lexington-Providence) (Springer and Elder 1980). It represents the sandier part of the Upper Coastal Plain in west Tennessee and corresponds, geologically, to the McNairy Sand. Today, most soils formerly classified as Ruston would be classified as Smithdale. Soil association C11 is dominantly hilly and deeply dissected by meandering drainageways. Drainageways are typically narrow and V-shaped in the upper reaches but quickly widen to contain narrow to moderately broad strips of bottomland and, in places, narrow terraces. The steeper hillsides are usually gullied to some degree, some severely so, which reflects the extensive erosion associated with the forest-to-cropland cycle of the late 19th and early 20th centuries.

The dominant soils are formed in sandy and loamy Coastal Plain sediments. On the milder slopes, this sediment is capped with loess up to nearly 3-feet thick. Common patterns are soils formed in loess and Coastal Plain sediments on the ridgetops and soils formed entirely in Coastal Plain sediments on the hillsides. The soils are mostly well drained, highly leached, low in natural fertility, and strongly acid. The well-drained Smithdale soils are on the hillsides and, where not severely eroded, have brown loam or fine sandy loam surface layers and yellowish red, friable sandy clay loam or clay loam subsoils several feet thick. Lexington and Providence soils are on the narrow, winding, undulating to rolling hilltops. The well-drained Lexington soils are brownish and silty to a depth of about 3 feet, below which they are reddish sandy clay loam or clay loam. Providence soils are similar in color and texture but are moderately well drained and have a fragipan. On NTSF, these fragipans are weakly developed. It is possible that these pans are degrading as the ridges become more narrow (less stable landscape) because of stream upcutting and excessive gully erosion on the sideslopes.

General soil association C11 (Ruston-Lexington-Providence) corresponds to soil associations 3 (Smithdale-Lexington-Providence) in Carroll County (Moore and others 1984), 3 (Ruston-Lexington) in Henderson County (Flowers and other 1960), and 4 (Ruston-Providence-Savannah) in Benton County (Odom and others 1953).

The eastern side of NTSF in Henderson County is included in soil association C21 (Shubuta-Cuthbert-Dulac). It is one of three associations in the Clay Hills of the Upper Coastal Plain and corresponds, geologically, to the Coon Creek Formation. Taxonomically, Cuthbert soils have been redefined and are no longer recognized in Tennessee; most soils formerly classified as Cuthbert are now classified as Sweatman. Sweatman soils have more than 30 percent silt in the control section and clayey sola less than 60 inches thick. Similar soils with less than 30 percent silt in the control section are called Luverne. Shubuta soils are similar but have clayey sola more than 60 inches thick. Soil association C21, like C11, is dominantly hilly and dissected by numerous crooked drainageways with profiles similar to those of C11.

Soils on the slopes formed in Coastal Plain clay, sandy clay, and shaley clay. Soils on the narrow, widing ridgetops formed in 2 to 3 feet of loess and the underlying clays. These soils have a thick, reddish, clayey subsoil, and, where uneroded, a loamy surface layer; but on many areas, erosion has either exposed or gullied through the sandy clay or clay subsoil. These hilly soils are highly leached, acid, and low in phosphorus. They are well drained or moderately well drained but have only moderate available water capacity.

The well-drained Silerton soils and the moderately well-drained Dulac soils, which have a fragipan, are on the loess-capped hilltops. Sweatman and Shubuta soils are on the hillsides and formed from Coastal Plain clays. Sweatman soils are more common than Shubuta soils on NTSF.

Soils in the bottoms that drain both soil associations have a variety of textures because of mixing during transport, active erosion, and differential rates of deposition. These soils occur in intricate patterns so that it is often impossible to separate the silty ones from the loamy ones at the usual scale (1:15,840) of county soil surveys. Two catenas are represented—a

coarse-silty group (Vicksburg, Collins, Falaya, and Waverly) and a coarse-loamy group (Ochlocknee, Iuka, Enville, and Bibb). The somewhat poorly drained, fine-loamy Mantachie soils may occur in places. Occasionally, the moderately well-drained, fine-silty Freeland soils occur on terraces.

Many bottomland soils mapped in Benton (Odom and others 1953) and Henderson (Flowers and others 1960) Counties have been redefined.[1] Soils common to NTSF are listed below:

Old series and phase	Current series and surface texture
Alva fine sandy loam	Iuka fine sandy loam, occasionally flooded
Beechy fine sandy loam	Bibb fine sandy loam, occasionally flooded
Beechy silt loam	Waverly silt loam, occasionally flooded
Briensburg silt loam	Collins silt loam, occasionally flooded
Eupora fine sandy loam	Iuka fine sandy loam
Hymon fine sandy loam	Mantachie fine sandy loam, occasionally flooded
Hymon silt loam	Mantachie silt loam, occasionally flooded

In the Carroll City soil survey (Moore and others 1984), severely gullied land is mapped as soil complexes—Udorthents-Smithdale, gullied and Udorthents-Sweatman, gullied. A soil complex consists of two or more soils occurring in such an intricate pattern or in such a small area that they cannot be shown separately on soil maps.

Udorthents are soils that show little or no evidence of development of pedogenic horizons. They occur on recent erosional surfaces in areas of a humid climate. On NTSF, erosion was induced by cultivation, and the former soil has been removed or so truncated that diagnostic horizons are absent. Udorthents are on sideslopes and in the bottoms of gullies. Smithdale and Sweatman soils are on the remnants of the original soils between gullies. In Henderson County (Flowers and others 1960), similar gullied land was mapped as moderately or severely gullied, consisting of either Lexington-Ruston or Cuthbert-Silerton materials. In Benton County (Odom and others 1953), such areas were mapped as rough-gullied land, consisting of either Ruston or Cuthbert materials.

General soil association C21 (Shubuta-Cuthbert-Dulac) has no comparable association in Carroll County, although the General Soils Map (Springer and Elder 1980) shows C21 cutting across the southeast corner. Comparable soil associations are 4 (Shubuta-Cuthbert) in Henderson County (Flowers and others 1960) and 5 (Saffell-Cuthbert-Ruston) in Benton County (Odom and others 1953).

In general, all of the upland soils are fragile and subject to extensive sheet and gully erosion when disturbed. Foresters should recognize this limitation and tailor all forest management activities to minimize erosion. Specifically, the clayey substratum of Sweatman soils has a high capacity to slip or slump when saturated with water, particularly on slopes disturbed by road construction. (Refer to Appendix A for the taxonomic classification of the dominant soils encountered on NTSF.)

[1] Personal communication with David E. Lewis, assistant state soil scientist, USDA Soil Conservation Service. January 1988.

Climate

The NTSF has a temperate climate characterized by long, moderately hot summers and short, mild winters. According to Thornthwaite's (1948) classification of climate, it is humid mesothermal with adequate precipitation in all seasons. Daily and seasonal weather is controlled largely by alternating cold, dry continental air masses from Canada and warm, moist air from the Gulf of Mexico. During the summer, complete exchanges of air masses are few, and tropical maritime air masses persist for extended periods. Long periods of mild, sunny weather typically occur in the fall. Table 1 shows elevation above sea level and

Table 1.—*Average monthly and annual precipitation in inches for two weather stations near the Natchez Trace State Forest, State Park, and Wildlife Management Area**

Station and county	Years of record	Elevation (ft)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Jackson Madison, TN	40	433	4.77	4.45	5.24	5.44	4.99	3.81	4.44	2.98	3.52	2.63	4.12	4.60	50.99
Paris 2 NW Henry, TN	51	580	4.67	4.29	5.52	4.90	4.26	3.80	3.93	3.65	3.56	2.46	4.52	4.68	50.24

* U.S. Department of Commerce (1988).

Table 2.—*Average monthly and annual temperature in °F and length of warm period for two weather stations near the Natchez Trace State Forest, State Park, and Wildlife Management Area**

Station and county	Years of record	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Warm period (days)†
Jackson Madison, TN	40	37.8	41.7	50.1	61.2	69.5	77.1	80.4	79.1	72.6	61.1	49.5	41.6	207
Paris 2 NW Henry, TN	51	35.4	39.1	47.9	58.0	66.2	74.2	78.0	77.0	70.4	58.1	47.8	39.5	205

* U.S. Department of Commerce (1988).
† Mean period from last 32 °F to first 32 °F; 1984–1988.

average monthly and annual precipitation, and table 2 shows average monthly and annual temperature and average frost-free periods for two stations in neighboring counties. Jackson is about 31 miles west-southwest of the forest, and Paris is about 36 miles north of the forest. Complete long-term records of precipitation and temperature were not available from any station in Henderson, Carroll, Benton, or Decatur Counties.

Mean annual temperature for NTSF is about 58 °F. The mean winter temperature is about 38 °F, and the mean summer temperature is 77 °F. The date of last freeze is mid- to late-April, and the date of first freeze is mid- to late-October, making a frost-free period of about 210 days. The temperature often falls below freezing at night in December, January, and February. Under forest cover, the ground seldom freezes except during exceptionally cold periods when the air temperature remains below 20 °F for several days. However, on bare ground the soil freezes to a depth of 2 to 5 inches several times during the average winter season and commonly remains frozen for 2 to 12 days. At 1 inch below the surface of bare ground, the temperature can be freezing or colder as early as October 25 and as late as March 28. Air temperature does not vary much across the forest; however, microtemperature may vary considerably because of relief, aspect, and cloud cover. Midday air temperature in closed forest stands is cooler than in unforested areas.

Southerly winds prevail from May to September and northerly winds from November to March; average velocity ranges from 5 to 10 miles/hour. Severe winds are infrequent, and most are associated with tornadoes and summer thundershowers.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 70 percent of the possible time in summer and 45 percent in winter. Annual precipitation averages about 48 inches and ordinarily is fairly well distributed throughout the year. Monthly precipitation averages 4.50 inches or more from November or December through April or May. Rainfall averages less than 4 inches/month during the summer and early fall. Short periods of very wet or very dry weather are common, and rainfall was below normal across much of Tennessee from 1983 to 1988. Thunderstorms with high-intensity rainfall, occasionally hail, occur about 55 days each year, mostly in the summer months while snowfall seldom exceeds a few inches and melts in a few days. Soils are wettest from December to April and driest from July to October.

Tree growth on ridges and south slopes is commonly retarded for periods of a few to several days six to eight times each growing season. Tree growth on north slopes and in bottoms is seldom retarded because of dryness, except during prolonged rainless periods.

Soil dryness during the growing season can also be shown by probability of drought (Safley and Parks 1974). A drought day is a day when precipitation and evapotranspiration data indicate that soil moisture status is zero and that water deficits will develop in trees. At Jackson, there is a 10-percent or greater probability of a weeklong drought occurring any time from the second week of August through the second week of October. There is a 20-percent or greater probability that there will be 5 days of drought per week from the second week of August through the third week of October.

These probabilities are based on deep soils having an available-water-holding capacity (AWHC) of 7 inches (the maximum value reported by Safley and Parks (1974). Most soils on NTSF have greater AWHC's. The probability of a given length of drought increases with less AWHC and vice versa. In addition, as AWHC decreases, the period that such drought can occur begins earlier and continues later in the year and vice versa.

Vegetation

Regional Classification.—Braun (1950) assigned west Tennessee to the Mississippi Embayment Section of the Western Mesophytic Forest Region. This region coincides with Fenneman's (1938) Interior Low Plateau (Highland Rim-Pennyroyal, Bluegrass, Nashville

Basin, and the Shawnee Section) but also includes the area of Coastal Plain sediments in western Kentucky, west Tennessee, and northern Mississippi. Braun (1950) described the vegetation as a mosaic of communities that were broadly related to soil parent material and topography. Distinct forest types were on the ridgetops and slopes and in the valleys; however, species composition differed greatly within these forest types because of past land use.

Oak and oak-hickory forests dominated the uplands. White oak and southern red oak were the dominant species, and post oak, blackjack oak, black oak, chinkapin oak, and yellow-poplar occurred locally. Hickories, in varying abundance, were almost always present. American beech and sugar maple occurred only rarely. Mesophytic species (yellow-poplar, black walnut, American beech, white ash, black cherry, cherrybark oak, and sweetgum) were more common on cool slopes and in heads of hollows. South toward the Tennessee-Mississippi border, loblolly and shortleaf pines occurred increasingly emphasizing the transition to the Oak-Pine Region.

The understory of the oak and oak-hickory communities contained few oak seedlings and saplings, but flowering dogwood, black cherry, winged elm, blackgum, common persimmon, red mulberry, white ash, sassafras, and American holly were common. Common shrubby species are devils-walkingstick, elderberry, hazel, swamp privet, coralberry, poison ivy, and Virginia creeper.

The broad alluvial valleys contained luxuriant, dense forests of willow oak, pin oak, overcup oak, water oak, eastern cottonwood, American elm, winged elm, sugarberry, river birch, pecan, American sycamore, red maple, sweetgum, black willow, silver maple, boxelder, and baldcypress. These species were segregated into more or less distinct communities according to periodicity and length of annual flooding.

Natchez Trace State Forest.—Before settlement, NTSF was heavily forested, mostly with deciduous species. Land clearing by settlers was a selective process. The most fertile soils on level or nearly level topography were cleared first. Less desirable land was cleared as the demand for cropland increased. In general, nearly all the broader ridgetops, terraces, and well-drained streambottoms were cleared. Most of the less productive, steeper land was left in forest but was burned, grazed, and high-graded (fig. 2A). American chestnut succumbed to the chestnut blight.

Since the Federal government purchased NTSF in 1935, an estimated 16,355 acres of gullied cropland and pasture and poorly stocked hardwood stands (many were early successional) have been planted to pine (fig. 2B). About 6,000 acres were planted between 1935 and 1939, and the remainder since 1939. Of the early pine plantings, nearly 75 percent was loblolly pine, 15 percent was shortleaf pine, and the remainder was eastern redcedar, baldcypress, slash pine, Virginia pine, and longleaf pine. Since 1939, TDF has planted mostly loblolly pine because of its proven ability to survive and grow well in the area and to stabilize gullied land rapidly. About 110,000 baldcypress seedlings were planted in poorly drained bottoms from 1976 to 1979.

From 1935 to 1939, several thousand acres were planted with a variety of deciduous species—black locust, shipmast locust, black walnut, butternut, yellow-poplar, northern catalpa, green ash, red oak, white oak, water tupelo, silktree, and red mulberry. For many reasons, nearly all of these plantings except loblolly pine were unsuccessful, and there is little or no evidence of this effort.

According to the latest inventory (Tennessee Department of Conservation 1987), the composition of NTSF forests is 69 percent hardwoods and 31 percent pines. The area classified as pine is, with few exceptions, formerly eroded cropland. However, of the estimated 16,355 acres planted to pine, only 10,797 acres are now classified as pine type because of competition from hardwoods and of high juvenile mortality. Of the hardwood acreage, 75 percent is on the uplands and 25 percent is in the bottoms. Of the pine acreage, 98 percent is on the uplands and only 2 percent is in the bottoms. Most of NTSF is reasonably well stocked. Some of the forest is overstocked and in need of thinning; some of it is poorly stocked and in need of regeneration or reinforcement planting. The average acre supports a basal area in trees greater than 2.0 inches d.b.h. of 75 feet^2 (73 percent hardwoods and 27 percent pines). Of the 56 feet^2 of hardwoods, 55 percent is mast-producing oaks and hickories. The present sawtimber volume is 235.4 million fbm or about 6,753 fbm per acre. Pulpwood-size trees contain upwards of 500,000 cords or 13.9 cords/acre.

CLASSIFICATION HIERARCHY

In the six published regional forest site classification guides, a five-level hierarchy was developed consisting of successive stratifications of the landscape, beginning with physiographic province (Smalley 1979a, 1984a, 1985, 1989, 1991). Because this report is for a specific tract of land, a stratification of the entire Coastal Plain was not developed. However, the levels of the hierarchy above the landtypes described below for NTSF are logical and well-recognized divisions and are only outlined here. If and when a regional classification is developed, it will be easy to fit this localized effort into the overall system.

V. Physiographic Province—Coastal Plain
  VI. Region—East Gulf Coastal Plain
    III. Subregion—Upper Coastal Plain Hills

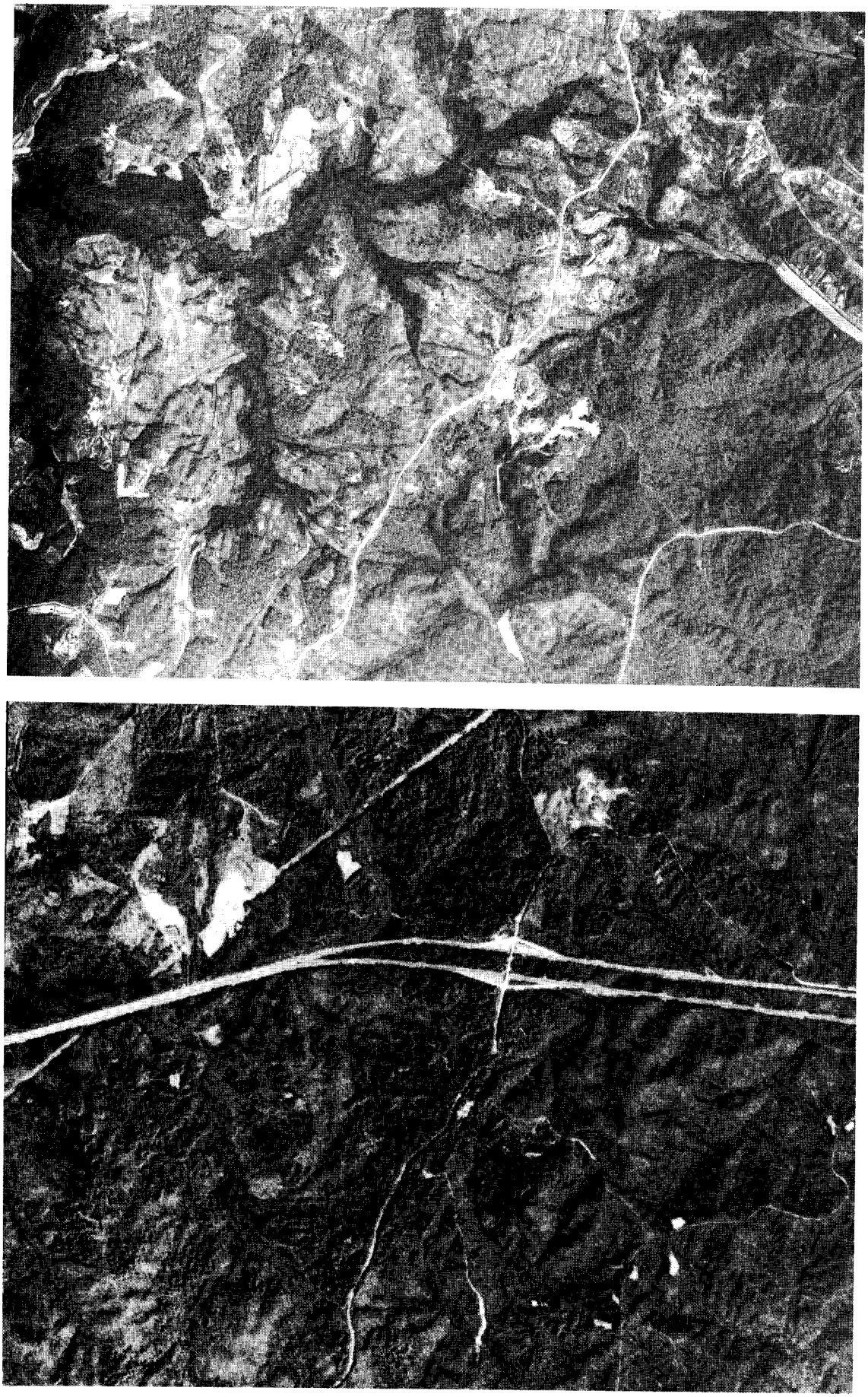

Figure 2.—*Aerial views of the central part of the Natchez Trace State Forest, State Resort Park, and Wildlife Management Area. In 1938 (A) there was widespread farming on most ridges and on many slopes. Sheet and gully erosion of the fragile soils was unchecked. What is known as "Fairview Gullies" is the extensive white area in the center of the photo. In 1985 (B), Interstate 40 bisects the Forest. Note the extensive pine stands, many approaching 50 years of age. Fairview Gullies is barely visible. Forest composition is 69 percent hardwoods and 31 percent pines.*

II. Landtype Association

A. Sandy and Loamy Hills

B. Clayey and Sandy Clay Hills

These two landtype associations (LTA's) conform to both soil (Springer and Elder 1980) and geologic divisions (Miller and others 1966). LTA-A corresponds to soil association C11 (Ruston-Lexington-Providence) and the McNairy Sand Member of the Ripley Formation. LTA-B corresponds to soil association C21 (Shubuta-Cuthbert-Dulac) and the Coon Creek Formation.

LANDTYPES

Rationale

The two LTA's were divided into landtypes, which are the smallest unit of the landscape recognized in this classification system. Wertz and Arnold (1975) describe landtypes as visually identifiable areas that have similar soils and productivity and that have resulted from similar climate and geological processes.

NTSF has 25 landtypes distributed between the two LTA's (table 3). Landtypes 1 through 4, 6 through 9, and 18 are common only to LTA-A, and Landtypes 10 through 17, and 19 are common only to LTA-B. Landtypes 5 and 20 through 25 are common to both LTA's.

Ridges on NTSF vary considerably in width and were placed in one of two categories—narrow (usually less than 300 feet wide) and broad (greater than 300 feet wide). No aspect divisions seem necessary. Landtype 5 represents narrow ridges and convex upper slopes supporting depauperate blackjack oak-post oak-southern red oak communities. There is no apparent relation of these "poor" sites to soil mapping units, soil parent material, topographic position, or degree of erosion. Further study may determine a need to recognize a separate "poor ridge" landtype in each LTA.

Land not cleared during the early 1900's supports upland hardwoods on the slopes and ridges and bottomland hardwoods in the bottoms. Ridges and sideslopes that were cleared and cropped or pastured sustained extensive sheet and gully erosion. Productivity and the associated management problems of these eroded areas are decidedly different from those of uneroded areas. As stated earlier, extensive planting of loblolly pine has stabilized much of this eroded land; consequently, the presence of loblolly pine clearly distinguishes the former eroded crop and pasture land from land that was never cleared. Outside NTSF, most broad ridges and wide streambottoms are still farmed or pastured.

Landtypes 1, 3, 10, and 12 are uneroded narrow or broad, sandy and clayey ridges, respectively, that sup-

Table 3.—*Summary of landtypes and their frequency of occurrence by landtype association*[†]

Landtype number and name	Landtype association A	Landtype association B
1. Upland hardwoods on narrow sandy ridges and convex upper slopes	***	
2. Loblolly pine on eroded narrow sandy ridges and convex upper slopes	**	
3. Upland hardwoods on broad sandy ridges and convex upper slopes	***	
4. Loblolly pine on eroded broad sandy ridges and convex upper slopes	**	
5. Poor narrow ridges and convex upper slopes	*	*
6. Upland hardwoods on north sandy sideslopes	***	
7. Upland hardwoods on south sandy sideslopes	***	
8. Loblolly pine on eroded north sandy sideslopes	**	
9. Loblolly pine on eroded south sandy sideslopes	**	
10. Upland hardwoods on narrow clayey ridges and convex upper sopes		***
11. Loblolly pine on eroded narrow clayey ridges and convex upper slopes		**
12. Upland hardwoods on broad clayey ridges and convex upper slopes		***
13. Loblolly pine on eroded broad clayey ridges and convex upper slopes		**
14. Upland hardwoods on north clayey sideslopes		***
15. Upland hardwoods on south clayey sideslopes		***
16. Loblolly pine on eroded north clayey sideslopes		**
17. Loblolly pine on eroded south clayey sideslopes		**
18. Gullied land, sandy material	*	
19. Gullied land, clayey material		*
20. Lakes, ponds, and other impoundments	*	*
21. Ponded bottoms and swamps	*	*
22. Narrow wet bottoms	*	*
23. Narrow moist bottoms	**	**
24. Wide wet bottoms	*	*
25. Wide moist bottoms	**	**

[†] Frequency of occurrence is common (***), frequent (**), or occasional (*). Rating are made within each landtype association (vertically). Comparison of landtype frequency among landtype associations (horizontally) is not valid.

port upland hardwoods. Landtypes 2, 4, 11, and 13 are eroded narrow or broad, sandy and clayey ridges respectively, that support loblolly pine.

Separate north- and south-facing sideslopes were defined for each LTA. North aspects include all azimuths clockwise from 315 degrees (northwest) to 135 degrees (southeast). The remainder of the azimuth circle represents south aspects. Sideslopes were not long enough to justify dividing them into upper and lower segments. Soils on sideslopes were formed in place; there is no strong evidence that colluvial processes are active. Landtypes 6, 7, 14, and 15 are uneroded north or south, sandy or clayey sideslopes that support upland hardwoods. Landtypes 8, 9, 16, and 17 are eroded north or south, sandy or clayey sideslopes that support loblolly pine (table 3).

Two "gullied land" landtypes (18 and 19), one in each LTA, represent areas in which gully erosion is still taking place. These two landtypes are the source of most of the sediment that continues to fill stream channels, aggrade bottomlands, and reduce streamwater quality. Topography is so complex in these severely gullied areas that it is unlikely that north- and south-facing segments can be effectively delineated, except on a very broad scale. Control of erosion in Landtypes 18 and 19 should be a high-priority management objective. A variety of control methods are possible. Reshaping some of the area may be advisable where a rough, broken landscape with steep slopes will severely restrict all forest management activities.

No pattern of soil drainage with respect to stream order was determined. There is no apparent relation of soil mapping units (internal drainage) to existing plant communities. As stated earlier, both loamy and silty soils in these bottoms occur in patterns too intricate to map at the usual scales of county soil surveys. The alluvium is stratified horizontally and vertically.

Evidently, the periodic filling and flushing out of the stream channels and the general aggradation of these bottoms by sediment from eroding sideslopes and ridgetops upstream have upset the normal pattern of soil drainage. In addition, beaver dams have caused localized flooding and death of some timber.

Six bottomland landtypes are proposed. Landtype 20 is lakes and ponds. Landtype 21 is ponded bottoms consisting mostly of alder swamps and/or dead and dying timber; water is impounded on the area most of time. Landtypes 22 through 25 are delineated on the basis of stream order and internal soil drainage. Landtypes 22 and 23 are narrow bottoms occurring along first- and second-order streams, and Landtypes 24 and 25 are broad bottoms occurring along third-order or higher order streams, mostly near or outside NTSF. Landtypes 22 and 24 are wet bottoms dominated by water-tolerant tree species. Soil drainage is somewhat poorly drained and poorly drained. Landtypes 22 and 25 are moist bottoms dominated by upland hardwoods and, occasionally, loblolly pine. Soil drainage is moderately well drained and well drained. The broad wet bottoms (Landtype 24) are frequently flooded, and the broad moist bottoms (Landtype 25) are occasionally flooded for short periods in the winter and early spring. Most of Landtype 25 is in cultivation or pasture, as is some of Landtype 24 that has been tile-drained.

Ditching or dynamiting stream channels, trapping and removing beavers and destroying their dams could change the drainage status of some areas. Ditching and dynamiting should be done so that the original sinuous character of the stream channels is maintained. The integrity of these streambottoms is contingent on the control of erosion in the uplands.

There are some hard rock outcrops on NTSF, but the area involved is insufficient to justify a "rock outcrop and shallow soils" landtype.

Landtype Description Elements

Letters in the upper right corner of each landtype description (see Landtype Descriptions and Forest Management Interpretations) identify the landtype association(s) in which each landtype occurs. Each landtype is described in that section in terms of the following nine elements. The **geographic setting** provides an overall description of the landtype, specifying where it occurs on the landscape and its relation to other landtypes. Slope was classified in accordance with the standards in the Carroll County soil survey (Moore and others 1984).

Slope classes and corresponding percent of slope:

Slope percent	Class
0–2	Level or nearly level
2–5	Gently sloping
5–8	Sloping
8–12	Strongly sloping
12–20	Moderately steep
20+	Steep

The most prevalent soil series are listed under **dominant soils**. These series link this site classification system with county soil surveys published by SCS and reflect the current thinking regarding soil taxonomy and classification. Users who wish more detailed information can refer to soil series descriptions issued by SCS.

The kind of soil **parent material** is listed next. On the uplands, parent materials are up to 3 feet of loess and/or either unconsolidated sandy and loamy or clayey and sandy clay Coastal Plain sediments. Alluvium in the streambottoms was washed from soils formed in these materials and from the materials

themselves where erosion has been severe. **Solum thickness** refers to that part of the soil profile that is influenced by plant roots; i.e., all horizons (O, A, E, and B) above the parent material. **Texture** is described in terms of the 12 conventional classes, based on percentages of sand, silt, and clay (Soil Survey Staff 1951).

The conventional seven **soil drainage** classes are very poorly drained, poorly drained, somewhat poorly drained, moderately well drained, well drained, somewhat excessively drained, and excessively drained (Soil Survey Staff 1951). **Relative soil water supply** of each landtype is rated in five classes: very low, low, medium, high, and very high. This qualitative rating is based on the available water-holding capacity of the dominant soils (a function of soil texture, soil structure, and thickness), but allowances are made for the influence of soil drainage, topographic position, and aspect.

Soil fertility is described as very low, low, moderately low, moderate, moderately high, high, or very high. Soils common to NTSF are highly leached and acid to strongly acid. They are rated low in natural fertility for agricultural crops. However, these soils must be rated higher for trees because of the presence of tall, high-quality oaks, yellow-poplar, sweetgum, and loblolly pine. Consequently, the most fertile upland soils are rated moderate; those on south slopes and active gullied areas are rated moderately low. Soils in streambottoms have been enriched somewhat, have good moisture relations, and are rated moderate to moderately high. More detailed growth data may result in rating some landtypes "high." The site index of yellow-poplar probably exceeds 100 in the moist bottoms.

The most common woody species in the overstory are listed under **vegetation** in approximately order of abundance. Important understory species also are listed, including any distinctive herbaceous groups. Although not listed, reproduction of overstory species may be present in the understory. Species nomenclature follows Little (1979) and Fernald (1950).

Although there is a successful plantation of eastern white pine on NTSF, the species is too far removed from its botanical range to be considered for extensive planting without further testing. Slash and longleaf pines, planted in early species trials, were unsuccessful. None of these pines is listed as occuring on any landtype.

DEVELOPING FOREST MANAGEMENT INTERPRETATIONS

Each landtype is evaluated in terms of productivity for selected species of trees and species desirability for timber production (tables 5 through 28). In addition, each landtype is rated for five problems and hazards that affect forest management operations.

Productivity

Productivity of commercially valuable species is expressed as site index and as average annual growth in cubic feet per acre. Site index is the total height attained by dominant and codominant trees at some specified age. For all naturally occurring species, site indices are the means of values from soil survey interpretations for the dominant soils in each landtype. Interpretations are issued by SCS as part of each soil series description. Heights and age measurements were obtained in well-stocked, even-aged, essentially unmanaged stands that had not been damaged excessively by fire, insects, disease, or grazing. These stands are located on soils representing, as nearly as possible, the modal concept of each soil series. The height and age data were converted to site indices using published site index curves (Beck 1962; Briscoe and Ferrill 1958; Broadfoot 1960, 1961, 1963, 1964; Broadfoot and Krinard 1959; Nelson and others 1961; Olson 1959; USDA FS 1929; Tennessee Valley Authority 1948[2]).

Base age is 50 years for all species except eastern cottonwood (30 years) and American sycamore (35 years). When necessary, the SCS site index values were adjusted for aspect and slope position on the basis of experience and soil-site research (Broadfoot 1976, Carmean 1975). When no values were available, site indices of important species were estimated; where they occur in tables 5 through 28, these estimated values are enclosed in parentheses.

Rules used to assign site indices are as follows. On the uplands, site indices were determined for the uneroded landtypes first. Of all upland landtypes, site indices are highest on north sideslopes and correspond to values reported by SCS. On south sideslopes, site indices are 5 feet less than their northern counterparts. Site indices on the narrow ridges are equivalent to those on south sideslopes and, generally, are equal to values reported by SCS for the soils common to the ridges. Bases on limited data and experience, there was no reason to assign site indices to clayey landtypes that were different from those assigned to equivalent sandy landtypes. On eroded landtypes, site indices were arbitrarily decreased 5 feet from those on uneroded counterparts. In the bottoms, site indices were derived entirely from SCS woodland interpretations.

All those estimated site indices appear to be reasonable and consistent, except those for loblolly pine on

[2] Site index curves for eastern redcedar based on data from 271 plots throughout the Tennessee River Valley. Mineographed sheet on file with author.

eroded landtypes. The general consensus of foresters in the area is that the site index of loblolly is 5 to 15 feet taller than the values reported here. The footnote to table 6 pertaining to loblolly pine alerts users to this possibility. The validity of this consensus should be tested by extensive forest inventories before the reported values are changed.

Except for. eastern cottonwood, average annual growth expressed in cubic feet per acre was calculated from available yield tables (McCarthy 1933, Nelson and others 1961, Schnur 1937, USDA FS 1929, Winters and Osborne 1935). The yield tables represent either normal or fully stocked, unthinned conditions. Annual growth rates were averaged over 50 years. Average annual cubic growth of eastern cottonwood was extrapolated from yields obtained from both thinned plantations and young natural stands (Baker and Broadfoot 1979, table 13). Mean annual increments include yields from thinnings and were averaged over 30 years.

Winters and Osborne's (1935) yields for natural stands of sweetgum were used instead of Baker and Broadfoot's (1979, table 14) values estimated as a proportion of eastern cottonwood yields. It was impossible to use Baker and Broadfoot's (1979, table 14) estimated yields for American sycamore because their values are keyed to a site index, base age 50, while site indices derived from SCS woodland interpretations are keyed to a site index, base age 35 (Briscoe and Ferrill 1958).

For Landtypes 1, 3, 6, 7, 10, 12, 14, and 15, the site index and average annual cubic growth of loblolly pine are shown because some users might consider conversion of these landtypes (now supporting upland hardwoods). Loblolly has survived and grown well on equivalent eroded landtypes. No estimate of loblolly productivity is made in this report for Landtype 5, now occupied by depauperate stands of blackjack oak, post oak, and southern red oak. Shortleaf and Virginia pine would be the species of choice if Landtype 5 were selected for conversion from low-quality upland hardwoods to pine.

All site curves and yield tables were developed for geographic areas larger than and including the NTSF or for areas that do not include the NTSF. Yields could not be expressed in a common merchantability standard; therefore, care should be exercised in comparing average annual yields of species both within and between landtypes. Footnotes to table 5, which apply to subsequent tables, specify the merchantability standards used.

When referring to tables 5 through 28, users are cautioned that site indices and yields for loblolly and shortleaf pines are for natural stands, although, with few exceptions, stands of these species on NTSF are plantations. Growth and yield data for old-field plantations in the Highland Rim-Pennyroyal, Cumberland Plateau, and Ridge and Valley physiographic provinces in Tennessee, Georgia, and Alabama (Smalley and Bailey 1974a, 1974b; Smalley and Bower 1968a, 1968b, 1971) should not be applied to these Upper Coastal Plain plantations established on eroded old fields and pastures without extensive testing.

This caution is further emphasized by the research of Van Deusen and others (1981). They attempted to devise a prediction system for cubic-foot volume of loblolly pine trees that was applicable through much of the species botanical range. Prediction equations for total volume, both outside and inside bark, for the Tennessee, Georgia, and Alabama highlands were significantly different from three others sets of equations representing the Georgia Piedmont; the Alabama, Arkansas, and Mississippi Gulf Coastal Plain; and the Piedmont and Coastal Plain of Virginia, Delaware, Maryland, and North Carolina.

Additional growth and yield information applicable to NTSF is available. This information, and some precautions regarding its use, follows. An alternate approach to rating site quality was formulated by Baker and Broadfoot (1979) for 14 commercially important, mostly bottomland southern hardwoods. Many of these species occur on NTSF. This practical field method incorporates an evaluation of physical, moisture, nutrient, and aeration properties of soils into a site index value. Because this method is a point system, it is best applied after delineating the landtypes. A check of two species on several landtypes indicated that the Baker and Broadfoot (1979) values are very close to the average site indices published by SCS.

Clatterbuck (1987) has constructed site index curves for cherrybark oak and sweetgum in mixed, even-aged stands in the bottoms of minor streams in central Mississippi. The curves for cherrybark oak in these minor bottoms are different from Broadfoot's (1961) that were developed from plots located mainly in major river bottoms and loessial hills. Clatterbuck's curves may better depict the height-age relations of cherrybark oak in NTSF streambottoms.

The most applicable growth and yield information for NTSF is Sullivan and Williston's (1977) stand-level values for thinned loblolly pine plantations established on abandoned, eroded fields and farmlands in loessial soil areas of Mississippi, Arkansas, and Tennessee. Some of the data came from NTSF in Henderson County, Tennessee. No attempt was made to use this system to determine mean annual cubic increments for individual landtypes because it would further complicate comparison of productivity by introducing another variable—thinning.

The efficacy of thinning loblolly pine plantations on topography and soils similar to those on NTSF was reported by Williston (1979). Plantations on two sites (80 and 90; base age 50) were thinned three times at 5-year intervals to basal areas of 70 to 100 feet^2 acre^{-1} beginning at age 17. Cubic-foot and board-foot production is shown in table 4.

Table 4.—*Total production (feet³ and fbm-International ¼ inch) at age 37 of loblolly pine plantations on sites 80 and 90 thinned three times at 5-year intervals to residual basal areas of 70 and 100 feet²/acre beginning at age 17.*

Site index	Unit	Residual basal area (feet²/acre) 70	100
80	feet³	4,390	4,692
	fbm	10,643	9,230
90	feet³	5,274	6,215
	fbm	16,925	18,910

Matney and Sullivan (1982) have published a procedure for developing compatible stand and stock tables for thinned and unthinned old-field plantations of loblolly pine. The procedure includes determining diameter distributions using a 3-parameter Weibull function.

Tentative variable density yield tables for red oak-sweetgum stands, primarily in minor streambottoms in central Mississippi, have been developed by Sullivan and others (1983). The stand-level model allows prediction of cubic-foot or board-foot yield as a function of age, total height of merchantable trees, and basal area. These minor streambottoms are similar to NTSF streambottoms.

Management Problems

Plant competition is based on the invasion of unwanted plants after openings are made in the canopy. Plant competition is *slight* if unwanted plants do not prevent adequate natural regeneration, interfere with early growth, or restrict normal development of planted or seeded seedlings. Competition is *moderate* if unwanted plants delay establishment and hinder the growth of regenerated seedlings or if they retard the eventual development of a fully stocked stand. Competition is *severe* if unwanted plants prevent adequate restocking without extensive site preparation or special maintenance practices.

Seedling mortality is the loss of artificially established tree seedlings as influenced by soils and topographic conditions, if the planting is done properly and plant competition is insignificant. Rating is *slight* if expected mortality is 0 to 25 percent, *moderate* if expected mortality is 26 to 50 percent, and *severe* if mortality is more than 50 percent. If the rating is moderate or severe, special preparation of the seedbed and special planting techniques are often necessary to ensure a fully stocked stand.

Equipment limitations are restrictions on the use of conventional wheeled or tracked equipment. Soil and topographic characteristics, such as slope, drainage, texture, and rockiness, influence equipment limitations, sometimes necessitating the use of different kinds of equipment and methods of operation or restricting the season when equipment can be used. In general, limitation is *slight* if slope is 20 percent or less and farm machinery can operate efficiently during all seasons. The rating is *moderate* if the slope is 20 to 30 percent, limiting the use of ordinary farm machinery and requiring track-type equipment or if soil wetness prevents the use of logging vehicles for 2 to 6 months in a year. The rating is *severe* if slope exceeds 30 percent, making track-type equipment inadequate and requiring power vehicles and other special equipment or if wetness prevents use of vehicles for 6 months or more in a year.

Erosion hazard is the degree of potential soil erosion that can occur during and after forest management operations that expose soil along roads, skid trails, fire lanes, and landing areas. The ratings assume that the forest is well managed and protected from fire and grazing. Soil and topographic characteristics considered in rating the hazard of erosion include slope, infiltration, permeability, water-holding capacity, and resistance to detachment of soil particles by rainfall and runoff. *Slight* indicates that no special measures are needed, *moderate* indicates that some attention needs to be given to erosion control, and *severe* indicates that intensive erosion-control measures are needed.

Windthrow hazard measures how soils affect root development and how firmly soils hold trees. The hazard is *slight* if rooting depth is more than 20 inches and trees withstand most winds, *moderate* if effective rooting depth is 10 to 20 inches and some trees are blown down during excessive soil wetness and strong winds, and *severe* if rooting depth is 10 in or less and trees will not stand alone in strong winds.

Species Desirability

Three categories are used for rating **species desirability** of species that are listed under **vegetation** in the description of each landtype. *Most desirable* species are those with potential for fast growth, high value, or both. *Acceptable* species are those with moderate growth rates of value. *Least desirable* species are those with slow growth, poor quality, or both. These ratings represent the average situation for NTSF.

For Landtypes 2, 4, 8, 9, 11, 13, 16, and 17 (eroded ridgetops and sideslopes where erosion has been stabilized) and Landtypes 18 and 19 (gullied land where erosion is still active), only loblolly pine is listed in the most desirable category.

For uneroded Landtypes 1, 3, 6, 7, 10, 12, 14, and 15 (dominated by upland hardwoods), loblolly pine is included as a *most desirable* species because it has survived and grown well on equivalent eroded landtypes, and some users might consider conversion of these landtypes to loblolly.

Landtype Descriptions and Forest Management Interpretations

Description of Landtype 1: Upland Hardwoods on Narrow Sandy Ridges and Convex Upper Slopes

Geographic Setting—Deep soils on nearly level to sloping, straight to winding, narrow ridgetops and adjoining convex upper slopes that were never cleared and farmed. The forest type is upland hardwoods. Slope is mostly 2 to 8 percent, but occasionally ranges to 12 percent. Typically, these ridgetops are less than 300 feet wide but may be wider in some places. Landtype 1 occupies the main and finger ridgetops in all but the extreme eastern part of the forest. Landtypes 2 through 5 and 18 occur next to Landtype 1 on the ridges. Landtypes 6 through 9 and 18 occupy the sideslopes below Landtype 1. At the heads of hollows, Landtype 23 may adjoin Landtype 1.

Dominant Soils—Lexington and Providence; possibly Ruston and Savannah.

Parent Material—2 to 3 feet loess and/or sandy and loamy Coastal Plain sediments.

Solum Thickness—More than 60 inches; Providence and Savannah soils have fragipans at depths of 18 to 38 inches and 16 to 38 inches, respectively.

Texture—Lexington and Providence soils are silt loam. Ruston and Savannah soils have sandy loam surfaces. The fragipan of Providence soils ranges from silty clay loam and silt loam to sandy loam and sandy clay loam. The fragipan of Savannah soils is sandy clay loam, clay loam, or loam.

Soil Drainage—Lexington and Ruston soils are well-drained. Providence and Savannah soils are moderately well drained and have a perched water table at depths of 1.5 to 3.0 feet from January through March.

Relative Soil Water Supply—Medium.

Soil Fertility—Moderate.

Vegetation—White oak, southern red oak, and yellow-poplar; occasional black oak, northern red oak, red maple, blackgum, hickories, American beech, scarlet oak, post oak, eastern redcedar, shortleaf pine, Virginia pine, and white ash. Sassafras, American holly, flowering dogwood, sourwood, serviceberry, common persimmon, vacciniums, grapes, eastern hophornbeam, viburnums, devils-walkingstick, red mulberry, Carolina buckthorn, and coralberry occur in the understory. Loblolly pine would be the species of choice if this landtype were selected for conversion from upland hardwoods to pine.

Table 5.—*Forest management interpretations for Landtype 1: Upland hardwoods on narrow sandy ridges and convex upper slopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth† (feet³/acre)
Shortleaf pine	65	113
Loblolly pine	(75)	114
Virginia pine	(65)	70
White oak	(70)	52
N. red oak	(70)	52
Black oak	(70)	52
S. red oak	70	52
Yellow-poplar	(80)	71

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight to moderate	Slight	Slight to moderate	Slight to moderate	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Shortleaf pine	Hickories	E. redcedar
Loblolly pine	American beech	E. hophornbeam
Virginia pine	Scarlet oak	Post oak
White oak	Yellow-poplar	Red mulberry
N. red oak	Common persimmon	Sassafras
Black oak	White ash	Serviceberry
S. red oak		American holly
		Red maple
		Carolina buckthorn
		Flowering dogwood
		Sourwood

* Site indices for each naturally occurring species, except those enclosed in parentheses, are the means of values from soil survey interpretations by SCS for the dominant soils in each landtype (Beck 1962; Briscoe and Ferrill 1958; Broadfoot 1960, 1961, 1963, 1964; Broadfoot and Krinard 1959; Nelson and others 1961; Olson 1959; USDA FS 1929). Estimated site indices are enclosed in parentheses. Base age is 50 years for all naturally grown species except eastern cottonwood (30 years) and American sycamore (35 years).

† Annual growth of natural stands calculated from published yields at 50 years: yellow-poplar (McCarthy 1933, table 17), inside-bark volume to a 3.0-inch i.b. top, trees >4.5 inches in d.b.h.; sweetgum (Winters and Osborne 1935, table 13), inside-bark volume to a 4.0-inch i.b. top, trees >4.5 inches in d.b.h.; upland oaks (Schnur 1937, table 2, column 12), outside-bark volume to a 4.0-inch o.b. top, trees >4.5 inches in d.b.h.; Virginia pine (Nelson and others 1961, table 4), outside-bark volume to a 4.0-inch o.b. top, trees >3.5 inches in d.b.h., 100-percent density; loblolly and shortleaf pines (USDA FS 1929, tables 44 and 108, respectively), total volume outside-bark, trees >3.5 inches in d.b.h. Annual growth of young plantations and natural stands calculated from published yields at 30 years: eastern cottonwood (Baker and Broadfoot 1979, extrapolated from table 13), outside-bark volume to a >3.5-inch o.b. top, trees >3.5 inches in d.b.h.

Description of Landtype 2: Loblolly Pine on Eroded Narrow Sandy Ridges and Convex Upper Slopes

Geographic Setting—Areas composed of a network of gullies that have nearly destroyed the former deep soils on early level to sloping, straight to winding, narrow ridgetops and adjoining convex upper slopes. These lands were once cultivated and/or pastured and then abandoned as gully erosion spread. Erosion has been stabilized by planting pines, mainly loblolly. Remnants of the former soils remain between the gullies. Most gullies range from 10 to 40 feet wide and 5 to 12 feet deep, but in places are wider and deeper. Before clearing, slope was mostly 2 to 8 percent and occasionally ranged to 12 percent. Now slope ranges from 2 to 25 percent and locally may approach 50 percent. Areal extent of units of Landtype 2 ranges from 5 to 30 acres. Landtypes 1, 3 through 5, and 18 occur next to Landtype 2 on the ridges. Landtypes 6 through 9 and 18 occupy the sideslopes below Landtype 2. At the heads of hollows, Landtype 23 may adjoin Landtype 2.

Dominant Soils—Udorthents and eroded and severely eroded phases of Lexington and Providence; possibly Ruston and Savannah.

Parent Material—2 to 3 feet of loess and/or sandy and loamy Coastal Plain sediments; alluvial and colluvial deposits from these sediments.

Solum Thickness—Remnants of the original soils may be more than 60 inches deep. Providence and Savannah soils have fragipans at depths of 18 to 38 inches and 16 to 38 inches, respectively. There is little or no development of pedogenic horizons in the deposits in the bottoms of gullies, which range in thickness from a few inches to several feet.

Texture—Lexington and Providence soils are silt loam but may be silty clay loam if eroded. Ruston and Savannah soils have sandy loam surfaces. The fragipan of Providence soils ranges from silty clay loam and silt loam to sandy loam and sandy clay loam, or loam. Texture of deposits in the bottom of gullies is sandy clay loam, sandy loam, and loamy sand.

Soil Drainage—Originally, Lexington and Ruston soils were well-drained. Providence and Savannah soils were moderately well drained and had a perched water table at depths of 1.5 to 3.0 feet from January through March. Drainage of the gully network ranges from moderately well drained to excessively drained, depending on slope and position in the gully network.

Relative Soil Water Supply—Medium to high, depending on slope and position in the gully network.

Soil Fertility—Moderately low.

Vegetation—Of the pines planted for erosion control, only loblolly was effective in rapidly stabilizing gullied land. White oak, southern red oak, shortleaf pine, Virginia pine, black oak, hickories, northern red oak, red maple, blackgum, sweetgum, American beech, and sourwood are frequent to common on uneroded narrow sandy ridges but occur only as scattered individuals in fully stocked loblolly pine plantations. Flowering dogwood, common persimmon, sassafras, eastern hophornbeam, vacciniums, winged elm, grapes, grasses, and blackberries are in the understory.

Table 6.—*Forest management interpretations for Landtype 2: Loblolly pine on eroded narrow sandy ridges and convex upper slopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(60)	102
Loblolly pine	(70)†	104
Virginia pine	(60)	53
White oak	(65)	48
N. red oak	(65)	48
Black oak	(65)	48
S. red oak	(65)	48
Sweetgum	(75)	50

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight	Moderate	Moderate to severe	Moderate	Slight

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine	Hickories
	Virginia pine	E. hophornbeam
	White oak	American beech
	N. red oak	Winged elm
	Black oak	Sassafras
	S. red oak	Red maple
	Sweetgum	Blackgum
		Flowering dogwood
		Sourwood
		Common persimmon

* See footnotes * and † to table 5, page 17.

† The general consensus of foresters in the area is that the site index of loblolly pine planted on these eroded sites is 5 to 15 feet taller than the reported values that were derived from data reported by SCS for uneroded soils common to these landtypes. The validity of this consensus should be confirmed by extensive forest inventories before changing the values shown here.

Description of Landtype 3: Upland Hardwoods on Broad Sandy Ridges and Convex Upper Slopes

Geographic Setting—Deep soils on nearly level to sloping broad ridgetops and adjoining convex upper slopes that were never cleared and farmed. The forest type is upland hardwoods. Slope is mostly less than 5 percent, but occasionally ranges to 8 percent. Typically, these ridgetops are 300 to 500 feet wide, but may range to more than 1,000 feet, particularly on the western side of the forest. Landtype 3 occupies the wide main ridgetops in all but the extreme eastern part of the forest. Landtypes 1, 2, 4, 5, and 18 occur next to Landtype 3 on the ridges. Landtypes 6 through 9 and 18 occupy the sideslopes below Landtype 3.

Dominant Soils—Providence and Lexington; possibly Savannah and Ruston.

Parent Material—2 to 3 feet of loess and/or sandy and loamy Coastal Plain sediments.

Solum Thickness—More than 60 inches; Providence and Savannah soils have fragipans at depths of 18 to 38 inches and 16 to 38 inches, respectively.

Texture—Providence and Lexington soils are silt loam. Savannah and Ruston soils have sandy loam surfaces. The fragipan of Providence soils ranges from silty clay loam and silt loam to sandy loam and sandy clay loam. The fragipan of Savannah soils is sandy clay loam, clay loam, or loam.

Soil Drainage—Providence and Savannah soils are moderately well-drained and have a perched water table at depths of 1.5 to 3.0 feet from January through March. Lexington and Ruston soils are well-drained.

Relative Soil Water Supply—Medium.

Soil Fertility—Moderate.

Vegetation—White oak, southern red oak and yellow-poplar; occasional black oak northern red oak, red maple, blackgum, hickories, American beech, scarlet oak, post oak, eastern redcedar, shortleaf pine, Virginia pine, and white oak. Sassafras, American holly, flowering dogwood, sourwood, serviceberry, common persimmon, vacciniums, grapes, eastern hophornbeam, viburnums, devils-walking stick, red mulberry, Carolina buckthorn, and coralberry occur in the understory. Loblolly pine would be the species of choice if this landtype were selected for conversion from upland hardwoods to pine.

Table 7.—*Forest management interpretations for Landtype 3: Upland hardwoods on broad sandy ridges and convex upper slopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	65	113
Loblolly pine	(75)	114
Virginia pine	(65)	70
White oak	(70)	52
N. red oak	(70)	52
Black oak	(70)	52
S. red oak	70	52
Yellow-poplar	(80)	71

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight to moderate	Slight	Slight	Slight to moderate	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Shortleaf pine	Hickories	E. redcedar
Loblolly pine	American beech	E. hophornbeam
Virginia pine	Scarlet oak	Red mulberry
White oak	Post oak	Sassafras
N. red oak	Yellow-poplar	Serviceberry
Black oak	Common persimmon	American holly
S. red oak	White ash	Red maple
		Carolina buckthorn
		Flowering dogwood
		Blackgum
		Sourwood

* See footnotes * and † to table 5, page 17.

Description of Landtype 4: Loblolly Pine on Eroded Broad Sandy Ridges and Convex Upper Slopes

Geographic Setting—Deep soils on nearly level to sloping broad ridgetops and adjoining convex upper slopes that were once cultivated and/or pastured and then abandoned as sheet, rill, and minor gully erosion spread. Erosion has been stabilized by planting pines, mainly loblolly. Along the western side of the forest, much of this landtype is still in agriculture. Landtype 4 has not eroded to the extent that Landtype 2 has. Slope is mostly less than 5 percent, but occasionally ranges to 8 percent. Typically, these ridgetops are 300 to 500 feet wide, but may range to more than 1,000 feet, particularly on the western side of the forest. Landtype 4 occupies the wide main ridgetops in all but the extreme eastern part of the forest. Landtypes 1 through 3 and 5 occur next to Landtype 4 on the ridges. Landtypes 6 through 9 and 18 occupy the sideslopes below Landtype 4.

Dominant Soils—Slightly eroded and eroded phases of Providence and Lexington; possibly Savannah and Ruston.

Parent Material—2 to 3 feet of loess and/or sandy and loamy Coastal Plain sediments.

Solum Thickness—Original soils were more than 60 inches deep; Providence and Savannah have fragipans at depths of 18 to 38 inches and 16 to 38 inches, respectively.

Texture—Providence and Lexington soils are silt loam. Savannah and Ruston soils have sandy loam surfaces. The fragipan of Providence soils ranges from silty clay loam and silt loam to sandy loam and sandy clay loam. The fragipan of Savannah soils is sandy clay loam, clay loam, or loam.

Soil Drainage—Providence and Savannah soils are moderately well drained and have a perched water table at depths of 1.5 to 3.0 feet from January through March. Lexington and Ruston soils are well-drained.

Relative Soil Water Supply—Medium.

Soil Fertility—Moderate.

Vegetation—Of the pines planted for erosion control, only loblolly was effective in rapidly stabilizing eroded land. White oak, southern red oak, yellow-poplar, black oak, northern red oak, red maple, blackgum, hickories, American beech, scarlet oak, post oak, eastern redcedar, shortleaf pine, Virginia pine, and white ash are occasional to common on uneroded broad sandy ridges but occur only as scattered individuals in fully stocked loblolly pine plantations. Flowering dogwood, common persimmon, sassafras, eastern hophornbeam, vacciniums, winged elm, grapes, grasses, and blackberries are in the understory.

Table 8.—*Forest management interpretations for Landtype 4: Loblolly pine on eroded broad sandy ridges and convex upper slopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(60)	102
Loblolly pine	(70)†	104
Virginia pine	(60)	53
White oak	(65)	48
N. red oak	(65)	48
Black oak	(65)	48
S. red oak	(65)	48
Yellow-poplar	(75)	63

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight to moderate	Slight	Slight	Slight to moderate	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine	E. redcedar
	Virginia pine	Hickories
	White oak	E. hophornbeam
	N. red oak	American beech
	Black oak	Post oak
	S. red oak	Scarlet oak
	Yellow-poplar	Winged elm
	White ash	Sassafras
		Red maple
		Blackgum
		Flowering dogwood
		Common persimmon

* See footnotes * and † to table 5, page 17.

† See footnote to table 6 pertaining to loblolly pine, page 19.

Description of Landtype 5: Poor Narrow Ridges and Convex Upper Slopes

Geographic Setting—Soils of undetermined depth on nearly level to sloping, straight to winding, narrow ridgetops and adjoining convex upper slopes. Slope is mostly 2 to 8 percent but occasionally ranges to 12 percent. Typically these ridgetops are less than 300 feet wide. Landtype 5 occurs sporadically throughout the forest and differs from Landtypes 1 through 4 and 10 through 13 in supporting low-density stands of blackjack oak, post oak, and poor-quality southern red oak. Landtypes 6 through 9, 14 through 17, 18 and 19 occupy the sideslopes below Landtype 5.

Dominant Soils—Probably eroded or severely eroded phases of Lexington and Providence; possibly Ruston, Silerton, Dulac, or Shubuta.

Parent Material—2 to 3 feet of loess and/or sandy, loamy, clayey, and sandy clay Coastal Plain sediments. Erosion may have removed all or nearly all of the loess cap.

Solum Thickness—Probably less than 60 inches; Providence and Dulac soils have a fragipan at depths of 18 to 38 inches and 16 to 30 inches, respectively.

Texture—Lexington, Providence, Silerton, and Dulac soils are silt loam; Ruston and Shubuta soils have loam or sandy loam surfaces. If eroded, surface soil texture is most likely silty clay loam. The fragipan of Providence and Dulac soils is mostly silty clay loam or silt loam. In the extreme eastern part of the forest, where clayey sediments are common, flagstone or ironstone occurs sometimes at the boundary of the two parent materials. Gravel and iron concretions may also occur throughout the profile.

Soil Drainage—Although these soils are rated well-drained to moderately well drained, species composition indicates that these sites are droughty.

Relative Soil Water Supply—Probably low to very low.

Soil Fertility—Probably low to moderately low.

Vegetation—Blackjack oak, post oak, southern red oak; occasional white oak, scarlet oak, chestnut oak, and eastern redcedar. Sparkleberry and other vacciniums, grasses, and forbs are common in the understory. Shortleaf and Virginia pine would be the species of choice if this landtype were selected for conversion from low-quality upland hardwoods to pine.

Table 9.—*Forest management interpretations for Landtype 5: Poor narrow ridges and convex upper slopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
E. redcedar	(40)	. . .
Shortleaf pine	(55)	90
Virginia pine	(55)	41
Upland oaks	(55)	38

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight	Moderate to severe	Slight	Slight to moderate	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Shortleaf pine Virginia pine	E. redcedar White oak Chestnut oak	Post oak Scarlet oak Blackjack oak

* See footnotes * and † to table 5, page 17.

Description of Landtype 6: Upland Hardwoods on North Sandy Sideslopes

Geographic Setting—Deep, loamy soils on sloping to steep, north-facing linear or nearly linear sideslopes that were never cleared and farmed. The forest type is upland hardwoods. Landtype 6 lies below both narrow and broad ridgetops and convex upper slopes (Landtypes 1 through 5) and above concave footslopes and nearly level terraces and bottoms (Landtypes 21 through 25). On sideslopes, Landtype 6 adjoins Landtypes 7 through 9. Slope commonly ranges from 8 to 20 percent but may be as steep as 40 percent. Gullies are absent or occur infrequently.

Dominant Soils—Smithdale; possibly Lexington, Providence, Ruston, and Savannah.

Parent Material—Thick beds of loamy Coastal Plain sediments.

Solum Thickness—60 to more than 100 inches; Providence and Savannah soils have fragipans at 18 to 38 inches and 16 to 38 inches, respectively.

Texture—Fine sandy loam, sandy loam, or loamy sand. Gravel content is 10 percent or less in the subsoil.

Soil Drainage—Well-drained.

Relative Soil Water Supply—Medium to high. Lower slopes may have wet weather seeps.

Soil Fertility—Moderate; possibly moderately high.

Vegetation—White oak, southern red oak, and yellow-poplar; occasional shortleaf pine, northern red oak, black oak, red maple, backgum, hickories, sweetgum, American elm, cherrybark oak, Shumard oak, American beech, white ash, black walnut, black cherry, sourwood, and sugar maple. American holly, flowering dogwood, common persimmon, sassafras, seviceberry, eastern hophornbeam, pawpaw, vacciniums, Carolina buckthorn, viburnums, devils-walkingstick, coralberry, grapes, and red mulberry are in the understory. Loblolly pine would be the species of choice if this landtype were selected for conversion from upland hardwoods to pine.

Table 10.—*Forest management interpretations for Landtype 6: Upland hardwoods on north sandy sideslopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	70	125
Loblolly pine	(80)	123
White oak	(75)	57
N. red oak	(75)	57
Black oak	(75)	57
Shumard oak	(75)	57
S. red oak	70	52
Cherrybark oak	80	. . .
Yellow-poplar	90	90
Sweetgum	90	81

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight to moderate	Slight	Moderate	Moderate	Slight

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Shortleaf pine	Black walnut	E. hophornbeam
Loblolly pine	Hickories	Red mulberry
White oak	American beech	Sassafras
N. red oak	American elm	Serviceberry
Black oak	Sweetgum	American holly
Shumard oak	Black cherry	Carolina buckthorn
S. red oak	Sugar maple	Flowering dogwood
Cherrybark oak	Red maple	Sourwood
Yellow-poplar	Blackgum	
White ash	Common persimmon	

* See footnotes * and † to table 5, page 17.

Description of Landtype 7: Upland Hardwoods on South Sandy Sideslopes

Geographic Setting—Deep, loamy oils on sloping to steep, south-facing linear or nearly linear sideslopes that were never cleared and farmed. The forest type is upland hardwoods. Landtype 7 lines below both narrow and broad ridgetops and convex upper slopes (Landtypes 1 through 5) and above concave footslopes and nearly level terraces and bottoms (Landtypes 21 through 25). On sideslopes, Landtype 7 adjoins Landtypes 6, 8, and 9. Slope commonly ranges from 8 to 20 percent but may be as steep as 40 percent. Gullies are absent or occur infrequently.

Dominant Soils—Smithdale; possibly Lexington, Providence, Ruston, and Savannah.

Parent Material—Thick beds of loamy Coastal Plain sediments.

Solum Thickness—60 to more than 100 inches; Providence and Savannah soils have fragipans at depths of 18 to 38 inches and 16 to 38 inches, respectively.

Texture—Fine sandy loam, sandy loam, or loamy sand. In severely eroded areas, texture ranges to sandy clay loam. Gravel content is 10 percent or less in the subsoil.

Soil Drainage—Well-drained.

Relative Soil Water Supply—Medium.

Soil Fertility—Moderately low.

Vegetation—White oak, southern red oak, black oak, and scarlet oak; occasional blackgum, northern red oak, chestnut oak, shortleaf pine, hickories, American beech, red maple, Virginia pine, post oak, eastern redcedar, and sourwood. American holly, flowering dogwood, sassafras, common persimmon, eastern hophornbeam, vacciniums, viburnums, grapes, Carolina buckthorn, and devils-walkingstick are in the understory. Loblolly pine would be the species of choice if this landtype were selected for conversion from upland hardwoods to pine.

Table 11.—*Forest management interpretations for Landtype 7: Upland hardwoods on south sandy sideslopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(65)	113
Loblolly pine	(75)	114
Virginia pine	(65)	70
White oak	(70)	52
Chestnut oak	(70)	52
N. red oak	(70)	52
Black oak	(70)	52
S. red oak	(65)	48

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight	Moderate	Moderate	Moderate	Slight

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Shortleaf pine	Hickories	E. redcedar
Loblolly pine	American beech	E. hophornbeam
Virginia pine	Post oak	Sassafras
White oak	Chestnut oak	American holly
N. red oak	Scarlet oak	Red maple
Black oak		Carolina buckthorn
S. red oak		Flowering dogwood
		Sourwood
		Common persimmon

* See footnotes * and † to table 5, page 17.

Description of Landtype 8:
Loblolly Pine on Eroded North Sandy Sideslopes

Geographic Setting—Areas composed of a network of gullies that have nearly destroyed the former deep soils on sloping to steep, north-facing, linear or nearly linear sideslopes. These lands were once cultivated and/or pastured and then abandoned as gully erosion spread. Erosion has been stabilized by planting pines, mainly loblolly. Remnants of the former soils remain between the gullies. Most gullies range from 10 to 40 feet wide and 5 to 12 feet deep, but in places are wider and deeper. Before clearing, slope commonly ranged from 8 to 20 percent, but was as steep as 40 percent in localized areas. Now slope ranges from 8 to more than 50 percent. Areal extent of units of Landtype 8 range from 5 to 50 acres. Landtypes 6, 7, and 9 occur next to Landtype 8. Landtypes 1 through 5 occur on ridgetops above Landtype 8. Landtypes 21 through 25 occur in bottoms below Landtype 8. Gullied, north-facing sandy slopes that are still actively eroding should be classified as Landtype 18.

Dominant Soils—Udorthents and the severely eroded phase of Smithdale. In old soil surveys, severely eroded phases of Lexington, Providence, Ruston, and Savannah were mapped on sideslopes in places.

Parent Material—Thick beds of loamy Coastal Plain sediments; alluvial and colluvial deposition from loess and sandy and loamy sediments.

Solum Thickness—Remnants of the original soils are more than 60 inches deep. Providence and Savannah soils have a fragipan at depths of 18 to 38 inches and 16 to 38 inches, respectively. There is little or no development of pedogenic horizons in the deposits in the bottoms of gullies that range in thickness from a few inches to several feet.

Texture—Fine sandy loam, sandy loam, or loamy sand. In severely eroded areas, texture ranges to sandy clay loam. Gravel content is 10 percent or less in the subsoil but may be higher in the gully deposits.

Soil Drainage—Original soils were mostly well-drained. Drainage of gully network ranges from moderately well drained to excessively drained, depending on slope and position in the gully network.

Relative Soil Water Supply—Medium, possibly high.

Soil Fertility—Moderate.

Vegetation—Of the pines planted for erosion control, only loblolly was effective in rapidly stabilizing gullied land. White oak, southern red oak, yellow-poplar, shortleaf pine, northern red oak, black oak, red maple, blackgum, hickories, sweetgum, American elm, cherrybark oak, Shumard oak, American beech, white ash, black walnut, black cherry, sourwood, and sugar maple are occasional to common on uneroded north-facing sandy sideslopes but occur only as scattered individuals in fully stocked loblolly pine plantations. American holly, flowering dogwood, common persimmon, sassafras, service berry, eastern hophornbeam, pawpaw, vacciniums, coralberry, viburnums, devils-walkingstick, Carolina buckthorn, grapes, and red mulberry are in the understory.

Table 12.—*Forest management interpretations for Landtype 8: Loblolly pine on eroded north sandy sideslopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(65)	113
Loblolly pine	(75)†	114
White oak	(70)	52
N. red oak	(70)	52
Black oak	(70)	52
Shumard oak	(70)	52
S. red oak	(65)	48
Cherrybark oak	(75)	. . .
Yellow-poplar	(85)	80
Sweetgum	(85)	70

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight	Moderate	Severe	Moderate to severe	Moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine	E. hophornbeam
	Black walnut	Red mulberry
	Hickories	Sassafras
	American beech	American holly
	White oak	Red maple
	N. red oak	Carolina buckthorn
	Black oak	Blackgum
	Shumard oak	Flowering dogwood
	S. red oak	Sourwood
	Cherrybark oak	
	American elm	
	Yellow-poplar	
	Sweetgum	
	Black cherry	
	Sugar maple	
	Common persimmon	
	White ash	

* See footnotes * and † to table 5, page 17.

† See footnote to table 6 pertaining to loblolly pine, page 19.

Description of Landtype 9: Loblolly Pine on Eroded South Sandy Sideslopes

Geographic Setting—Areas composed of a network of gullies that have nearly destroyed the former deep soils on sloping to steep, south-facing, linear or nearly linear sideslopes. These lands were once cultivated and/or pastured and then abandoned as gully erosion spread. Erosion has been stabilized by planting pine, mainly loblolly. Remnants of the former soils remain between the gullies. Most gullies range from 10 to 40 feet wide and 5 to 12 feet deep, but in places are wider and deeper. Before clearing, slope commonly ranged from 8 to 20 percent but was as steep as 40 percent in localized areas. Now slope ranges from 8 to more than 50 percent. Areal extent of units of Landtype 9 ranges from 5 to 50 acres. Landtypes 6 through 8 occur next to Landtype 9 on the sideslopes. Landtypes 1 through 5 occur on ridgetops above Landtype 9. Landtypes 21 through 25 occur in bottoms below Landtype 9. Gullied, south-facing sandy slopes that are still actively eroding should be classified as Landtype 18.

Dominant Soils—Udorthents and the severely eroded phase of Smithdale. In old soil surveys, severely eroded phases of Lexington, Providence, Ruston, and Savannah were mapped on sideslopes in places.

Parent Material—Thick beds of loamy Coastal Plain sediments; alluvial and colluvial deposition from loess and sandy and loamy sediments.

Solum Thickness—Remnants of the original soils are more than 60 inches deep. Providence and Savannah soils have fragipans at depths of 18 to 38 inches and 16 to 38 inches, respectively. There is little or no development of pedogenic horizons in the depositions in the bottom of gullies that range in thickness from a few inches to several feet.

Texture—Fine sandy loam, sandy loam, or loamy sand. In severely eroded areas, texture ranges to sandy clay loam. Gravel content is 10 percent or less in the subsoil but may be higher in the gully deposits.

Soil Drainage—Original soils were mostly well-drained. Drainage of gully network ranges from moderately well drained to excessively drained, depending on slope and position in the gully network.

Relative Soil Water Supply—Medium.

Soil Fertility—Moderately low.

Vegetation—Of the pines planted for erosion control, only loblolly was effective in rapidly stabilizing gullied land. White oak, southern red oak, black oak, scarlet oak, blackgum, northern red oak, chestnut oak, shortleaf pine, hickories, American beech, red maple, Virginia pine, post oak, eastern redcedar, and sourwood are occasional to common on uneroded south-facing sandy sideslopes, but occur only as scattered individuals in fully stocked loblolly pine plantations. American holly, flowering dogwood, sassafras, common persimmon, eastern hophornbeam, vacciniums, viburnums, grapes, Carolina buckthorn, and devils-walkingstick are in the understory.

Table 13.—*Forest management interpretations for Landtype 9: Loblolly pine on eroded south sandy sideslopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(60)	102
Loblolly pine	(70)†	104
Virginia pine	(60)	53
White oak	(65)	48
Chestnut oak	(60)	43
N. red oak	(65)	48
Black oak	(65)	48
S. red oak	(60)	43

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight	Moderate to severe	Severe	Moderate to severe	Moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine	E. redcedar
	Virginia pine	E. hophornbeam
	Hickories	Post oak
	American beech	Scarlet oak
	White oak	Sassafras
	Chestnut oak	American holly
	N. red oak	Red maple
	Black oak	Carolina buckthorn
	S. red oak	Blackgum
		Flowering dogwood
		Sourwood
		Common persimmon

* See footnotes * and † to table 5, page 17.

† See footnote to table 6 pertaining to loblolly pine, page 19.

Description of Landtype 10: Upland Hardwoods on Narrow Clayey Ridges and Convex Upper Slopes

Geographic Setting—Deep soils on nearly level to sloping, straight to winding, narrow ridgetops and adjoining convex upper slopes that were never cleared and farmed. The forest type is upland hardwoods. Slope is mostly 2 to 8 percent, but occasionally ranges to 12 percent. Typically, these ridgetops are less than 300 feet wide, but may be wider in some places. Landtype 10 occupies the main and finger ridgetops in the extreme eastern part of the forest. Landtypes 5, 11 through 13, and 19 occur next to Landtype 10 on the ridges. Landtypes 14 through 17 and 19 occupy the sideslopes below Landtype 10. At the head of hollows, Landtype 23 may adjoin Landtype 10.

Dominant Soils—Silberton and Dulac; possibly Shubuta.

Parent Material—2 to 3 feet of loess and/or clayey or sandy clay Coastal Plain sediments.

Solum Thickness—48 to more than 60 inches; Dulac soils have a fragipan at depths of 16 to 30 inches.

Texture—Silerton and Dulac soils are silt loam, occasionally loam. Shubuta soils are sandy loam and loam. The fragipan of Dulac soils is silt loam or silty clay loam. In places, flagstone or ironstone occurs at the boundary of the parent materials. Gravel and iron concretions range from none or few to common.

Soil Drainage—Silerton and Shubuta soils are well-drained. Dulac soils are moderately well drained and have a perched water table at a depth of 1 to 2 feet from December through April.

Relative Soil Water Supply—Low to medium.

Soil Fertility—Moderate.

Vegetation—White oak, southern red oak, and yellow-poplar; occasional black oak, northern red oak, red maple, blackgum, hickories, American beech, scarlet oak, post oak, eastern redcedar, shortleaf pine, Virginia pine, and white ash. Sassafras, American holly, flowering dogwood, sourwood, serviceberry, common persimmon, vacciniums, grapes, eastern hophornbeam, viburnums, devils-walkingstick, red mulberry, Carolina buckthorn, and coralberry occur in the understory. Loblolly pine would be the species of choice if this landtype were selected for conversion from upland hardwoods to pine.

Table 14.—*Forest management interpretations for Landtype 10: Upland hardwoods on narrow clayey ridges and convex upper slopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(65)	113
Loblolly pine	(75)	114
Virginia pine	(65)	70
White oak	(65)	52
N. red oak	70	52
Black oak	(70)	52
S. red oak	(70)	52
Yellow-poplar	(80)	71

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight	Slight	Slight to moderate	Slight to moderate	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Shortleaf pine	Hickories	E. redcedar
Loblolly pine	American beech	E. hophornbeam
Virginia pine	Post oak	Red mulberry
White oak	Scarlet oak	Sassafras
N. red oak	Red maple	Serviceberry
Black oak	Common persimmon	American holly
S. red oak		Carolina buckthorn
Yellow-poplar		Blackgum
White ash		Flowering dogwood
		Sourwood

* See footnotes * and † to table 5, page 17.

Description of Landtype 11: Loblolly Pine on Eroded Narrow Clayey Ridges and Convex Upper Slopes

Geographic Setting—Areas composed of a network of gullies that have nearly destroyed the former deep soils on nearly level to sloping, straight to winding, narrow ridgetops and adjoining convex upper slopes. These lands were once cultivated and/or pastured and then abandoned as gully erosion spread. Erosion has been stabilized by planting pines, mainly loblolly. Remnants of the former soils remain between the gullies. Most gullies range from 10 to 50 feet wide and 5 to 15 feet deep, but in places are wider and deeper. Before clearing, slope was mostly 2 to 8 percent but occasionally ranged to 12 percent. Now slope ranges from 2 to 25 percent and locally may approach 50 percent. Areal extent of units of Landtype 11 ranges from 5 to 30 acres. Landtype 11 occupies the main and finger ridgetops in the extreme eastern part of the forest. Landtypes 5, 10, 12, 13, and 19 occur next to Landtype 11 on the ridges. Landtypes 14 through 17 and 19 occupy the sideslopes below Landtype 11.

Dominant Soils—Udorthents and the severely eroded phases of Sweatman; possibly Silerton, Dulac, and Shubuta.

Parent Material—2 to 3 feet of loess and/or clayey and sandy clay Coastal Plain sediments; alluvial and colluvial deposits from these sediments. The lower sidewalls and bottoms of some gullies are entrenched in partly weathered, acid clay shale.

Solum Thickness—Remnants of the original soils range from 48 to more than 60 inches deep. Dulac soils have a fragipan at depths of 16 to 30 inches. There is little or no development of pedogenic horizons in the deposits in the bottoms of gullies which range in thickness from a few inches to several feet.

Texture—The surfaces of Silerton and Dulac soils are silt loam, occasionally loam, but may be silty clay loam if eroded. Shubuta soils are sandy loam and loam. The fragipan of Dulac soils is silt loam or silty clay loam. In places, flagstone or ironstone occurs at the boundary of the parent materials. Gravel and iron concretions range from none or few to common. Texture of deposits in the bottom of gullies is clay, sandy clay loam, or silt loam.

Soil Drainage—The original Silerton and Shubuta soils were well-drained; Dulac soils were moderately well drained and had a perched water table at a depth of 1 to 2 feet from December through April. Drainage of the gully network ranges from moderately well drained to excessively drained, depending on slope and position in the gully network.

Relative Soil Water Supply—Low to medium, depending on slope and position in the gully network.

Soil Fertility—Moderately low.

Vegetation—Of the pines planted for erosion control, only loblolly was effective in rapidly stabilizing gullied land. White oak, southern red oak, shortleaf pine, Virginia pine, black oak, hickories, northern red oak, red maple, blackgum, sweetgum, American beech, and sourwood are frequent to common on uneroded clayey ridges but occur only as scattered individuals in fully stocked loblolly pine plantations. Flowering dogwood, common persimmon, sassafras, eastern hophornbeam, vacciniums, winged elm, grapes, grasses, and blackberries are in the understory.

Table 15.—*Forest management interpretations for Landtype 11: Loblolly pine on eroded narrow clayey ridges and convex upper slopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(60)	102
Loblolly pine	(70)†	104
Virginia pine	(60)	53
White oak	(65)	48
N. red oak	(65)	48
Black oak	(65)	48
S. red oak	(65)	48
Sweetgum	(75)	50

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight	Moderate	Moderate to severe	Moderate to severe	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine	Hickories
	Virginia pine	E. hophornbeam
	White oak	American beech
	N. red oak	Winged elm
	Black oak	Sassafras
	S. red oak	Red maple
	Sweetgum	Blackgum
		Flowering dogwood
		Sourwood
		Common persimmon

* See footnotes * and † to table 5, page 17.

† See footnote to table 6 pertaining to loblolly pine, page 19.

Description of Landtype 12: Upland Hardwoods on Broad Clayey Ridges and Convex Upper Slopes

Geographic Setting—Deep soils on nearly level to sloping broad ridgetops and adjoining convex upper slopes that were never cleared and farmed. The forest type is upland hardwoods. Slope is mostly less than 5 percent, but occasionally ranges to 8 percent. Typically, these ridges are 300 to 500 feet wide but may range up to 800 feet. Landtype 12 occupies the wide main ridgetops in the extreme eastern part of the forest. Landtypes 5, 10, 11, 13, and 19 occur next to Landtype 12 on the ridges. Landtypes 14 through 17 and 19 occupy the sideslopes below Landtype 12.

Dominant Soils—Dulac and Silerton; possibly Shubuta.

Parent Material—2 to 3 feet of loess and/or clayey or sandy clay Coastal Plain sediments.

Solum Thickness—48 to more than 60 inches; Dulac soils have a fragipan at depths of 16 to 30 inches.

Texture—Dulac and Silerton soils are silt loam, occasionally loam. Shubuta soils are sandy loam and loam. The fragipan of Dulac soils is silt loam or silty clay loam. In places, flagstone or ironstone occurs at the boundary of the parent materials. Gravel and iron concretions range from none or few to common.

Soil Drainage—Dulac soils are moderately well drained and have a perched water table at a depth of 1 to 2 feet from December through April. Silerton and Shubuta soils are well-drained.

Relative Soil Water Supply—Medium.

Soil Fertility—Moderate.

Vegetation—White oak, southern red oak, and yellow-poplar; occasional black oak, northern red oak, red maple, blackgum, hickories, American beech, scarlet oak, post oak, eastern redcedar, shortleaf pine, Virginia pine, and white ash. Sassafras, American holly, flowering dogwood, sourwood, serviceberry, common persimmon, vacciniums, grapes, eastern hophornbeam, viburnums, devils-walkingstick, red mulberry, Carolina buckthorn, and coralberry occur in the understory. Loblolly pine would be the species of choice if this landtype were selected for conversion from upland hardwoods to pine.

Table 16.—*Forest management interpretations for Landtype 12: Upland hardwoods on broad clayey ridges and convex upper slopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	65	113
Loblolly pine	(75)	114
Virginia pine	(65)	70
White oak	(70)	52
N. red oak	(70)	52
Black oak	(70)	52
S. red oak	(70)	52
Yellow-poplar	(80)	71

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight to moderate	Slight to moderate	Slight	Slight to moderate	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Shortleaf pine	Hickories	E. redcedar
Loblolly pine	American beech	E. hophornbeam
Virginia pine	Post oak	Red mulberry
White oak	Scarlet oak	Sassafras
N. red oak	Yellow-poplar	Serviceberry
S. red oak	Common persimmon	American holly
	White ash	Red maple
		Carolina buckthorn
		Flowering dogwood
		Blackgum
		Sourwood

* See footnotes * and † to table 5, page 17.

Description of Landtype 13: Loblolly Pine on Eroded Broad Clayey Ridges and Convex Upper Slopes

Geographic Setting—Slightly eroded and eroded deep soils on nearly level to sloping, broad ridgetops and adjoining convex upper slopes that were once cultivated and/or pastured and then abandoned as sheet, rill, and minor gully erosion spread. Erosion has been stabilized by planting pines, mainly loblolly. Outside the forest, much of this landtype is still in agriculture. Landtype 13 has not eroded to the extent that Landtype 11 has. Slope is mostly less than 5 percent, but occasionally ranges to 8 percent. Typically, these ridgetops are 300 to 500 feet wide but may range up to 800 feet. Landtype 13 occupies the wide main ridgetops in the extreme eastern part of the forest. Landtypes 5, 10 through 12, and 19 occur next to Landtype 13. Landtypes 14 through 17 and 19 occupy the sideslopes below Landtype 13.

Dominant Soils—Slightly eroded and eroded phases of Dulac and Silerton; possibly Shubuta.

Parent Material—2 to 3 feet of loess and/or clayey and sandy clay Coastal Plain sediments.

Solum Thickness—48 to more than 60 inches; Dulac soils have a fragipan at depths of 16 to 30 inches.

Texture—Dulac and Silerton are silt loam, occasionally loam, but may be silty clay loam if eroded. Shubuta soils are sandy loam and loam. The fragipan of Dulac soils is silt loam or silty clay loam. In places, flagstone or ironstone occurs at the boundary of the parent materials. Gravel and iron concretions range from none or few to common.

Soil Drainage—Dulac soils are moderately well drained and have a perched water table at a depth of 1 to 2 feet from December through April. Silerton and Shubuta soils are well-drained.

Relative Soil Water Supply—Medium.

Soil Fertility—Moderate.

Vegetation—Of the pines planted for erosion control, only loblolly was effective in rapidly stabilizing eroded land. White oak, southern red oak, yellow-poplar, black oak, northern red oak, red maple, blackgum, hickories, American beech, scarlet oak, post oak, eastern redcedar, shortleaf pine, Virginia pine, and white ash are occasional to common on uneroded broad clayey ridges but occur only as scattered individuals in fully stocked loblolly plantations. Flowering dogwood, common persimmon, sassafras, eastern hophornbeam, vacciniums, winged elm, grapes, grasses, and blackberries are in the understory.

Table 17.—*Forest management interpretations for Landtype 13: Loblolly pine on eroded broad clayey ridges and convex upper slopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(60)	102
Loblolly pine	(70)†	104
Virginia pine	(60)	53
White oak	(65)	48
N. red oak	(65)	48
Black oak	(65)	48
S. red oak	(65)	48
Yellow-poplar	(75)	63

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight to moderate	Slight to moderate	Slight	Slight to moderate	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine	E. redcedar
	Virginia pine	Hickories
	White oak	E. hophornbeam
	N. red oak	American beech
	Black oak	Post oak
	S. red oak	Scarlet oak
	Yellow-poplar	Winged elm
		Sassafras
		Red maple
		Blackgum
		Flowering dogwood
		Common persimmon

* See footnotes * and † to table 5, page 17.

† See footnote to table 6 pertaining to loblolly pine, page 19.

Description of Landtype 14: Upland Hardwoods on North Clayey Sideslopes

Geographic Setting—Deep, clayey soils on sloping to steep, north-facing, linear or nearly linear slopes that were never cleared and farmed. The forest type is upland hardwoods. Landtype 14 lies below both narrow and broad ridgetops and convex upper slopes (Landtypes 10 through 13) and above concave footslopes and nearly level terraces and bottoms (Landtypes 21 through 25). Landtype 14 adjoins Landtypes 15 through 17 on the sideslopes. Slope commonly ranges from 8 to 20 percent but may be as steep as 35 percent. Gullies are absent or occur infrequently.

Dominant Soils—Sweatman; possibly Silerton, Dulac, and Shubuta. The clayey substrate of Sweatman soils has a high capacity to slip or slump when saturated with water, particularly on slopes disturbed by road construction.

Parent Material—Thick, stratified shaley clay and sandy clay Coastal Plain sediments underlain by soft, acid clay shale.

Solum Thickness—20 to 50 inches or more. Rooting is impeded by the firm clayey subsoil. Dulac soils have a fragipan at depths of 16 to 30 inches.

Texture—Silt loam and sandy loam. Subsoil texture ranges from silty clay loam to silty clay and clay. A few fragments of ironstone are on the surface and throughout the profile.

Soil Drainage—Well-drained to moderately well drained.

Relative Soil Water Supply—Medium.

Soil Fertility—Moderate; possibly moderately high.

Vegetation—White oak, southern red oak, and yellow-poplar; occasional shortleaf pine, northern red oak, black oak, red maple, blackgum, hickories, sweetgum, American elm, cherrybark oak, Shumard oak, American beech, white ash, black walnut, black cherry, sourwood, and sugar maple. American holly, flowering dogwood, common persimmon, sassafras, serviceberry, eastern hophornbeam, pawpaw, vacciniums, Carolina buckthorn, viburnums, devilswalkingstick, coralberry, grapes, and red mulberry are in the understory.

Table 18.—*Forest management interpretations for Landtype 14: Upland hardwoods on north clayey sideslopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(70)	125
Loblolly pine	(80)	123
White oak	(75)	57
N. red oak	(75)	57
Black oak	(75)	57
Shumard oak	(75)	57
S. red oak	(70)	52
Cherrybark oak	(80)	. . .
Yellow-poplar	90	90
Sweetgum	90	81

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight to moderate	Slight to moderate	Moderate	Moderate to severe	Slight

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Shortleaf pine	Black walnut	E. hophornbeam
White oak	Hickories	Red mulberry
N. red oak	American beech	Sassafras
Black oak	American elm	Serviceberry
Shumard oak	Sweetgum	American holly
S. red oak	Black cherry	Red maple
Cherrybark	White ash	Carolina buckthorn
Yellow-poplar	Sugar maple	Blackgum
	Common persimmon	Flowering dogwood
		Sourwood

* See footnotes * and † to table 5, page 17.

Description of Landtype 15: Upland Hardwoods on South Clayey Sideslopes

Geographic Setting—Deep, clayey soils on sloping to steep, south-facing, linear or nearly linear slopes that were never cleared and farmed. The forest type is upland hardwoods. Landtype 15 lies below both narrow and broad ridgetops and convex upper slopes (Landtypes 10 through13) and above concave footslopes and nearly level terraces and stream bottoms (Landtypes 21 through 25). Landtype 15 adjoins Landtypes 14, 16, and 17 on the sideslopes. Slope commonly ranges from 8 to 20 percent but may be as steep as 35 percent. Gullies are absent or occur infrequently.

Dominant Soils—Sweatman; possibly Silerton, Dulac, and Shubuta. The clayey substrate of Sweatman soils has a high capacity to slip or slump when saturated with water, particularly on slopes disturbed by road construction.

Parent Material—Thick, stratified shaley clay and sandy clay Coastal Plain sediments underlain by soft, acid clay shale.

Solum Thickness—20 to 50 inches or more. Rooting is impeded by the firm clayey subsoil. Dulac soils have a fragipan at depths of 16 to 30 inches.

Texture—Silt loam and sandy loam. Subsoil texture ranges from silty clay loam to silty clay and clay. A few fragments of ironstone are on the surface and throughout the profile.

Soil Drainage—Well-drained to moderately well drained.

Relative Soil Water Supply—Low to moderate.

Soil Fertility—Moderately low.

Vegetation—White oak, southern red oak, black oak, and scarlet oak; occasional blackgum, northern red oak, chestnut oak, shortleaf pine, hickories, American beech, red maple, Virginia pine, post oak, eastern redcedar, and sourwood. American holly, flowering dogwood, sassafras, common persimmon, eastern hophornbeam, vacciniums, viburnums, grapes, Carolina buckthorn, and devils-walking-stick are in the understory. Loblolly pine would be the species of choice if this landtype were selected for conversion from upland hardwoods to pine.

Table 19—Forest management interpretations for Landtype 15: Upland hardwoods on south clayey sideslopes

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(65)	113
Loblolly pine	(75)	114
Virginia pine	(65)	70
White oak	(70)	52
Chestnut oak	(70)	52
N. red oak	(70)	52
Black oak	(70)	52
S. red oak	(65)	48

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight	Moderate	Moderate	Moderate to severe	Slight

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Shortleaf pine	Hickories	E. redcedar
Loblolly pine	American beech	E. hophornbeam
Virginia pine	Post oak	Sassafras
White oak	Scarlet oak	American holly
Chestnut oak		Red maple
N. red oak		Carolina buckthorn
Black oak		Blackgum
S. red oak		Flowering dogwood
		Sourwood
		Common persimmon

* See footnotes * and † to table 5, page 17.

Description of Landtype 16: Loblolly Pine on Eroded North Clayey Sideslopes

Geographic Setting—Areas composed of a network of gullies that have nearly destroyed the former deep soils on sloping to steep, north-facing, linear or nearly linear sideslopes. These lands were once cultivated or pastured and then abandoned as gully erosion spread. Erosion has been stabilized by planting pine, mainly loblolly. Remnants of the former soils remain between the gullies. Most gullies range from 10 to 40 feet wide and 5 to 12 feet deep but in places are wider and deeper. Before clearing, slope commonly ranged from 8 to 20 percent but was as steep as 40 percent in localized areas. Now slope ranges from 8 to more than 50 percent. Areal extent of units of Landtype 16 ranges from 5 to 50 acres. Landtypes 14, 15, and 17 may occur next to Landtype 16 on sideslopes. Landtypes 10 through 13 occur on ridgetops above Landtype 16. Landtypes 21 through 25 occur in bottoms below Landtype 16. Gullied, north-facing clayey slopes that are still actively eroding should be classified as Landtype 19.

Dominant Soils—Udorthents and the severely eroded phase of Sweatman. In old soil surveys, severely eroded phases of Silerton, Dulac, and Shubuta were mapped on sideslopes in places.

Parent Material—Thick, stratified shaley clay and sandy clay Coastal Plain sediments; alluvial and colluvial deposits from loess and clayey and sandy clay sediments. The lower sidewalls and bottoms of some gullies are entrenched in partly weathered, acid clay shale.

Solum Thickness—Remnants of the former soils range from 20 inches to more than 60 inches. Dulac soils have a fragipan at depths of 16 to 30 inches. There is little or no development of pedogenic horizons in the deposits in the bottoms of gullies which range in thickness from a few inches to several feet. Rooting is impeded by the firm clayey subsoil.

Texture—Silt loam and fine sandy loam. In severely eroded areas, surface texture ranges from sandy clay loam to silty clay and clay.

Soil Drainage—Original soils were mostly well-drained. Drainage of the gully network ranges from moderately well drained to excessively drained, depending on slope and position in the gully network.

Relative Soil Water Supply—Medium.

Soil Fertility—Moderate.

Vegetation—Of the pines planted for erosion control, only loblolly was effective in rapidly stabilizing gullied land. White oak, southern red oak, yellow-poplar, shortleaf pine, northern red oak, black oak, red maple, blackgum, hickories, sweetgum, American elm, cherrybark oak, Shumard oak, American beech, white oak, black walnut, black cherry, sourwood, and sugar maple are occasional to common on uneroded, north-facing, clayey sideslopes but occur only as scattered individuals in fully stocked loblolly pine plantations. American holly, flowering dogwood, common persimmon, sassafras, serviceberry, eastern hophornbeam, pawpaw, vacciniums, Carolina buckthorn, viburnums, devils-walking-stick, coralberry, grapes, and red mulberry are in the understory.

Table 20—*Forest management interpretations for Landtype 16: Loblolly pine on eroded north clayey sideslopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(65)	113
Loblolly pine	(75)†	114
White oak	(70)	52
N. red oak	(70)	52
Black oak	(70)	52
Shumard oak	(70)	52
S. red oak	(65)	48
Cherrybark oak	(75)	. . .
Yellow-poplar	(85)	80
Sweetgum	(85)	70

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight to moderate	Moderate	Severe	Severe	Moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine	E. hophornbeam
	Black walnut	Red mulberry
	Hickories	Sassafras
	American beech	Serviceberry
	White oak	Red maple
	N. red oak	Carolina buckthorn
	Black oak	Blackgum
	Shumard oak	Flowering dogwood
	Cherrybark oak	Sourwood
	American elm	Common persimmon
	Yellow-poplar	
	Sweetgum	
	Black cherry	
	Sugar maple	
	White ash	

* See footnotes * and † to table 5, page 17.

† See footnote to table 6 pertaining to loblolly pine, page 19.

Description of Landtype 17: Loblolly Pine on Eroded South Clayey Sideslopes

Geographic Setting—Areas composed of a network of gullies that have nearly destroyed the former deep soils on sloping to steep, north-facing, linear or nearly linear sideslopes. These lands were once cultivated or pastured and then abandoned as gully erosion spread. Erosion has been stabilized by planting pine, mainly loblolly. Remnants of the former soils remain between the gullies. Most gullies range from 10 to 40 feet wide and 5 to 15 feet deep but in places are wider and deeper. Before clearing, slope commonly ranged from 8 to 20 percent, but was as steep as 40 percent in localized areas. Now slope ranges from 8 to more than 50 percent. Areal extent of units of Landtype 17 ranges from 5 to 50 acres. Landtypes 10 through 14 occur on ridgetops above Landtype 17. Landtypes 21 through 25 occur in bottoms below Landtype 17. Gullied south-facing, clayey slopes that are still actively eroding should be classified as Landtype 19.

Dominant Soils—Udorthents and the severely eroded phase of Sweatman. In old soil surveys, severely eroded phases of Silerton, Dulac, and Shubuta were mapped on sideslopes in places.

Parent Material—Thick, stratified shaley clay and sandy clay Coastal Plain sediments; alluvial and colluvial deposits from loess and clayey and sandy clay sediments. The lower sidewalls and bottoms of some gullies are entrenched in partly weathered, acid clay shale.

Solum Thickness—Remnants of the former soils range from 210 inches to more than 60 inches. Dulac soils have a fragipan at depths of 16 to 30 inches. There is little or no development of pedogenic horizons in the deposits in the bottoms of gullies which range in thickness from a few inches to several feet. Rooting is impeded by the firm clayey subsoil.

Texture—Silt loam and fine sandy loam. In severely eroded areas, surface texture ranges from sandy clay loam to silty clay and clay.

Soil Drainage—Original soils were mostly well-drained. Drainage of the gully network ranges from moderately well drained to excessively drained, depending on slope and position in the network.

Relative Soil Water Supply—Low to medium.

Soil Fertility—Moderately low.

Vegetation—Of the pines planted for erosion control, only loblolly was effective in rapidly stabilizing gullied land. White oak, southern red oak, black oak, scarlet oak, blackgum, northern red oak, chestnut oak, shortleaf pine, hickories, American beech, red maple, Virginia pine, post oak, eastern redcedar, and sourwood are occasional to common on uneroded, south-facing, clayey sideslopes but occur only as scattered individuals in fully stocked loblolly pine plantations. American holly, flowering dogwood, sassafras, common persimmon, eastern hophornbeam, vacciniums, viburnums, grapes, Carolina buckthorn, and devils-walkingstick are in the understory.

Table 21—*Forest management interpretations for Landtype 17: Loblolly pine on eroded south clayey sideslopes*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	(60)	102
Loblolly pine	(70)†	104
Virginia pine	(60)	53
White oak	(65)	48
Chestnut oak	(60)	43
N. red oak	(65)	48
Black oak	(65)	48
S. red oak	(60)	43

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight	Moderate to severe	Severe	Severe	Moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine	E. redcedar
	Virginia pine	E. hophornbeam
	Hickories	Sassafras
	American beech	Red maple
	White oak	Carolina buckthorn
	Post oak	Blackgum
	Chestnut oak	Flowering dogwood
	N. red oak	Sourwood
	Black oak	Common persimmon
	S. red oak	
	Scarlet oak	

* See footnotes * and † to table 5, page 17.

† See footnote to table 6 pertaining to loblolly pine, page 19.

Description of Landtype 18:
Gullied Land, Sandy Material

Geographic Setting—Areas composed of a network of gullies that have destroyed the former soils on sideslopes and, in places, on ridgetops. Erosion is still active. Landtype 18 does not include gullied areas that have been revegetated and where erosion has been stopped. These lands were once cultivated and/or pastured and then abandoned as gully erosion spread. Included in Landtype 18 are areas recently planted to loblolly pine, areas recently cleared for kudzu control, older, sparse pine plantations that were not successful in controlling erosion, and areas in various stages of natural plant succession. Remnants of the original soils remain between the gullies. Most gullies range from 10 to 40 feet wide and 5 to 12 feet deep, but in places are wider and deeper; e.g., Fairview Gullies just south of the Interstate 40 interchange (fig. 1). Slope ranges from 8 to 35 percent but locally may exceed 50 percent. Areal extent of units of Landtype 18 ranges from 5 to 50 acres.

Dominant Soils—Udorthents and the severely eroded phase of Smithdale. In old soil surveys, severely eroded phases of Lexington, Providence, Ruston, and Savannah were mapped on ridgetops and sideslopes.

Parent Material—2 to 3 feet of loess and sandy and loamy Coastal Plain sediments; alluvial and colluvial deposits from these sediments.

Solum Thickness—Remnants of the original soils are more than 60 inches deep. Providence and Savannah soils have a fragipan at depths of 18 to 38 inches and 16 to 38 inches, respectively. There is little or no development of pedogenic horizons in the deposits in the bottoms of gullies where range in thickness from a few inches to several feet.

Texture—Uneroded remnants are silt loam and sandy loam. On eroded areas and in deposits in gullies, texture ranges from loamy sand and sandy loam to sandy clay loam and silty clay loam. Where fragipans have been exposed, texture may range from sandy loam and loam to clay loam, silt loam, and silty clay loam. Gravel content is usually 10 percent or less in subsoils but may be higher in gully deposits.

Soil Drainage—Original soils were mostly well-drained. Drainage of the gully network ranges from moderately well drained to excessively drained, depending on slope and position in the network.

Relative Soil Water Supply—Low.

Soil Fertility—Moderately low.

Vegetation—Any of the species listed for Landtypes 1 through 9 may occur on Landtype 18, depending on position on the landscape, severity of erosion, prevalence and severity of fire and grazing, degree of success of tree planting, and areal extent of each unit of gullied land. Loblolly pine is the only most desirable tree species recommended for planting on Landtype 18.

Table 22—*Forest management interpretations for Landtype 18: Gullied land, sandy material**

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight	Moderate to severe	Moderate to severe	Severe	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine Virginia pine	Kudzu All other tree species

* Data on productivity (species, site index, and average annual growth) were not available for these highly variable sites. Potential productivity for plantings of loblolly, shortleaf, and Virginia pines may approach the values shown for Landtypes 2, 4, 8, and 9.

Occurs in LTA—B

Description of Landtype 19:
Gullied Land, Clayey Material

Geographic Setting—Areas composed of a network of gullies that have destroyed the former soils on sideslopes and, in places, ridgetops. Erosion is still active. Landtype 19 does not include gullied areas that have been revegetated and where erosion has been stopped. These lands were once cultivated and/or pastured and then abandoned as gully erosion spread. Included in Landtype 19 are areas recently planted to loblolly pine, areas recently cleared for kudzu control, older, sparse pine plantations that were not successful in controlling erosion, and areas in various stages of natural plant succession. Remnants of the original soils remain between the gullies. Most gullies range from 10 to 40 feet wide and 5 to 12 feet deep but in places are wider and deeper. Slope ranges from 8 to 35 percent but locally may exceed 50 percent. Areal extent of units of Landtype 19 ranges from 5 to 50 acres.

Dominant Soils—Udorthents and the severely eroded phase of Sweatman. In old soil surveys, severely eroded phases of Silerton, Dulac, Shubuta, Luverne, and Cuthbert were mapped on ridgetops and sideslopes.

Parent Material—2 to 3 feet of loess and clayey and sandy clay Coastal Plain sediments; alluvial and colluvial deposits from these sediments. The lower sidewalls and bottoms of some gullies are entrenched in partly weathered, acid clay shale.

Solum Thickness—Remnants of the original soils range from 20 to more than 60 inches thick. Dulac soils have a fragipan at depths of 16 to 30 inches. There is little or no development of pedogenic horizons in the deposits in the bottoms of gullies, which range in thickness from a few inches to several feet. Rooting is impeded by the firm, clayey subsoil.

Texture—Uneroded remnants are silt loam and fine sandy loam. On eroded areas and in deposits in gullies, texture ranges from fine sandy loam and silt loam to sandy clay loam, silty clay, and clay. Where fragipans have been exposed, texture is silt loam or silty clay loam.

Soil Drainage—Original soils were mostly well-drained. Drainage of the gully network ranges from moderately well drained to excessively drained, depending on slope and position in the network.

Relative Soil Water Supply—Low.

Soil Fertility—Moderately low.

Vegetation—Any of the species listed for Landtypes 5 and 10 through 17 may occur on Landtype 19, depending on position of the landscape, severity of erosion, prevalence and severity of fire and grazing, degree of success of tree planting, and areal extent of each unit of gullied land. Loblolly pine is the only most desirable tree species recommended for planting on Landtype 19.

Table 23—*Forest management interpretations for Landtype 19: Gullied land, clayey material**

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Slight	Moderate to severe	Moderate to severe	Severe	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine Virginia pine	Kudzu All other tree species

* Data on productivity (species, site index, and average annual growth) were not available for these highly variable sites. Potential productivity for plantings of loblolly, shortleaf, and Virginia pines may approach the values shown for Landtypes 11, 13, 16, and 17.

Description of Landtype 20: Lakes, Ponds, and Other Impoundments

Geographic Setting—This landtype includes the major lakes (Cub Creek, Maple Creek, Browns Creek, and Pin Oak) created for recreational purposes. Also included are Redbud Lake and numerous farm ponds and other small impoundments on and in close proximity to the forest, which should be considered as sources of water when modeling wildlife habitat. Shallow impoundments created by beaver dams are included in Landtype 21. The other eight descriptive elements are not applicable.

Forest management interpretations for Landtype 20 are not applicable.

Description of Landtype 21: Ponded Bottoms and Swamps:

Geographic Setting—Deep and very deep, silty, loamy, and sandy soils with very poor internal drainage on nearly level bottomlands. Water stands on the soil surface for 3 months or more annually. Depth of water ranges from a few inches to 2 feet, depending on the height of the impoundment and/or intensity and duration of rainfall. Impoundment is caused by beaver dams or aggrading and damming of stream channels by material eroded from adjacent uplands. Swamps are common at the heads of the major lakes on the forest. Width of ponded bottoms and swamps usually exceeds 150 feet and ranges to 500 to 600 feet. Slope is generally less than 3 percent. Trees are generally dead or dying; alder is the dominant vegetation. Landtype 21 occurs below Landtypes 6 though 9 and 14 through 17 as isolated areas of a few acres to more than 20 acres. Landtype 21 occurs upstream from Landtype 20 and next to or within Landtypes 24 and 25. Landtypes 22 and 23 may occur upstream or downstream from Landtype 21. Ponding is a fairly recent event, and status as Landtype 21 could revert to Landtypes 22 or 23 if beaver dams are destroyed or stream channels are dynamited to eliminate ponding.

Dominant Soils—Falaya, Waverly, Enville, and Bibb; possibly Mantachie before ponding.

Parent Material—Sandy, loamy, and silty alluvium washed from upland soils formed in loess and sandy, loamy, or clayey Coastal Plain sediments.

Solum Thickness—More than 60 inches including gleyed horizons. Falaya soils may have a buried fragipan at 40 to more than 80 inches.

Texture—Texture varies greatly because of extremely variable rates of erosion in individual headwater drainages. Surface texture ranges from fine sandy loam and loam to clay loam, silt loam and silt, occasionally sandy loam and loamy sand.

Soil Drainage—Very poorly drained. These soils were probably somewhat poorly drained or poorly drained before ponding; possibly moderately well drained.

Relative Soil Water Supply—Very high. Saturated for 3 months or more annually. When not ponded, the water table is within 1 foot of the surface.

Soil Fertility—Moderate to moderately high.

Vegetation—Sweetgum, willow oak, red maple, green ash, and eastern cottonwood; occasional water oak, blackgum, American beech, baldcypress, river birch, and silver maple. All or many of the trees are dead or dying. Smooth alder, grasses, sedges, reeds, azaleas, hollies, cattails, and viburnums are in the understory.

Table 24—*Forest management interpretations for Landtype 21: Ponded bottoms and swamps**

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Moderate to severe	Severe	Severe	Slight	Slight to moderate

* Data on productivity (species, site index, and average annual growth) and species desirability were omitted because most trees in ponded areas and swamps are dead or dying. If Landtype 21 was drained, areas would probably be reclassified as Landtype 22 or 23.

Description of Landtype 22:
Narrow Wet Bottoms

Geographic Setting—Deep, silty, loamy, and sandy soils with poor internal drainage on level to nearly level bottoms of first- to second-order streams. The forest type is wet bottomland hardwoods. Slope is generally 3 percent or less. Typically, Landtype 22 occurs below Landtypes 6 through 9 and 14 through 17 as long, narrow strips along intermittent and permanent streams. When Landtypes 22 and 23 are adjacent, Landtype 23 occupies a slightly higher position on the landscape. Width of Landtype 22 varies from 30 feet in first-order drainageways to 300 to 500 feet in second-order drainageways.

Dominant Soils—Falaya, Waverly, Enville, and Bibb; possibly Mantachie. These soils represent both coarse-silty and coarse-loamy families. Often they occur in such an intricate pattern or in such small areas that they cannot be delineated at the scale of county soil survey maps.

Parent Material—Sandy, loamy, and silty alluvium washed from upland soils formed in loess and sandy, loamy, and clayey Coastal Plains sediments.

Solum Thickness—More than 60 inches including gleyed horizons. Falaya soils may have a buried fragipan at 40 to more than 80 inches.

Texture—Varies greatly because of extremely variable rates of erosion in headwater drainages. Surface texture ranges from fine sandy loam and loam to clay loam, silty loam, and silt, occasionally sandy loam and loamy sand. Fragments of ironstone, gravel and/or shale may be present in the streambeds and in places scattered throughout the soil.

Soil Drainage—Somewhat poorly drained to poorly drained.

Relative Soil Water Supply—High to very high.

Soil Fertility—Moderate to moderately high.

Vegetation—Red maple, sweetgum, willow oak, and eastern cottonwood; occasional Nuttall oak, black willow, river birch, American elm, green ash, boxelder, water oak, silver maple, slippery elm, baldcypress, American sycamore, shellbark hickory, overcup oak, and water tupelo. Alders, azaleas, mosses, American holly, viburnums, American hornbeam, ferns, spicebush, flowering dogwood, and buttonbush occur in the understory.

Table 25—*Forest management interpretations for Landtype 22: Narrow wet bottoms*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
E. cottonwood	100	188
Nuttall oak	105	. . .
Willow oak	95	. . .
Water oak	95	. . .
Sweetgum	95	93
American sycamore	(100)	126
Green ash	85	. . .

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Moderate to severe	Moderate to severe	Moderate to severe	Slight	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Baldcypress	Shellbark hickory	Black willow
E. cottonwood	Overcup oak	River birch
Nuttall oak	American elm	Alders
Willow oak	Slippery elm	American hornbeam
Water oak	Red maple	American holly
Sweetgum	Silver maple	Flowering dogwood
American sycamore	Boxelder	
Green ash	Water tupelo	

* See footnotes * and † to table 5, page 17.

Occurs in LTA's—A and B

Description of Landtype 23:
Narrow Moist Bottoms

Geographic Setting—Deep, silty, loamy, and sandy soils with good internal drainage on level to nearly level bottoms and on sloping to strongly sloping concave footslopes of first- and second-order streams. The forest type is moist bottomland hardwoods with some upland hardwoods and loblolly pine plantations. Slope is generally 3 percent or less in streambottoms and 5 to 10 percent on footslopes and in the heads of hollows. Typically, Landtype 23 occurs below Landtypes 6 through 9 and 14 through 17 as long, narrow strips along intermittent and permanent streams. In the heads of hollows, Landtype 23 may adjoin Landtypes 1 through 5 and 10 through 13. When Landtypes 22 and 23 are adjacent, Landtype 23 occupies a slightly higher position on the landscape. Width of Landtype 23 varies from 30 feet in first-order drainageways to 300 to 500 feet in second-order drainageways.

Dominant Soils—Collins and Iuka, possibly Vicksburg, Grenada, Freeland, and Almo. These soils represent both coarse-silty and coarse-loamy families in the bottoms and fine-silty families on the terraces and footslopes. Often they occur in such an intricate pattern or in such small areas that they cannot be delineated at the scale of county soil survey maps.

Parent Material—Sandy, loamy, and silty alluvium washed from upland soils formed in loess and sandy, loamy, and clayey Coastal Plain sediments.

Solum Thickness—More than 60 inches including gleyed horizons. Grenada soils have fragipans at depths of 24 to 36 inches.

Texture—Varies greatly because of extremely variable rates of erosion in headwater drainages. Surface texture ranges from fine sandy loam and loam to clay, clay loam, silt loam, and silt; occasionally sandy loam and loamy sand. Fragments of ironstone, gravel, and/or shale may be present in the streambeds and, in places, scattered throughout the soils.

Soil Drainage—Well-drained to moderately well drained.

Relative Soil Water Supply—High.

Soil Fertility—Moderate to moderately high.

Vegetation—Yellow-poplar, sweetgum, red maple, white oak, and loblolly pine; occasional American beech, cherrybark oak, boxelder, Shumard oak, shagbark hickory, blackgum, American elm, American sycamore, slippery elm, black cherry, eastern cottonwood, water oak, green ash, shortleaf pine, and sourwood. American holly, flowering dogwood, American hornbeam, azaleas, viburnums, sassafras, sumacs, buttonbush, elderberry, vacciniums, spicebush, devils-walkingstick, and ferns are in the understory.

Table 26—*Forest management interpretations for Landtype 23: Narrow moist bottoms*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	75	136
Loblolly pine	100	168
E. cottonwood	115	289
White oak	(80)	62
Shumard oak	100	. . .
Cherrybark oak	105	. . .
Water oak	105	. . .
Yellow-poplar	110	>116
Sweetgum	105	118
American sycamore	(110)	166
Green ash	90	. . .

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Moderate to severe	Slight to moderate	Slight to moderate	Slight	Slight

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine	American hornbeam
E. cottonwood	American beech	Sassafras
Shagbark hickory	American elm	Sumacs
White oak	Slippery elm	American holly
Shumard oak	Black cherry	Blackgum
Cherrybark oak	Red maple	Flowering dogwood
Water oak	Boxelder	
Yellow-poplar		
Sweetgum		
American sycamore		
Green ash		

* See footnotes * and † to table 5, page 17.

Description of Landtype 24: Wide Wet Bottoms

Geographic Setting—Deep, silty, loamy, and sandy soils with poor internal drainage on level to nearly level bottoms of third-order and higher order streams and creeks that occur mostly outside the forest. The forest type is wet bottomland hardwoods, but most of this land is in pasture or cropland. Slope is generally 3 percent of less. Typically, Landtype 24 occurs below Landtypes 6 through 9 and 14 through 17 as wide valleys along permanent streams and creeks. Landtype 24 occurs downstream from Landtypes 21 through 23. When Landtypes 24 and 25 are adjacent, Landtype 25 occupies a lightly higher position on the landscape. Swamps (Landtype 21) may occur within Landtype 24. Width of Landtype 24 is typically more than 500 feet and ranges to more than 0.25 miles in tributaries of the Big Sandy River on the west side of the forest.

Dominant Soils—Falaya, Waverly, Enville, and Bibb, possibly Mantachie. These soils represent both coarse-silty and coarse-loamy families. Often they occur in such an intricate pattern or in such small areas that they cannot be delineated at the scale of county soil survey maps.

Parent Material—Sandy, loamy, and silty alluvium washed from upland soils formed in loess and sandy, loamy, and clayey Coastal Plain sediments.

Solum Thickness—More than 60 inches, including gleyed horizons. Falaya soils may have a buried fragipan at 40 to more than 80 inches.

Texture—Varies greatly because of extremely variable rates of erosion in headwater drainages. Surface texture ranges from fine sandy loam and loam to clay loam, silt loam, and silt; occasionally sandy loam and loamy sand. Fragments of ironstone, gravel and/or shale may be present in the streambeds and, in places, scattered throughout the soil.

Soil Drainage—Somewhat poorly drained to poorly drained.

Relative Soil Water Supply—High to very high.

Soil Fertility—Moderate to moderately high.

Vegetation—Red maple, sweetgum, willow oak, and eastern cottonwood; occasional Nuttall oak, black willow, river birch, American elm, green ash, boxelder, water oak, silver maple, slippery elm, baldcypress, American sycamore, shellbark hickory, overcup oak, and water tupelo. Alders, azaleas, mosses, American holly, viburnums, American hornbeam, ferns, spicebush, flowering dogwood, and buttonbush occur in the understory.

Table 27—*Forest management interpretations for Landtype 24: Wide wet bottoms*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
E. cottonwood	100	188
Nuttall oak	105	. . .
Willow oak	85	. . .
Water oak	95	. . .
Sweetgum	95	93
American sycamore	(100)	126
Green ash	85	. . .

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Moderate to severe	Moderate to severe	Moderate to severe	Slight	Slight to moderate

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Baldcypress	Shellbark hickory	Black willow
E. cottonwood	Overcup oak	River birch
Nuttall oak	American elm	Alders
Willow oak	Slippery elm	American hornbeam
Water oak	Red maple	American holly
Sweetgum	Silver maple	Flowering dogwood
American sycamore	Boxelder	
Green ash	Water tupelo	

* See footnotes * and † to table 5, page 17.

Occurs in LTA's—A and B

Description of Landtype 25:
Wide Moist Bottoms

Geographic Setting—Deep, silty, loamy, and sandy soils with good internal drainage on level to nearly level terraces and bottoms, and on sloping to strongly sloping concave footslopes of third- and higher order streams and creeks that occur mostly outside the boundary of the forest. The forest type is moist bottomland hardwoods, but most of this land is in pasture or cropland. Slope is generally 3 percent or less on terraces and in streambottoms and 5 to 10 percent on footslopes. Typically Landtype 25 occurs below Landtypes 6 through 9 and 14 through 17 as wide valleys along permanent streams and creeks. Landtype 25 occurs downstream from Landtypes 21 through 23. When Landtypes 24 and 25 are adjacent, Landtype 25 occupies a slightly higher position on the landscape. Swamps (Landtype 21) may occur within Landtypes 25. Width of Landtype 25 is typically more than 500 feet and ranges to more than 0.25 mile in tributaries of the Big Sandy River on the west side of the forest.

Dominant Soils—Collins and Iuka; possibly Vicksburg, Grenada, Freeland, and Almo. These soils represent both coarse-silty and coarse-loamy families in the bottoms and the fine-silty family on the terraces and footslopes. Often they occur in such an intricate pattern or in such small areas that they cannot be delineated at the scale of county soil survey maps.

Parent Material—Sandy, loamy, and silty alluvium washed from upland soils formed in loess and sandy, loamy, and clayey Coastal Plain sediments.

Solum Thickness—More than 60 inches, including gleyed horizons. Grenada soils have fragipans at depths of 24 to 36 inches.

Texture—Varied greatly because of extremely variable rates of erosion in headwater drainages. Surface texture ranges from fine sandy loam and loam to clay, clay loam, silt loam, and silt; occasionally sandy loam and loamy sand. Fragments of ironstone, gravel, and/or shale may be present in the streambeds and, in places, scattered throughout the soil.

Soil Drainage—Well-drained to moderately well drained.

Relative Soil Water Supply—High.

Soil Fertility—Moderate to moderately high.

Vegetation—Yellow-poplar, sweetgum, red maple, white oak, and loblolly pine; occasional American beech, cherrybark oak, boxelder, Shumard oak, shagbark hickory, blackgum, American elm, American sycamore, slippery elm, black cherry, eastern cottonwood, water oak, green ash, shortleaf pine, and sourwood. American holly, flowering dogwood, American hornbeam, azaleas, viburnums, sassafras, sumacs, buttonbush, elderberry, vacciniums, spicebush, devils-walkingstick, and ferns are in the understory.

Table 28—*Forest management interpretations for Landtype 25: Wide moist bottoms*

PRODUCTIVITY		
Species	Site index*	Average annual growth* (feet^3/acre)
Shortleaf pine	75	136
Loblolly pine	100	168
E. cottonwood	115	289
White oak	(80)	62
Shumard oak	100	. . .
Cherrybark oak	105	. . .
Water oak	105	. . .
Yellow-poplar	110	>116
Sweetgum	105	118
American sycamore	(110)	166
Green ash	90	. . .

MANAGEMENT PROBLEMS				
Plant competition	Seedling mortality	Equipment limitations	Erosion hazard	Windthrow hazard
Moderate to severe	Slight to moderate	Slight to moderate	Slight	Slight

SPECIES DESIRABILITY		
Most desirable	Acceptable	Least desirable
Loblolly pine	Shortleaf pine	American hornbeam
E. cottonwood	American beech	Sassafras
Shagbark hickory	American elm	Sumacs
White oak	Slippery elm	American holly
Shummard oak	Black cherry	Blackgum
Cherrybark oak	Red maple	Flowering dogwood
Water oak	Boxelder	
Yellow-poplar		
Sweetgum		
American sycamore		
Green ash		

* See footnotes * and † to table 5, page 17.

APPLYING THE SYSTEM

From this report, resource professionals and landowners can make onsite determinations of site productivity. A practical framework for forest management planning and forest research on NTSF and similar landscapes is provided in this report.

To make onsite determinations of productivity, users must be able to recognize the two major parent materials—sandy and loamy sediments (LTA-A) and clayey and sandy clay sediments (LTA-B). The former group is the dominant parent material on NTSF; the latter group occurs only along the eastern side of NTSF. The approximate boundary is shown on the soil association map of Henderson County (Flowers and others 1960). These parent materials can best be seen in gullies and along road cuts. Table 3 shows which landtypes occur in each LTA and their relative abundance.

Landtype descriptions, a landscape drawing (fig. 3), and a dichotomous key (Appendix B) will enable users

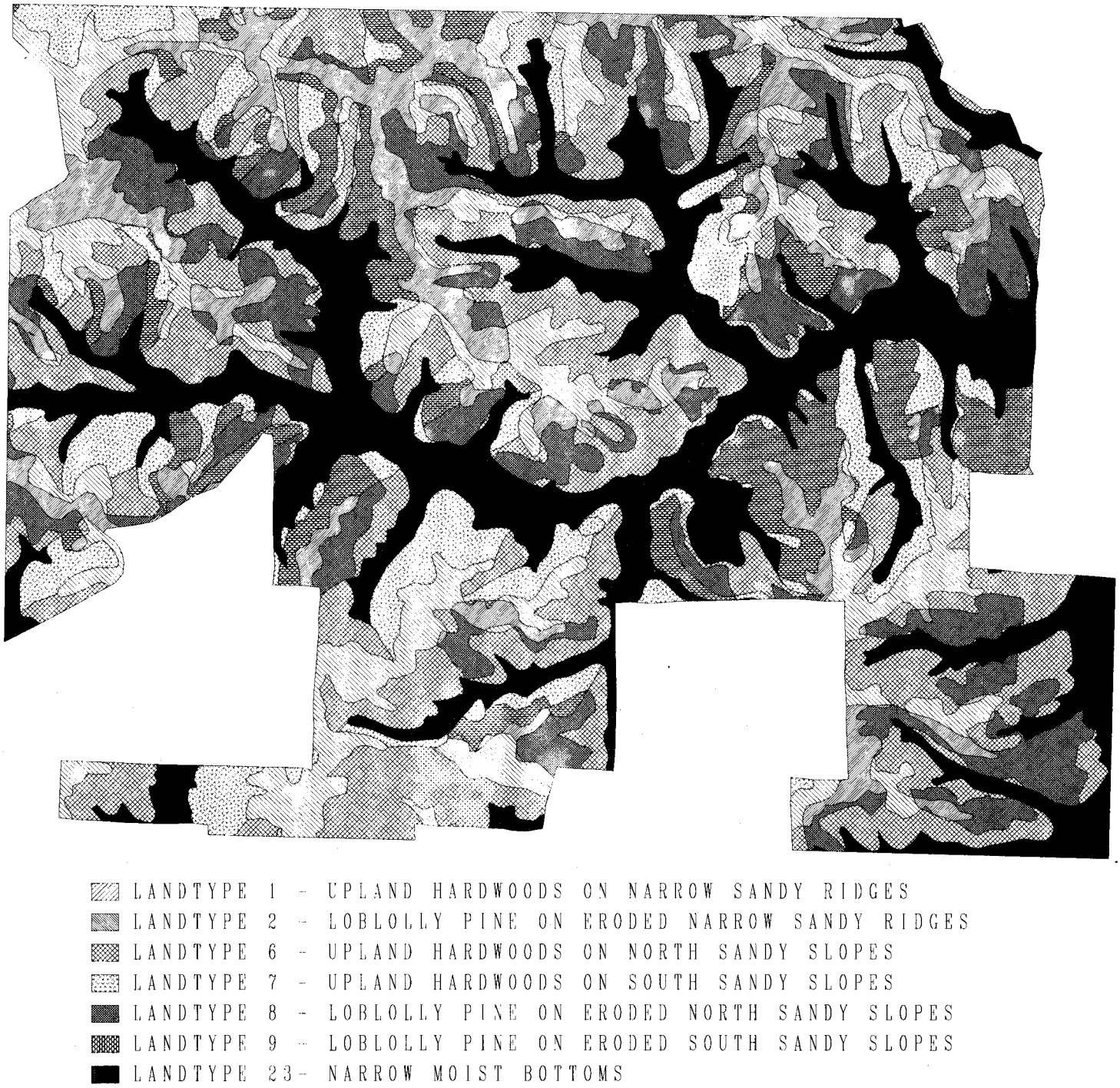

Figure 3—*Landtypes characteristic of landtype association A on the Natchez Trace State Forest, State Resort Park, and Wildlife Management Area.*

to identify specific landtypes. Information about productivity, severity of management problems, and species desirability are shown in tables 5 through 28.

This site classification system for NTSF provides a sound ecological basis for forest management planning because it recognizes inherent site differences and soil-related hazards. When the system is adopted, landtypes, not forest stands, become the basic unit of management. At the outset, landtype boundaries and existing stand boundaries may or may not coincide. Where they do not coincide, stand boundaries should be adjusted when that particular stand is first entered for timber management activities in the normal sequence of the management plan.

This site classification system can be easily incorporated into a continuous forest inventory or other forest inventory systems to obtain information on acreage, stocking, composition, and growth of forests by landtypes. Once productivity data are obtained for landtypes on NTSF, they should be substituted for the regional (SCS-derived) values in table 5 through 28.

Users should be aware that species composition and productivity may vary within a landtype (Hammer 1986, Wheat and Dimmick 1987, Clatterbuck 1988[3], Arnold 1990). Variation in productivity should be handled as a sampling problem dependent on the desired precision of the productivity information. To adequately sample some landtypes, users with existing inventory systems may be required to install new plots or points. Excessive variation may indicate a need to divide that landtype into more homogeneous units.

A logical vehicle to transfer this site classification system into a valuable forest management tool is a landtype map (fig. 4) that can be used in all phases of management, from day-to-day activities to long-range planning. The scale of this map will depend on the size of NTSF and how intensively TDF and TWRA want to

[3] Clatterbuck, W.K. 1988. Classification and analysis of forest plant communities on Cheatham Wildlife Management Area in north-central Tennessee. Report submitted to Tennessee Wildlife Resources Agency, Nashville, TN. 110 p.

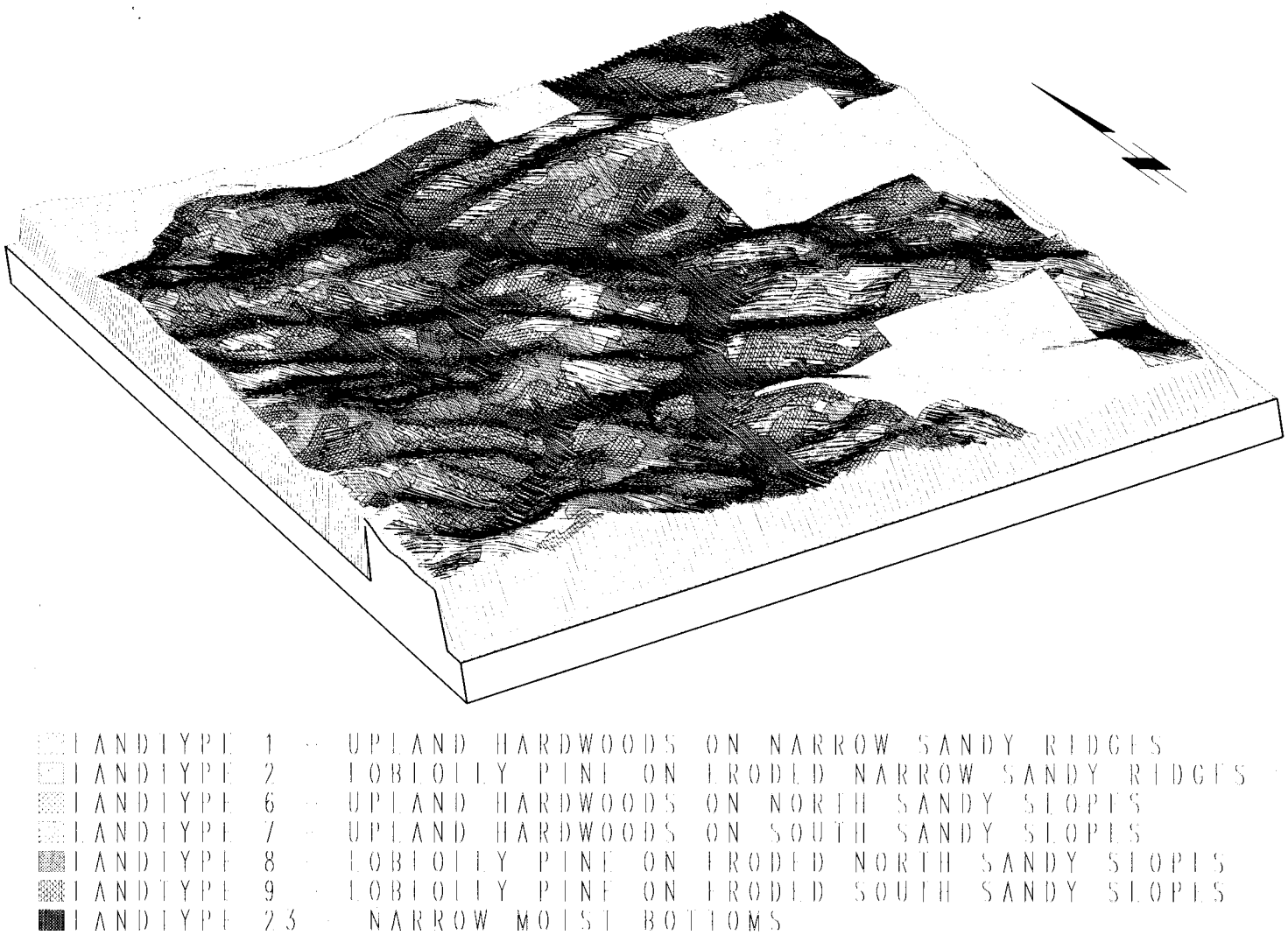

Figure 4.—*A sample landtype map covering a tract of about 2,770 acres on the Seventeen Creek Quadrangle, Carroll County, Tennessee. See table 3 for names of landtypes.*

manage. Landtypes can be mapped at scales of 1:10,000 to 1:60,000; at these scales, areas as small as 2 acres can be recognized on the larger scale maps. Smoothness of the terrain will determine maximum size of each landtype unit. Either U.S. Geological Survey 7.5 min quadrangle sheets (1:24,000) or the blow-up version (1:15,840) would make excellent base maps on which to delineate landtypes. It is strongly recommended that this mapping be done using a geographic information system. Most important, a geographic information system can merge data from maps with different scale.

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APPENDIX A

Classification of the dominant soils occurring on the Natchez Trace State Forest, State Resort Park, and Wildlife Management Area according to the USDA Soil Conservation Service's system of soil taxonomy (Soil Survey Staff 1975).

Soil Series	Family and subgroup
Almo	Fine-silty, mixed, thermic Typic Fragiaqualfs
Bibb	Coarse-loamy, siliceous, acid, thermic Typic Fluvaquents
Collins	Coarse-silty, mixed, acid, thermic Aquic Udifluvents
Dulac	Fine-silty, mixed, thermic Typic Fragiudalfs
Enville	Coarse-loamy, siliceous, acid, thermic Aeric Fluvaquents
Falaya	Coarse-silty, mixed, acid, thermic Aeric Fragiudalfs
Freeland	Fine-silty, siliceous, thermic Glossic Fragiudalfs
Grenada	Fine-silty, mixed, thermic Glossic Fragiudalfs
Iuka	Coarse-loamy, siliceous, acid, thermic Aquic Udifluvents
Lexington	Fine-silty, mixed, thermic Typic Paleudalfs
Mantachie	Fine-loamy, siliceous, acid, thermic Aeric Fluvaquents
Providence	Fine-silty, mixed, thermic Typic Fragiudalfs
Ruston	Fine-silty, siliceous, thermic Typic Paleudults
Savannah	Fine-loamy, siliceous, thermic Typic Fragiudults
Shubuta	Clayey, mixed, thermic Typic Paleudults
Silerton	Fine-silty, mixed, thermic Typic Hapludults
Smithdale	Fine-loamy, siliceous, thermic Typic Hapludults
Sweatman	Clayey, mixed, thermic Typic Hapludults
Vicksburg	Coarse-silty, mixed, acid, thermic Typic Udifluvents
Waverly	Coarse-silty, mixed, acid, thermic Typic Fluvaquents

Appendix B

Key to landtypes on the Natchez Trace State Forest, State Resort Park, and Wildlife Management Area.

A. Land on the Uplands—ridges or slopes ..... B
A. Land in bottoms, on footslopes or terraces ..... T
  B. Land gullied, not completely vegetated; active soil erosion C
  B. Land not gullied or, if gullied, vegetated with loblolly pine; no active soil erosion ..... D
C. Parent material is loamy or sandy Coastal Plain sediments. **Landtype 18.**
C. Parent material is clayey or sandy clay Coastal Plain sediments; only on the eastern side of the forest. **Landtype 19.**
  D. Land on ridges and convex upper slopes ..... E
  D. Land on linear or nearly linear sideslopes ..... M
E. Overstory is blackjack oak, post oak, and southern red oak. **Landtype 5.**
E. Overstory is other than blackjack oak, post oak, and southern red oak ..... F
  F. Parent material is loess over loamy or sandy Coastal Plain sediments ..... G
  F. Parent material is loess over clayey or sandy clay Coastal Plain sediments. Only on the eastern side of the forest ..... J
G. Ridges supporting upland hardwoods; never cleared and farmed ..... H
G. Ridges supporting loblolly pine plantations; formerly cleared, farmed, abandoned, planted to pine; land gullied, but stabilized I
  H. Ridges typically less than 300 feet wide. **Landtype 1.**
  H. Ridges typically more than 300 feet wide. **Landtype 3.**
I. Ridges typically less than 300 feet wide. **Landtype 2.**
I. Ridges typically more than 300 ft wide. **Landtype 4.**

Appendix B—Continued

J. Ridges supporting upland hardwoods; never cleared and farmed ..... K
J. Ridges supporting loblolly pine plantations; formerly cleared, farmed, abandoned, planted to pine; land gullied, but stabilized L
K. Ridges typically less than 300 feet wide. **Landtype 10.**
K. Ridges typically more than 300 feet wide. **Landtype 12.**
L. Ridges typically less than 300 feet wide. **Landtype 11.**
L. Ridges typically more than 300 feet wide. **Landtype 13.**
M. Parent material is loamy or sandy Coastal Plain sediments ..... N
M. Parent material is loamy or sandy clay Coastal Plain sediments; only on the eastern side of the forest .... Q
N. North aspect ..... O
N. South aspect ..... P
O. Slopes supporting upland hardwoods; never cleared and farmed. **Landtype 6.**
O. Slopes supporting loblolly pine plantations; formerly cleared, farmed, abandoned, planted to pine; land gullied, but stabilized. **Landtype 8.**
P. Slopes supporting upland hardwoods; never cleared and farmed. **Landtype 7.**
P. Slopes supporting loblolly pine plantations; formerly cleared, farmed, abandoned, planted to pine; land gullied, but stabilized. **Landtype 9.**
Q. North aspect ..... R
Q. South aspect ..... S
R. Slopes supporting upland hardwoods; never cleared and farmed. **Landtype 14.**
R. Slopes supporting loblolly pine plantations; formerly cleared, farmed, abandoned, planted to pine; land gullied, but stabilized. **Landtype 16.**
S. Slopes supporting upland hardwoods; never cleared and farmed. **Landtype 15.**
S. Slopes supporting loblolly pine plantations; formerly cleared, farmed, abandoned, planted to pine; land gullied, but stabilized. **Landtype 17.**
T. Lakes, ponds, and other impoundments. **Landtype 20.**
T. Streambottoms, terraces, and footslopes ..... U
U. Land ponded for much of the year; swamps. Timber dead or dying; alder thickets. **Landtype 21.**
U. Land not ponded. Water table within 1 to 2 feet of the surface from late fall to early spring;
V. Land wet. Supports water-tolerant deciduous species (wet bottomland hardwoods); frequent flooding during winter and spring ..... W
V. Land moist. Supports the less water-tolerant deciduous species (moist bottomland hardwoods), sometimes upland hardwoods and loblolly pine; occasional flooding during winter and spring X
W. Narrow wet bottoms; typically first- and second-order drainageways less than 500 feet wide. **Landtype 22.**
W. Broad wet bottoms; typically third- and higher order drainageways greater than 500 feet wide. **Landtype 24.**
X. Narrow moist bottoms; typically first- and second-order drainageways less than 500 feet wide. **Landtype 23.**
X. Broad moist bottoms; typically third- or higher order drainageways greater than 500 feet wide. **Landtype 25.**

Appendix C

Soil mapping units occurring on the Natchez Trace State Forest, State Resort Park, and Wildlife Management Area by landtype and county.

Landtype	1984 Carroll*	1960 Henderson†	1953 Benton‡
1/3. Upland Hardwoods on Sandy Ridges	LeB, LeC, PrB, PrC2; possibly LeD2, PrD2, SmD2	La, Lb, Lc, Lk, Lm, Ln, Po, Pc, Pd; possibly Ra	Pre, Prn, Svn, Svr
2/4. Pines on Eroded Sandy Ridges	Us; possibly LeC2, PrC2, LeD2, PrD2, SmD2	Gd, Ld, Le, Lf, Lg, Lh, Ln, Pb, Pe; possibly Gc, La, Lc, Lm, Pa, Pf, Rb, Rc	Rgr; possibly ScS
5. Poor Ridges	Same as Landtypes 1 and 3; possibly 2 and 4	Same as Landtypes 1 and 3; possibly 2 and 4	Same as Landtypes 1 and 3; possibly 2 and 4
6/7. Upland Hardwoods on Sandy North and South Sideslopes	SmD2, SmE; possibly LeD2, PrD2	Lo, Lp, Ls, Rb, Rc, Rd	Rfl, Rfz
8/9. Pines on Eroded Sandy North and South Sideslopes	Us; possibly SmE3, GrC3	Gd; possibly Gc, Ld, Le, Lh, Lr, Pf, Rf, Rg, Rh	Rgr; possibly Rtv
10/12. Upland Hardwoods on Clayey Ridges	None	Dlc, Dn, Sp, Sr, St, Su, Sx	Dsr, Sln
11/13. Pines on Eroded Clayey Ridges	Us	Gd; possibly Gc, Def, Deq, Sq, Sy	Rgr; possibly DcS
14/15. Upland Hardwoods on Clayey North and South Sideslopes	SwD, SwE	Cg, Sb, Sf, Sh, Sv, Sw	Cch, Cfl, Sfl, Sfz
16/17. Pines on Eroded Clayey North and South Sideslopes	Uw; pssibly SwE3	Gb; possibly Ga, Ch, Fh, Se, Sz	Rge; possibly Ccv
18. Sandy Gullied Land	Us	Gd; possibly Gc	Rgr
19. Clayey Gullied Land	Uw	Gb; possibly Ga	Rgc
21–25. Bottoms	Ca, Co, Fa, Wo, Wf, Wp, GrB	Ba, Bb, Fe, Fg, Hc, Ia, Ib, Id	As, Be, Bf, Br, Ef,Frn, Ha, Hf, Hy

* See map sheets 35, 42, 49, 50, 57, 64, 65, and 70; Scale 1:15,840 (Moore and others 1984).
† See map sheets 4, 5, 6, 10, 11, 12, 16, 17, and 23; Scale 1:20,000 (Flowers and others 1960).
‡ See map sheet 1; Scale 1:24,000 (Odom and others 1953).

*U.S. GOVERNMENT PRINTING OFFICE:1991-666-020/40014

METRIC EQUIVALENTS

1 inch = 2.54 centimeters
1 foot = 0.3048 meter
1 acre = 0.4047 hectare
1 square foot/acre = 0.2296 square meter/hectare
1 cubic foot/acre = 0.06997 cubic meter/hectare
1 mile = 1.6093 kilometers
1 square mile = 2.5900 square kilometers
°C = (°F − 32)/1.8

Smalley, Glendon. W. 1991. Classification and evaluation of forest sites on the Natchez Trace State Forest, State Resort Park, and Wildlife Management Area in west Tennessee. Gen. Tech. Rep. SO-85. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 73 p.

Presents comprehensive forest site classification system for the 45,084-acre Natchez Trace State Forest, State Resort park, and Wildlife Management Area in the highly dissected and predominantly hilly Upper Coastal Plain of west Tennessee. Twenty-five landtypes are identified. Each landtype is defined in terms of nine elements and evaluated on the basis of productivity.

Keywords: erosion, landtypes, selected species, site classification.