

Pocomoke State Forest

Ten Year Resource Management Plan

Volume II

Support Materials



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State of Maryland

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**Pocomoke State Forest
Ten Year Resource Management Plan
Volumes I and II**

ERRATA /ADDENDA

1. The Maryland Department of Natural Resources underwent a reorganization in 1995. All references herein to *Greenways and Resource Planning* should be amended to *Resource Planning Program*. All references to *Fish, Heritage and Wildlife Administration* should be amended to *Forest, Wildlife and Heritage Service*. Other program names in some cases may also have changed.
2. In Volume II, p. 74, *Appendix E*: Due to legislative actions in the 1995-1996 sessions of the Maryland General Assembly, there have been additions to the Wildlands in Pocomoke State Forest. There are currently 4,265 acres of Wildland at Pocomoke, on two parcels. In all, 27 Wildlands have been designated on a total of 39,412 acres in the state of Maryland.
3. Recent acquisitions by Maryland Program Open Space and new Wildlands designations have resulted in acreage changes within management zones. The General Management Zone in Pocomoke State Forest now totals 7,566 acres. The Special Management Zone now totals 3,638 acres. The Water Management Zone now totals 6,341 acres.
4. The Chesapeake Bay Critical Area Commission and DNR staff has developed guidelines for timber harvest in relation to forest interior dwelling birds that may affect land use in some Critical Area sites. The revised guidelines are entitled *Chesapeake Bay Critical Area Timber Harvest Plan Guidelines (June 2, 1999)*.
5. In 1996 the Department of Natural Resources published the DNR Lands Strategic Plan for Recreation and Conservation (August, 1996). This documents summarizes planning efforts throughout DNR's public lands system, identifying primary functions and issues of concern for each land unit, as well as recommendations for programming, land acquisition, conservation practices and recreation throughout the state. Regarding Pocomoke River State Forest, the plan indicates that "the forest includes cypress swamps along the Pocomoke River and is an integral link in the Pocomoke Scenic River Heritage Greenway connecting upstream urban parks and significant natural and ecologically sensitive sites. Limited use passive recreation is offered together with a demonstration of stewardship and forestry practices."

May 2000

Acknowledgements

A number of agencies and individuals made significant contributions to the development of the Ten Year Resource Management Plan for Pocomoke State Forest. The Department of Natural Resources particularly appreciates the efforts of the Pocomoke State Forest Advisory Committee who contributed their time and energy reviewing and commenting on the plan.

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Appendix A. Resource Inventory & Assessment

A. Introduction & History

Pocomoke State Forest is located in the south-western section of Worcester County and is unique in many ways that set it apart from Maryland's other State Forests. It is located in the Coastal Plain Physiographic Province. Elevation ranges from sea level to fifty five feet. The terrain is flat and drainage ranges from very poor in the swamps to very good at the higher elevations. The climate is generally temperate and humid. Seasonal temperatures are influenced by moderating effects of the Chesapeake Bay and Atlantic Ocean. Native stands of loblolly pine dominate uplands while cypress and other hydric species are found in the swamps and bottomlands.

Soils are composed of many classifications ranging from silt and clay loam to nearly pure sand. These soils developed from gravel, sand, silt, and clay transported by the Delaware, Susquehanna, and Potomac Rivers from the Allegheny Ridges.

Pocomoke State Forest was covered by ocean waters during the interglacial periods. The entire Forest is now drained by the Pocomoke River, which flows south-westerly into the Chesapeake Bay at the Maryland-Virginia boundary line.

Archaeological findings indicate that Indians inhabited the area dating from around 10-12000 BC. The various tribes present were part of the Indian linguistic family - the Algonquin Nations. Europeans began to colonize the area in the early 1600's. By the late 1600's an Indian reservation called "Askiminokonson" was set aside on the west side of the Pocomoke River near the present site of Snow Hill. Their town contained the largest Indian concentration in Maryland.

Primary pioneer activities included logging, trapping, fishing and farming. Early white settlers used the abundant natural resources for trade. By the late 1700's and early 1800's shipbuilding, brick manufacturing, the smelting of iron ore, and tobacco cultivation expanded.

The village of Furnace Town was located in parts of the present day State Forest. The ruins of Nassawango Iron Furnace are found adjacent to State Forest lands. The Civil War period and prohibition brought slaves, deserters, smugglers and bootleggers to the Forest area. The dark remote swamps of the Pocomoke River were an integral part of the underground railroad.

Before the establishment of the State Forest much of the land had been cleared for farming or used as farm woodlots. When the depression era hit many of the farmers fell on hard times, resulting in the acquisition of large amounts of land by the Federal Government. In the mid to late 1930's, two Civilian Conservation Camps were located on the Forest. The camp workers did considerable road and trail work, established boundary lines, provided for fire protection and suppression, planted trees and performed recreation improvements at Milburn Landing. At this same time the State was purchasing lands for management activities. In 1954, the Federal Government deeded its holdings to the State. In 1964, the Milburn Landing and Shad Landing areas were separated from the Forest and developed for intensive recreational use. The State continues to purchase in-holdings and other ecologically important areas along the Pocomoke River.

Current staffing at Pocomoke State Forest includes one Forest Manager, two Natural Resource Technicians (Forestry Option), and two Maintenance Assistants.

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Acquisition History - Pocomoke State Forest

Acquisition Date	Grantor	Acerage
1932	F.E. Hudson	740.000
1934	C.F. Chandler	403.230
1934	J.I. Couibourn	592.000
1940	S.K. Dennis	848.230
1941	H.W. Taylor	924.400
1954	U.S. Government	8,746.004
1962	M.C. Purnell	2.920
1962	G.E. Mason	7.790
1962	C. & M. Dryden	7.580
1964	L.D. Mason	126.270
1967	H. Bradford	25.500
1972	State Highway Adm.	10.410
1974	P.E. Cunningham	108.000
1976	The Nature Conservancy	32.072
1976	The Nature Conservancy	58.995
1977	K. Carter & R. Richardson	81.376
1978	The Nature Conservancy	1,429.540
1981	C.L. Timmons	31.491
1985	C.L. Timmons	11.226
1987	J.J. Mohr	55.289
1988	The Nature Conservancy (J. Onley)	383.000
1981	The Nature Conservancy (E. Jones)	313.390
1988	The Nature Conservancy (F. Jones)	150.000
1988	The Nature Conservancy (J. Jones)	140.000
1989	The Nature Conservancy (W. Mahan)	282.000
1989	The Nature Conservancy (W. Lewis)	120.000
1992	C.L. Timmons/B. Cary	6.302

Table A-1

Out-Conveyances - Pocomoke State Forest Land Transfers

Date	Assignor	Acres
1964	Shad Landing Area State Park	544.560
1964	Milburn Landing Area State Park	370.000
1974	State Highway Administration	40.620
1977	State Highway Administration	10.410

Table A-2

B. Soil Assessment

Productivity of forest soils is measured by the growth potential of trees. The potential productivity of a soil for trees is expressed as the site index, which is the average height, in feet, that the dominant trees can attain at age 50. Pine are the major tree species on the Forest and site indexes have only been determined for loblolly pine. Growing sites are based on three classes: Good sites are those on which a loblolly pine will attain 85+ feet in height at age 50. Average sites, which are the majority of sites, have indexes of between 60 to 84. Poor sites have site indexes below 60.

Soil Associations

A distinctive proportional pattern of soils in an area is termed an association. The soils have similar characteristics, parent material, and chemistry. Worcester County contains eight soil associations, seven of which are located on the Forest.

1. **Fallsington-Woodstown-Sassafras Association** - These soils are level and nearly level in most places, but they are steep in a few. They are poorly drained to well-drained soils that have a subsoil dominantly of sandy clay loam. This association occupies about 40 percent of the county.
2. **Mattapex-Matapeake-Othello Association** - In this association are deep soils that are well drained to poorly drained that have a subsoil dominantly of silty clay loam. These soils range from level to steep, but in most places they are level or gently sloping. This association occupies about 7 percent of the county.
3. **Othello-Fallsington-Portsmouth Association** - These soils are level and nearly level, poorly drained and very poorly drained that have a subsoil dominantly of sandy clay loam or silty clay loam. This association occupies about 21 percent of the county.
4. **Lakeland-Klej-Plummer Association** - In this association are level to steep, excessively drained to very poorly drained soils that are sand and loamy sand throughout. This association occupies about 6 percent of the county.
5. **Pocomoke-Rutlege-Plummer Association** - Level and nearly level, very poorly drained and poorly drained soils that have a subsoil of sandy loam and sandy clay loam or are underlain by loamy sand, sand, or both. This association occupies about 12 percent of the county.
6. **Muck Association** - Level, very poorly drained organic soils and alluvial land; subject to intermittent flooding. This association is on flats along the Pocomoke River and the adjoining swamp, and occupies 5 percent of the county.
7. **Tidal Marsh-Coastal Beach Association** - Dominantly level and nearly level, saline to brackish sediment; subject to flooding by tidal water. This association includes all of Assateague Island, Fenwick Island, and areas of tidal marsh. It occupies 8 percent of the county.

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Soil Association	State Forest Acreage
Pocomoke-Rutlege-Plummer	4,215
Muck	3,447
Fallsington-Woodstown-Sassafras	2,747
Mattapex-Matapeake-Othello	1,434
Lakeland-Klej-Plummer	1,272
Othello-Fallsington-Portsmouth	1,233
Tidal Marsh-Coastal Beaches	397
Total	14,745

Table B-1

Soil Series

Of the seven associations found in Pocomoke Forest, there are 20 different series. The soil series classification is based upon soil profiles of similar depth and composition. A profile is the sequence of natural layers, or horizons, in a soil. The soils within a series are broken down into individual soils, of which there are 44 different soils in Pocomoke State Forest.

The largest soil series in the Forest is Muck. Muck are black soils that are very poorly drained and extremely acid. A typical area of Muck is in heavily wooded areas along the Pocomoke River. Native trees include red maple, blackgum, sweetgum, bald cypress, and scattered atlantic white cedar. This soil is subject to flooding and not suitable to timber production.

Fallsington series is the second most common in the Forest. These deep, poorly drained soils have a high available moisture capacity and moderate nutrient content. Productivity for woodlands is good. The site index for loblolly pine ranges from 85 to 95. Equipment limitations are significant because of the high water table.

Lakeland series is the third most common in the Forest. These soils are level to steep, excessively drained, sandy soils on interfluvial flats and dunes. These soils are low in water-holding capacity and nutrient content. Productivity for woodlands is average. The site index for loblolly pine ranges from 75 to 85. Seedling mortality is moderate because of droughtiness.

Other principal soil series found in the Forest include Rutlege, Pocomoke, Plummer, Klej, Woodstown, and Matapeake. A complete description of each Soil type found in Pocomoke State Forest can be found in the Worcester County Soil Survey.

The soils on the Forest are all capable of growing trees (excluding tidal marsh which has a cover chiefly of grass and rushes, but a few shrubs and small trees will grow on these areas). The average productivity of State Forest soils are average to good for growing loblolly pine. Limitations are limited to wetness and droughtiness. Erosion hazard is nil due to the lack of slope.

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C. Timber/Vegetation Assessment

Introduction

Pocomoke State Forest is the smallest of the four State Forests in Maryland. Current acreage equals 14,745 acres. The Forest includes Southeastern forest types that are second growth and predominantly even-aged. Because of climate and drainage, a variety of plant life, prevalent in the south, are found in the Forest. In the swamp, bald cypress, Atlantic white cedar, red maple, black gum, swamp tupelo and green ash exist. The transition of swamp to upland has the greatest variety of species. In addition to the swamp vegetation yellow-poplar, sweetgum, and swamp oaks. Further inland and upland loblolly pine, shortleaf pine, Virginia pine and miscellaneous oaks and hickory can be found. A list of native trees identified in Pocomoke State Forest is given in Table C-3.

Many species of understory trees and shrubs also occur on the Forest and a list of known native species is also included in Table C-3. Some of the common understory trees and shrubs in the Forest include flowering dogwood, American holly, sweet-bay magnolia, sweet pepperbush, highbush blueberry, and mountain-laurel. There is limited growth of shrubs and herbs in the swamp because of poor light and drainage.

Herbaceous growth includes swamp rose mallow, saltmarsh bulrush, narrow-leaved cattail and broad-leaved arrowhead in salt marshes; water parsnip, sweetflag, jewelweed, cardinal flower, and tussock sedge in brackish to freshwater marshes; cinnamon fern, netted chain fern, carolina yelloweyed grass, and hop sedge in bottomland swamps; and crested yellow orchard, bracken fern, indian pipe and pink lady's slipper in pine/hardwood stands. Notable flora along ditch banks and open areas include sphagnum, day-lily, black-eyed susan, bluets, and butterfly weed.

When acquired much of the Forest was in a cut over condition or abandoned farmland. The subsequent natural regeneration and planting has resulted in a even-aged forest approximately 60 to 80 years old.

Forest Composition - Timber Types and Size Classes

Timber types utilized in the current forest inventory of Pocomoke State Forest:

Loblolly Pine-Hardwoods:

Comprised of a mixture of loblolly pine and hardwoods in which loblolly pine comprises the majority of the stocking (50%+) in the dominant position. Common associates include other southern pines, oak, gum, and maple. This type makes up 27% of the Forest.

Loblolly Pine:

Comprised of either pure stands or mixtures where pine stocking is greater than 75%. This type makes up 28 % of the Forest.

Swamp Hardwoods:

Bottomland or swamps that are comprised of a mixture of hardwoods with occasional bald cypress and Atlantic white cedar in low swampy areas. This type makes up 35 % of the Forest.

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Hardwood-Hard Pine:

Hardwood component is generally an oak species and the pine consists of loblolly, shortleaf, pond and Virginia. (SAF types 76, 78, 82). This type makes up 5 % of the Forest.

Size classes refer to the size (expressed as diameter at breast height - DBH) of the average trees in the stand.

Forest are:

Trees less than 5.0 inches DBH

Poletimber:

Trees 5.0" - 9.0" DBH (softwoods)

5.0" -11.0" DBH (hardwoods)

Sawtimber:

Trees 9.0" - 16.0+" DBH (softwoods)

11.0" - 16.0+" DBH (hardwoods)

As indicated (page 3) the potential productivity of a site for growing trees is expressed as the site index, which is the average height, in feet, that the dominant trees will reach in 50 years. For Pocomoke State Forest, site indexes have been determined for loblolly pine. Three site classes of productivity are used on the Forest.

Poor Sites - site indexes less than 60

Average Sites - site indexes 60 to 84

Good Sites - site indexes 85+

Forest Types by Size Class and Site Index

(based on 1989 inventory)

Forest Type	Size Class	Site Index	Acres	Differing Moisture
Pine	Sawtimber	85+	920	6.9
Pine	Sawtimber	<84	1,259	9.4
Pine/Hardwood	Sawtimber	all	2,868	21.5
Hardwood/Pine	Sawtimber	all	508	3.8
Pine	Pole	85+	494	3.7
Pine	Pole	<84	502	3.8
Pine/Hardwood & Hardwood/Pine	Pole	all	737	5.5
Pine & Pine/Hdwd	Seed & Sapling	---	1,503	11.3
Swamp Hardwoods	all	all	4,122	30.9
Other*			443	3.2
TOTAL			13,356	100%

*Other includes wildlife food plots, seed orchards, research areas, marsh lands, and power line right-of-ways.

Table C - 1

Note: An additional 43.0 acres of Pine/Hardwood (sawtimber), 40.0 acres of Hardwood/Pine (sawtimber), 1,023 acres of Swamp Hardwoods, and 283 acres of marsh land have been acquired since the 1989 inventory.

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Insect, Disease & Catastrophic Loss

the pine bark beetle, specifically the southern pine bark beetle (SPB). It attacks trees of pulpwood and sawtimber size, which it kills by girdling the tree. In addition, the beetle introduces a bluestain fungus into the tree which hastens its death. Infestations have been recorded since the early 1900's. This insect thrives in the warm climate of the Lower Eastern Shore. Cyclic infestations explode into full scale epidemics when excessively wet or dry weather conditions and mild winters are experienced. The presence of fully or over-stocked stands having declining growth rates also contributes to beetle outbreaks. Large scale infestations have a significant effect on normal timber harvesting schedules. In addition to causing an immediate loss in growth on the forest, the presence of vast areas of dead and dying timber creates a safety and fire hazard.

Other insects and diseases of concern include pine sawflies, pine tip moths, reproduction weevils, gypsy moths, forest tent caterpillars, annosus root rot, and fusiform rust.

Maintenance or improvement in tree vigor is the basis of prevention. Failure to systematically manage invites favorable conditions for insects and disease to thrive.

Other pests and damaging agents include deer browsing, high winds, tornadoes, hurricanes, fire, and air pollution. As a result of cutting and a severe drought in the early 1930's a catastrophic fire occurred destroying peat accumulation and parts of the forest. Hurricane force winds have resulted in wind-throw and branch and trunk breakage. Air pollutant impacts are complex and many physical factors can affect a plant's exposure.

Volume Estimates

The amount of wood in a tree or log is expressed in various units. Cubic feet, cords, pounds and board feet are the common units. The board-foot is the basis for volume of trees classified as sawtimber. The cord is the basis for pulpwood.

The volume growth of the Forest continues to exceed the volume harvested. In 1949 total sawtimber volume was 33 million board-feet. In 1989 when the last growth estimates were made, the total volume was 105 million board-feet. In 1949 pine sawtimber volume was 23 million board-feet. In 1989 the total pine sawtimber volume was 60 million board-feet. This substantial increase in volume can be attributed to the extensive cutting that occurred prior to state ownership (most stands are now maturing at the same time), and the conservative cutting practiced by the State.

Rotation Ages

Rotation is the period of years between regeneration cuts in a forest stand. Rotations are determined by silvicultural factors such as when the timber becomes merchantable and before deterioration becomes excessive, and technical factors such as the age of timber required to produce a designated product.

Rotation ages vary with the site index. The more productive the site, the faster larger trees can be grown. Site productivity is determined by the height a tree grows by age 50. Loblolly pine rotations range from 30 to 60 years.

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The following table represents the acres and volumes of sawtimber harvested in the 40 year period to 1993.

Timber Harvesting History on Pocomoke State Forest		
Year	Acres	Volume (Bd. Ft.)
1953	35.0	258,348
1955	27.5	330,597
1956	----	-----
1957	----	-----
1958	----	-----
1959	42.0	927,700
1960	66.5	567,900
1961	50.7	406,000
1962	116.5	518,000
1963	39.0	214,700
1964	65.0	275,000
1965	41.1	353,000
1966	78.8	839,478
1967	56.9	583,700
1968	58.5	624,000
1969	57.2	594,000
1970	58.6	1,066,000
1971	441.5	3,842,000
1972	49.8	841,451
1973	43.0	775,000
1974	80.3	1,362,000
1975	----	-----
1976	46.6	844,000
1977	74.9	1,080,000
1978	98.7	1,422,000
1979	110.3	1,722,000
1980	170.0	2,304,300
1981	119.1	1,695,000
1982	54.1	759,000
1983	55.1	743,000
1984	86.2	1,425,000
1985	86.2	1,200,000
1986	133.4	1,588,000
1987	61.3	2,801,672
1988	95.4	1,469,992
1989	47.0	689,119
1990	43.0	660,582
1991	41.5	688,450
1992	35.5	533,880
1993	352.2	6,422,196
	3,318.40	42,427,065

Table C-2

*Average # acres
harvested per year =
81*

*Average # board-feet
harvested per year =
1,034,806*

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Management Practices

Loblolly pine is the principal species managed for on Pocomoke State Forest. It is an intolerant tree, meaning it requires direct sunlight to grow and develop. For this reason even-aged silvicultural practices are used to manage the loblolly pine. This entails harvesting the entire stand in one cutting or a series of cuttings, which extend over a relatively short portion of the rotation. Reproduction is obtained artificially or by natural seeding. Loblolly pine grows well on a wide range of soil types with differing moisture conditions. It will form pure stands or be intermixed with other pine and tolerant hardwoods. If no management practices occurred the pine would eventually be replaced by hardwoods through natural succession.

Trees and shrubs of the Pocomoke State Forest

Table C-3

Native Trees	
Scientific Name	Common Name
<i>Acer rubrum</i>	Red Maple
<i>Amelanchier arborea</i>	Serviceberry
<i>Betula nigra</i>	River Birch
<i>Carpinus caroliniana</i>	American Hornbeam
<i>Carya tomentosa</i>	Mockernut Hickory
<i>Carya glabra</i>	Pignut Hickory
<i>Chamaecyparis thyoides</i>	Atlantic White Cedar
<i>Cornus florida</i>	Flowering Dogwood
<i>Diospyros virginiana</i>	Persimmon
<i>Fagus grandifolia</i>	American Beech
<i>Fraxinus pennsylvanica</i>	Green Ash
<i>Hamamelis virginiana</i>	Witch-Hazel
<i>Ilex opaca</i>	American Holly
<i>Juniperus virginiana</i>	Eastern Redcedar
<i>Liriodendron tulipifera</i>	Yellow-poplar
<i>Liquidambar styraciflua</i>	Sweetgum
<i>Magnolia virginiana</i>	Sweet-bay Magnolia
<i>Nyssa sylvatica</i>	Blackgum
<i>Nyssa sylvatica</i> var. <i>biflora</i>	Swamp Tupelo
<i>Persea borbonia</i>	Red Bay
<i>Pinus echinata</i>	Shortleaf Pine
<i>Pinus serotina</i>	Pond Pine
<i>Pinus taeda</i>	Loblolly Pine
<i>Pinus virginiana</i>	Virginia Pine
<i>Populus heterophylla</i>	Swamp Cottonwood
<i>Prunus serotina</i>	Black Cherry
<i>Quercus alba</i>	White Oak
<i>Quercus bicolor</i>	Swamp White Oak
<i>Quercus falcata</i>	Southern Red Oak
<i>Quercus marilandica</i>	Black-jack Oak
<i>Quercus michauxii</i>	Swamp Chestnut Oak

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Native Trees cont.

<i>Quercus phellos</i>	Willow Oak
<i>Quercus rubra</i>	Northern Red Oak
<i>Quercus stellata</i>	Post Oak
<i>Robinia pseudo-acacia</i>	Black Locust
<i>Sassafras albidum</i>	Sassafras
<i>Taxodium distichum</i>	Bald Cypress

Native Shrubs/Vines

Table C-3

Scientific Name	Common Name
<i>Alnus serrulata</i>	Smooth Alder
<i>Aralia spinosa</i>	Hercules' Club
<i>Bignonia capreolata</i>	Crossvine
<i>Campsis radicans</i>	Trumpet-creeper
<i>Cephalanthus occidentalis</i>	Button-bush
<i>Chionanthus virginicus</i>	Fringe-tree
<i>Clethra alnifolia</i>	Sweet Pepperbush
<i>Euonymus americanus</i>	Strawberry Bush
<i>Gaylussacia baccata</i>	Black Huckleberry
<i>Ilex laevigata</i>	Winterberry
<i>Ilex glabra</i>	Inkeberry
<i>Ilex verticillata</i>	Black Alder
<i>Kalmia latifolia</i>	Mountain-laurel
<i>Myrica cerifera</i>	Wax-myrtle
<i>Myrica pennsylvania</i>	Bayberry
<i>Parthenocissus quinquefolia</i>	Virginia Creeper
<i>Rhododendron viscosum</i>	White Swamp Azalea
<i>Rhododendron atlanticum</i>	Dwarf Azalea
<i>Rhododendron canescens</i>	Sweet Azzlea
<i>Rhus copallina</i>	Dwarf Sumac
<i>Rhus glabra</i>	Smooth Sumac
<i>Rhus toxicodendron</i>	Poison Oak
<i>Rosa palustris</i>	Swamp Rose
<i>Smilax bona-nox</i>	Bullbrier
<i>Smilax glauca</i>	Glaucous Greenbrier
<i>Smilax laurifolia</i>	Laurel-leaved Greenbrier
<i>Smilax rotundifolia</i>	Common Greenbrier
<i>Smilax walteri</i>	Red-berried Greenbrier
<i>Salix nigra</i>	Black Willow
<i>Toxicodendron radicans</i>	Poison Ivy
<i>Vaccinium corymbosum</i>	Highbush Blueberry
<i>Viburnum spp.</i>	Viburnum species
<i>Vitis spp.</i>	Grape

Pocomoke State Forest

State of Maryland Rare, Threatened or Endangered Plants Found within the
Pocomoke State Forest:

Table C-4

Rare, Threatened and Endangered Flora

Scientific Name	Common Name	Status
<i>Aeistida lanosa</i>	Woolly three-awn	Endangered
<i>Cardamine longii</i>	Long's bittecross	Endangered
<i>Carex hyalinolepis</i>	Shoreline sedge	Threatened
<i>Carex seorsa</i>	Weak stellate sedge	Rare
<i>Desmodium strictum</i>	Stiff tick-trefoil	Endangered
<i>Digitaria villosa</i>	Shaggy crabgrass	Endangered
<i>Drosera capillaris</i>	Pink sundew	Endangered
<i>Elatine americana</i>	American waterwort	Endangered
<i>Erianthis contortus</i>	Bent-awn plumegrass	Endangered
<i>Eriocaulon parkeri</i>	Parker's pipewort	Threatened
<i>Hypericum denticulatum</i>	Coppery St. John's wort	Endangered
<i>Leersia hexandra</i>	Club-headed cutgrass	Endangered
<i>Linum intercursum</i>	Sandplain flax	Endangered
<i>Listera australis</i>	Southern twayblade	Rare
<i>Lobelia canbyi</i>	Candy's lobelia	Endangered
<i>Lysimachia hybrida</i>	Lowland loosestrife	Endangered
<i>Nymphoides cordata</i>	Floating-heart	Endangered
<i>Oldenlandia uniflora</i>	Clustered bluets	Rare
<i>Panicum commonsianum</i>	Commons' panicgrass	Rare
<i>Panicum oligosanthos</i>	Few-flowered panicgrass	Endangered
<i>Persea borbonia</i>	Red bay	Endangered
<i>Platanthera cristata</i>	Crested yellow orchid	Threatened
<i>Polygala cruciata</i>	Cross-leaved milkwort	Threatened
<i>Rhynchosia tomentosa</i>	Hairy snoutbean	Endangered
<i>Rhynchospora filifolia</i>	Thread-leaved beakrush	Endangered
<i>Sacciolepis striata</i>	Sacciolepis	Endangered
<i>Scleria reticularis</i>	Red-berried greenbrier	Rare
<i>Solidago speciosa</i>	Showy goldenrod	Endangered
<i>Symplocos tinctoria</i>	Sweetleaf	Rare
<i>Trichostema setaceum</i>	Narrow-leaved bluecurls	Rare
<i>Trillium pusillum</i>	Dwarf trillium	Threatened
<i>Utricularia inflata</i>	Swollen bladderwort	Endangered
<i>Zizaniopsis miliacea</i>	Southern wildrice	Endangered

The Maryland Natural Heritage Program has identified a number of Rare, Threatened or Endangered plants within Pocomoke State Forest. These sites are afforded protection under COMAR 08.03.08.

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D. Fishery Assessment

The fisheries resources of Pocomoke State Forest can be divided into three general categories:

1) Anadromous and semi-anadromous fish species which spawn in the Pocomoke River and its tributaries but spend their adult lives in the Atlantic Ocean or Chesapeake Bay (semi-anadromous species: white perch and yellow perch) and which provide seasonal recreational fishing opportunities.

2) Warmwater game and panfish species that provide recreational fishing opportunities.

3) Non-gamefish species that are not sought by anglers but are important indicators of water quality.

Anadromous and Semi-anadromous Fishery

The Pocomoke River and its tributaries are considered to be suitable spawning habitat for anadromous and semi-anadromous fish species (see Table D-6). Current stocks of the anadromous American shad - *Alosa sapidissima*, and hickory shad - *Alosa mediocris* in the Pocomoke River basin are at very low levels of abundance but appear to be increasing. The taking of American shad and hickory shad is currently prohibited in Maryland. The anadromous river herring species in the Pocomoke River are characterized as remnant populations that appear to be declining (see Table D-5). The recreational and commercial fishery for herring in Maryland has declined considerably since the 1970's. The Pocomoke River is a spawning area for striped bass. Prior to the 1985 moratorium on the taking of striped bass in Maryland, stocks of this commercially and recreationally important finfish had undergone a serious decline. The moratorium allowed stocks to recover to the point that a limited commercial and recreational fishery in the Chesapeake Bay has been allowed since 1990-91. The semi-anadromous white perch and yellow perch support important commercial and recreational fisheries in Maryland. Under current regulations there is no minimum size or creel limits on white perch if caught with a hook and line. Current regulations on yellow perch place an 8.5" minimum size limit and a creel limit of 5 per person per day.

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Warmwater Gamefish and Panfish Fishery

The major water bodies within or adjoining the Pocomoke State Forest are considered to be warmwater fisheries habitat. Northern largemouth bass -*Micropterus salmoides salmoides*, are the predominate gamefish species and the Freshwater Fisheries Division directs management activities towards enhancing recreational fishing for this species. Other warmwater fish species popular with anglers include bluegill and pumpkinseed sunfish, catfish, carp, crappie, chain pickerel, and longnose gar. The fishery resource is very popular with local, state, and out-of-state anglers and numerous bass fishing tournaments are held annually. Current regulations in non-tidal portions include a 12 inch minimum size limit, a five fish daily creel limit, and a closed season from March 1 through June 15. Current regulation in tidal portions include a 12 inch minimum size limit except during the period from March 1 through June 15 when the minimum size limit increases to 15 inches and during all times a daily creel limit of five fish per person per day. For chain pickerel, current regulations specify a minimum size limit of 14 inches and a daily creel limit of five fish.

Electrofishing and seining surveys were conducted in 1987, 1991 and 1993 to monitor the status of the largemouth bass fishery (see Table D-5). Findings indicate that bass growth rates are slower than in other Maryland tidal rivers and that there has been a decline in the number of bass 15 inches or longer. Water quality monitoring in the fall of 1993 recorded pH and dissolved oxygen levels that for several samples were below the minimum requirements for successful warmwater fish growth and reproduction. As a result of these findings several studies are being conducted to determine the status of the fishery. Forage fish abundance and availability to predators is being recorded during electrofishing surveys and survival and growth of young bass is being examined from the stocking of 10,542 microtagged fingerling largemouth bass in June 1993 and 30,000 fingerling bass in June 1994. Also the genetic makeup of the bass population will be studied beginning in 1994 to determine if the bass population has been mixed with genes from the Florida subspecies of largemouth bass - *Micropterus salmoides floridanus*.

Associated Fish Species

Fish species diversity is an excellent means of monitoring water quality in Pocomoke State Forest. Intensive sampling of fish populations within the Pocomoke River basin and Pocomoke State Forest has been very limited. A list of fish species collected in Pocomoke State Forest is contained in Table D-1. Freshwater fish species composition for the two streams surveyed to date within the forest are shown in Tables D-2 and D-3. For optimal fish habitat and water quality, watershed management must include minimal sediment loading by protecting and maintaining vegetated banks and buffers, by implementing strict sediment controls on all road construction and maintenance activities, agricultural activities, and timber operations; and ensure that any instream construction activities do not result in any blockages to the passage of aquatic life.

As part of the Maryland Biological Stream Survey which began in March 1994, selected non-tidal first, second and third order streams within the Pocomoke River basin will be surveyed during the next three years to assess the current status of fish and benthic macroinvertebrates. In addition, presence/absence data will be collected on reptiles and amphibians.

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D. Fishery Assessment

Fish Collected from Water Bodies Within Pocomoke State Forest	
Scientific Name	Common Name
<i>Alosa sapidissima</i>	American shad
<i>Alosa mediocris</i>	Hickory shad
<i>Alosa pseudoharengus</i>	Alewife herring
<i>Alosa aestivalis</i>	Blueback herring
<i>Morone saxatilis</i>	Striped bass
<i>Morone americana</i>	White perch
<i>Perca flavescens</i>	Yellow Perch
<i>Anguilla rostrata</i>	American eel
<i>Micropterus salmoides</i>	Largemouth bass
<i>Esox niger</i>	Chain pickerel
<i>Esox americanus</i>	Redfin pickerel
<i>Ictalurus catus</i>	White catfish
<i>Ictalurus punctatus</i>	Channel catfish
<i>Ictalurus natalis</i>	Yellow bullhead
<i>Ictalurus nebulosus</i>	Brown bullhead
<i>Lepomis macrochirus</i>	Pumpkinseed sunfish
<i>Lepomis gibbosus</i>	Pumpkinseed sunfish
<i>Enneacanthus obesus</i>	Banded sunfish
<i>Enneacanthus gloriosus</i>	Bluespotted sunfish
<i>Acantharcus pomotis</i>	Mud sunfish
<i>Pomoxis nigromaculatus</i>	Black crappie
<i>Potemigonus erysoleucas</i>	Golden shiner
<i>Aphredoderus sayanus</i>	Pirate perch
<i>Umbra pygmaea</i>	Eastern mudminnow
<i>Lepisosteus osseus</i>	Longnose gar
<i>Dorosoma cepianum</i>	Gizzard shad
<i>Cyprinus carpio</i>	Common carp

Table D-1

Fish Species Collected from Mattaponi Creek, July 1991	
Common Name	Number
Yellow bullhead	1
American eel	6
Eastern mudminnow	31
Chain pickerel	1
Bluespotted sunfish	2
Redfin pickerel	7
Pirate perch	7
Banded sunfish	5
Mud sunfish	1

Table D-2

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Table D-3

Fish Species Collected from Pusey Branch, August 1975	
Common Name	Number
Yellow bullhead	1
Brown bullhead	12
American eel	1
Eastern mudminnow	5
Redfin pickerel	1
Pirate perch	7
Banded sunfish	2
Mud sunfish	1

Table D-4

Waterways Found Within Pocomoke State Forest	
Waterway	Miles Within PSF
Pocomoke River	13.2
Acquango Branch	0.4
Bachelors Branch	0.2
Corbin Branch	1.0
Corkers Creek	2.2
Cottingham Mill Run	1.1
Dividing Creek	1.2
Hardship Branch	0.4
Mattaponi Creek	1.0
Millburn Branch	1.5
Miller Branch	2.0
Milville Creek	1.0
Pilchard Creek	0.1
Pusey Branch	3.3
Tilghman Race	0.6
Willow Grove Creek	1.0

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Catch-per-unit-effort (CPUE) for Largemouth Bass (individuals/15 min electrofishing) and Herring (mean log_e individuals/5 min trawl +1)

Common Name	Total No.	CPUE/Adult	CPUE/Juvenile	Year
Largemouth bass	90	12.86		1987
	152	19.0	3.8	1991
	111	11.1	3.1	1993
Alewife herring	1		0.3	1985
	154		2.7	1986
	395		1.4	1987
	19		1.2	1988
	11		1.2	1989
	2		1.0	1990
Blueback herring	268		1.9	1985
	340		1.7	1986
	10783		1.6	1987
	129		4.5	1988
	152		1.6	1989
	12		1.1	1990

Table D-5.

Species of Anadromous and Semi-anadromous Fish Collected from Water Bodies in PSF, 1969-70 & 1986.

Table D-6.

Location	Striped bass	White perch	Yellow perch	Herring species	Alewife herring	Blueback herring
Pocomoke R.	X	0	0	0		X
Bachelors BR.				0		
Corbins Br.					X	
Corkers Ck.		X			X	
Dividing Ck.				0	X	
Miller Br.				0	X	
Pilchard Ck.		X/0			X	
Pusey Br.				0	X	
Tilghman			0	0		

KEY: 0 = Egg and/or larvae collected
X = Adult fish collected

E. Water Resources Assessment

Introduction

Worcester County is located in the southern part of the Eastern Shore, in the southeastern corner of the State. Worcester County has an area of 586.92 square miles, of which 482.54 square miles is land and 104.38 square miles is water. Essentially this area is low lying, very gently rolling plain. The County has two major drainage areas: the Pocomoke River and Sound, with its tributaries, Dividing Creek and Nassawango Creek; and the Atlantic Ocean watershed, composed of St. Martin River and numerous small creeks which run into Chincoteague, Sinepuxent, and Assawoman Bays behind the barrier islands; which in turn discharge by tidal flow through the Chincoteague and Ocean City inlets to the open sea.

The Hydrologic Cycle

Nature replenishes surface and ground water supplies through a mechanism known as the hydrologic cycle. This process consists of the endless recirculation of water from the atmosphere to the earth and back to the atmosphere. Precipitation falls on the land and drains into rivers, lakes and oceans by way of stream runoff and ground-water flow. Some precipitation falls directly onto the bodies of water.

Rainfall, which averages 45 inches per year, is fairly evenly distributed through the year although the heaviest precipitation occurs when it is most needed during the growing season in July, August, and September. Autumn is the driest part of the year with October the driest month. The rain and the light snow that fall during the winter and spring recharge the water table, because evapotranspiration is at a minimum during these seasons and a larger percentage of the precipitation percolates down to the water table.

Water is cycled back to the atmosphere by evaporation from land and water surfaces and transpiration from vegetation. Of the precipitation that falls each year, an average of 64% is evaporated or transpired back to the atmosphere from the land through the land and vegetation. The remainder is either absorbed through the land surface to become ground water or runs off directly into streams.

The rate at which water moves through this cycle is affected by a variety of natural conditions and land uses. Man's activities affect the natural pathways of the hydrologic cycle, particularly surface and ground water flow. Because Pocomoke State Forest is relatively undisturbed, runoff and base flow characteristics of the Forest are basically dictated by the geology of the area.

The Geologic Column

Pocomoke State Forest lies entirely in the Coastal Plain. The Coastal Plain sediments of Maryland form a thick clastic wedge of generally unconsolidated, eastward dipping sediments that thicken from a few feet at the Fall Line to over 7,700 feet at Ocean City. Off shore, the wedge of Coastal Plain sediments continues to thicken eastward to the continental slope.

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In describing the water-bearing properties of the above sediments, the terms aquifer and aquifer system are used. An aquifer is a body of earth material capable of yielding significant quantities of water to wells and springs. An aquifer system is a heterogeneous body of material that comprises two or more aquifers separated, at least locally, by confining units that impede ground-water movement but do not greatly affect the regional hydraulic continuity of the system. The aquifers and aquifer systems present in Pocomoke State Forest area are the Columbia aquifer, the Pocomoke aquifer, the Manokin aquifer, the Choptank aquifer, the Piney Point aquifer, the Paleocene aquifer system and the Potomac aquifer system.

Description of Formations / Ground Water Use

Columbia Aquifer

The Columbia Aquifer is the water table aquifer, and belongs to the Salisbury Formation Geological Unit and the Columbia Group. It is principally made up of Beaverdam Sand. The Beaverdam sand is an extensive aquifer. Most of the large-capacity wells derive their water from the Beaverdam sand in conjunction with the underlying red gravelly sand.

Pocomoke Aquifer

The Pocomoke aquifer, which is part of the Yorktown and Eastover Formations (undifferentiated), is an extensive water-bearing sand. Recharge to the aquifer occurs primarily where it directly underlies the surficial aquifer system. This is in a band, one to five miles wide that travels southwest to northeast through Somerset County. The Pocomoke aquifer may receive additional ground water recharge from leakage from the surficial aquifer system in the vicinity of Costen. The Pocomoke aquifer supplies water for domestic, irrigation, and industrial use in Somerset County and is the sole source of water for Pocomoke City.

Manokin Aquifer

The Manokin aquifer subcrops beneath the Chesapeake Bay west of Deal Island and trends northeast through Dorchester and Wicomico Counties into Delaware near Seaford. The top of the aquifer slopes southeast at about 9 ft/mi, with the altitude of the top of the unit ranging from about 75 ft. below sea level at Deal Island to 360 ft. at Ocean City. The Manokin aquifer is extensively used throughout Worcester County, except in the Pocomoke City area where the chloride concentrations in the aquifer exceed the 250 mg/L SMCL of the U.S. Environmental Protection Agency.

St. Marys Formation

The St. Marys Formation separates the Manokin aquifer from the underlying Choptank aquifer. This unit is found throughout the lower Eastern Shore of Mary-

Pocomoke State Forest

land. The St. Marys is a clayey, thick, relatively impermeable, but somewhat leaky confining unit. Pumping water wells may induce residual brackish water from the St. Marys Formation into the Manokin aquifer.

The St. Marys Formation underlies the middle and lower parts of the Delmarva Peninsula. The top of the formation occurs at about 225 ft below sea level on Smith Island, and dips to the east at about 10 ft/mi. Based on limited data, the formation appears to thicken from about 70 ft at Smith Island eastward to 150 ft at Rehobeth. Although the formation is capable of supplying adequate quantities of water to wells, chloride concentrations in excess of 900 mg/L and dissolved solids in excess of 3,000 mg/L preclude its use as a source of water for most purposes.

Choptank aquifer

The Choptank aquifer, which consists of the Choptank Formation, is composed of gray, coarse- to fine-grained sand, with shell beds and lenses of gray clay. The top of the aquifer occurs at about 225 feet below sea level on Smith Island, and dips to the east at about 10 ft/mi. Based on limited data, the aquifer appears to thicken from about 70 feet at Smith Island eastward to 150 feet at Rehobeth.

Although the aquifer is capable of supplying adequate quantities of water to wells, chloride concentrations in excess of 900 mg/L and dissolved solids in excess of 3,000 mg/L preclude its use as a source of water for most purposes.

Calvert Formation

A confining unit consisting of the Calvert Formation separates the Choptank and Piney Point aquifers. The unit appears to be laterally continuous and is up to 400 ft thick. The fine-grained nature, lateral continuity, and thickness of the unit probably allow little water to exchange between the Choptank aquifer and the Piney Point aquifer.

Piney Point AquiferX = Adult fish collected

The Piney Point aquifer is in the Piney Point Formation and is predominantly green, fine- to medium-grained glauconitic sand and gray, coarse-grained quartzose sand in a greenish gray clay matrix. It occurs at depths ranging from 580 ft below land surface on Deal Island to 950 ft below land surface at Rehobeth. The thickness of the aquifer ranges from 50 ft at Rehobeth to 85 ft on Smith Island. The best available information indicates that the Piney Point formation has turned brackish up dip of the project area, and may not be water bearing in Worcester County.

Paleocene Aquifer System

Underlying the Piney Point aquifer is a series of aquifers and confining units collectively called the Paleocene Aquifer System. The aquifers generally consist of fine- to medium-grained glauconitic and quartzose sand, whereas, the confining units are generally composed of gray to green clay and sandy clay. The aquifer system is encountered at depths of about 720 ft on Smith Island and about 800 ft at Crisfield. Total thickness of the system is about 90 ft on Smith Island and about 175 ft near Crisfield. In those wells that obtain water from the Paleocene Aquifer System, screens are usually set in the lower sands of the aquifer system. It is not known whether the Paleocene Aquifer System extends into Worcester County.

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Potomac Aquifer System

The deepest hydrogeologic units in the coastal plain sediments form the aquifer system of the Potomac Group. The top of the Potomac aquifer system is encountered at about 820 ft below land surface on Smith Island and at about 1,000 ft below land surface near Crisfield. Data indicates that the Potomac Group is over 3,000 ft thick at Crisfield, but only the sands in the upper several hundred feet of the unit are thought to contain potable water. It does appear from data from a well near Jenkins Bridge, Virginia that east of Crisfield the Potomac aquifer system becomes brackish.

Surface Water

Pocomoke State Forest incorporates the lower part of the Pocomoke River within its boundaries. The Pocomoke River flows southward and drains into the lower Chesapeake Bay. The Pocomoke River is tidal in this area.

Owing to the flat terrain there are many swampy areas having either brackish or fresh water. Several streams either originate in or flow through swamps. The streams are rather sluggish and much less flashy than those draining areas having more topographic relief.

Both surface runoff and ground water flow contribute to surface streamflow. During periods of rainfall or rapid snow melt, direct runoff greatly increases the volume of surface flows. Ground water, however, sustains the flow of surface streams in two ways. First, visible springs, located outside of stream channels, discharge excess ground water at flow rates which vary with the seasons and precipitation. These discharges are steadier and more dependable than direct runoff. Second, portions of many stream channels are often below the top of the local ground water table. At the times and in the places that the water table is higher than a stream bed, water seeps directly from the ground into the stream channel, supplementing surface flow. The portion of channel flow derived from ground water is known as stream base flow.

The Pocomoke River is tidal for 36 miles and maintains a uniform width ranging from 400 to 600 feet and a depth ranging from seven to 29 feet. Above Porters Crossing, the river essentially loses its free-flowing character as it meanders through bottomland swamp or unnatural man-made drainage ditches. Below Snow Hill, The Pocomoke widens into a beautiful free-flowing river.

Bald Cypress Swamps, the northernmost along the Atlantic Coast, and other wet areas border the entire length of the Pocomoke. The river and these swamps provide the meeting ground for major southern and northern plant species.

The Pocomoke enjoys high water quality except for areas around Pocomoke City and Snow Hill where minor pollution exists.

Pocomoke State Forest

Water Appropriation

State water appropriation and use permits are required for all water withdrawals in Maryland except for farming use under 10,000 gallons per day (gpd), individual domestic use and water uses.

Snow Hill

Snow Hill is located north of Pocomoke State Forest on the Pocomoke River. The municipality owns the water service and serves approximately 2200 residents. There are three production wells screened in the Manokin aquifer. The current average daily water demand is approximately 350,000 gallons. Storage for the City's water supply is accomplished in a 200,000 gallon elevated water storage tank. Each well has its own treatment system. The treatment process consists of chlorination and fluoridation.

The well production of water to serve the residents appears to be sufficient at the current 1500 gpm total. The existing storage tank, however, is insufficient to supply adequate storage capacity for fire protection and emergency water supply.

The City of Snow Hill currently has no plan to extend the municipal system to areas adjacent to the City.

Pocomoke City

The Pocomoke City Municipal Water System is owned and operated by Pocomoke City, and services approximately 4,100 residents. Pocomoke City is south of Pocomoke State Forest on the Pocomoke River. The system includes two watersupply wells screened in the Pocomoke aquifer, two water treatment plants, two elevated storage tanks and a water distribution system.

The Pocomoke City Water System is considered to be inadequate, due to the loss of supply sources and unacceptable levels of iron after treatment. Iron bacteria in the distribution network also requires attention.

The City has experienced an increased demand for water usage especially at the southern end and in the commercial corridor along U.S. Route 13. The City is also considering expansion of the utility to bordering areas of the community.

In 1992, the City was experiencing a shortfall of ground water supply due to a drop in production at the 6th Street well. On an emergency basis, one Pocomoke Aquifer well was installed on City property at Clarke Avenue and Oak Street and connected to the system. This well is one of three wells to be installed along Clarke Avenue.

A new Manokin Aquifer well and treatment facility is also proposed along U.S. Route 13 at the southern end of Town.

Other Major Appropriators:

*Nassawango County Club
9500 gpd*

Milburn Landing S.P. 2500 gpd

Shad Landing S.P. 1500 gpd

*Various farm permits for
summer irrigation*

Pocomoke State Forest

Figure E - 1 Hydrogeologic Section

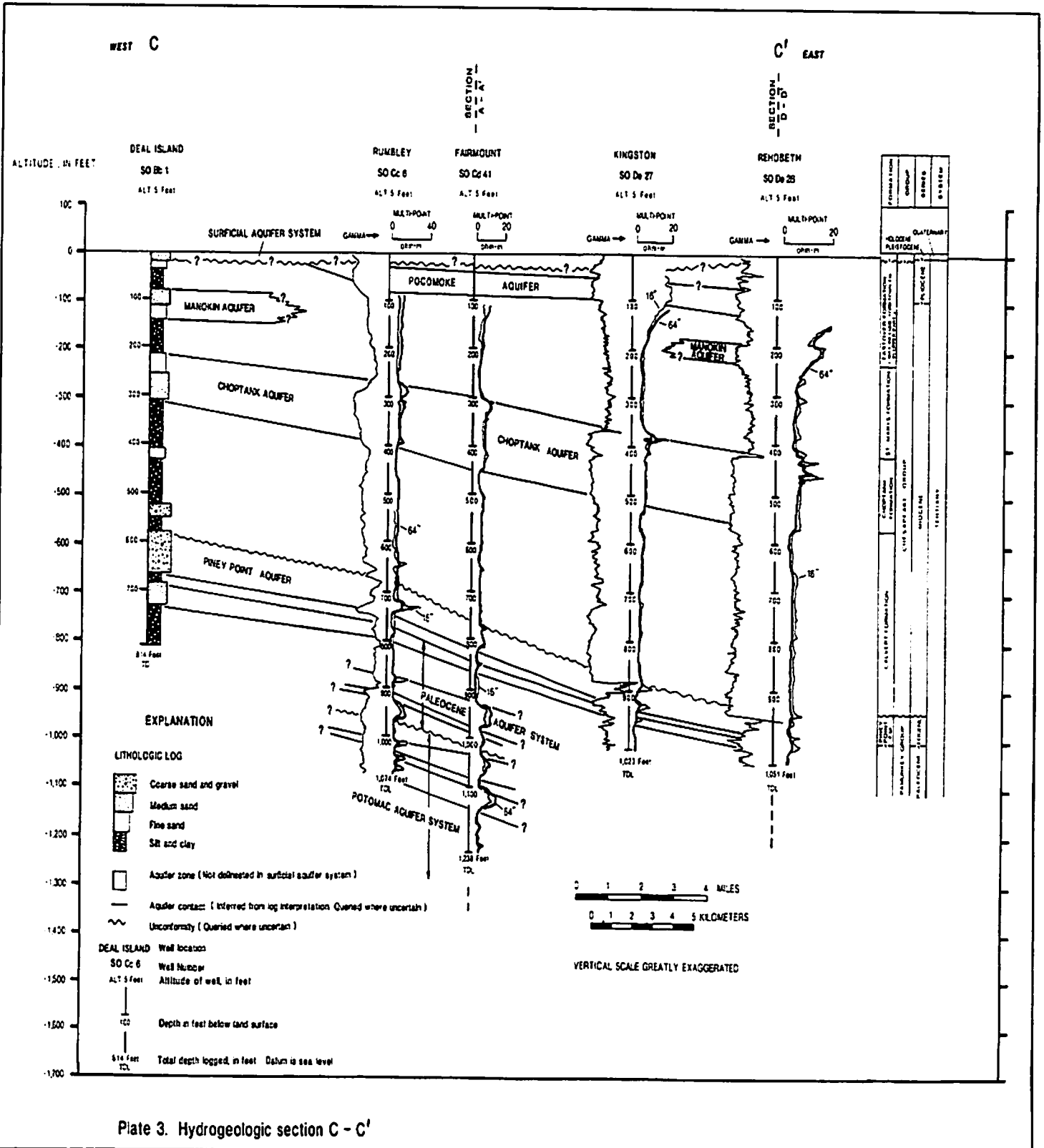


Plate 3. Hydrogeologic section C - C'

F. Nontidal Wetlands Assessment

Introduction

Nontidal wetlands are freshwater areas that are covered by water or have saturated soils for at least brief periods during the growing season. The term "nontidal wetlands" encompasses a variety of environments such as marshes and swamps, bottomland hardwood forests, wet meadows, springs and seeps, inland bogs and the shallow areas of lakes and ponds. Figure F-1 below shows nontidal wetland areas found along rivers, lakes, and streams, as shallow depressions surrounded by upland, and on slopes associated with ground water seepage areas and springs.

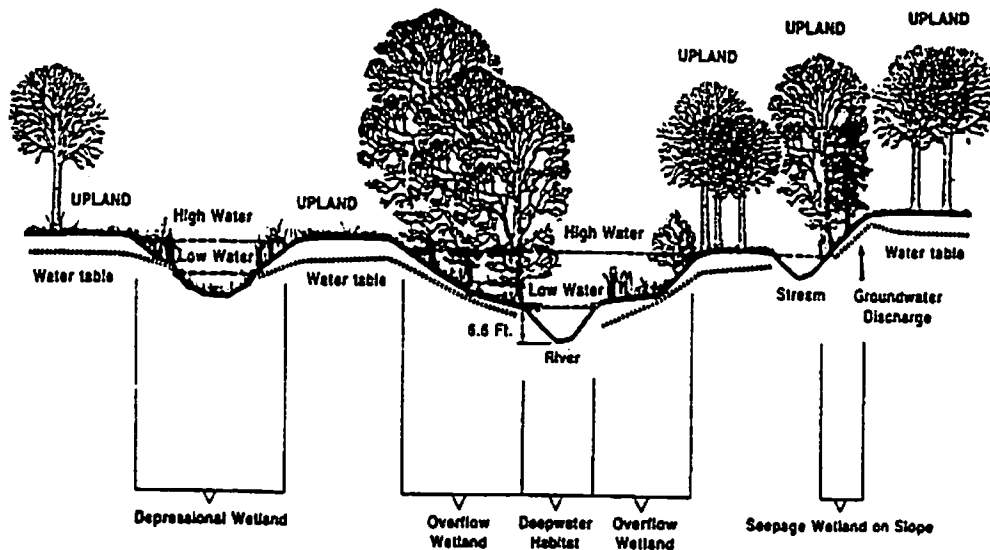


Figure F-1
Nontidal Wetlands

Some nontidal wetlands, such as freshwater marshes and shrub swamps, are very obvious. However, many nontidal wetlands, such as bottomland forests or wet meadows, are not as easily recognized because they are dry for some time during the summer. Three characteristics are used to identify nontidal wetlands - hydrology, soils and vegetation.

Nontidal wetlands form where the land is inundated or has a near surface ground water level. Water usually comes from rainfall, snow melt, flooding, overland flow, springs or a rising water table. Surface water may be present for varying periods as in flooded or ponded nontidal wetlands, while the underlying soils may be saturated near the surface with no surface water present. These hydrologic conditions promote the formation of hydric soils and the growth of wetland vegetation.

There are at least 12 soil types in Worcester County that are known to occur in nontidal soils. They usually develop because the amount of oxygen in the soil is limited due to standing water or saturated conditions. Other indicators of hydric soils are listed in chart at right.

Plants growing in nontidal wetlands, known as hydrophytic vegetation, are capable of living in hydric soils for at least part of the growing season. There are over 2,700 plant species that may occur in wetlands in Maryland. Some characteristics of nontidal wetland vegetation include roots growing above the soil surface on the plant stem or trunk, windthrown trees having shallow root systems and sometimes trees having swollen or buttressed trunks.

Other Indicators/hydric soils

- high organic content;
- a gray color, varying from bluish to greenish shades within 12-18 inches below the surface, or gray with inclusions of rusty stains;
- water-saturated with an odor of rotten eggs; or
- sandy with dark organic material in vertical streaks to approximately 12 inches deep.

The Value of Nontidal Wetlands

Nontidal wetlands provide habitat for a variety of aquatic and terrestrial wildlife. Many of the rare, threatened and endangered species make their homes in nontidal wetlands or are dependent upon them. Waterfowl and other birds use nontidal wetlands for breeding, wintering and migrating. Furbearers such as muskrats and beavers also inhabit nontidal wetlands.

The aquatic food chain is dependent upon nontidal wetlands to provide nourishment for the fish, shellfish and smaller organisms that spend periods of their lives in the wetland habitat. Organic material, or food, is produced in the water by the breakdown of wetland plants. When critical reproductive areas are filled for development or choked by pollution and excessive nutrients, the populations of these species decline.

Sedimentation decreases the penetration of sunlight needed by submerged aquatic plants and severely impacts reproduction and survival of aquatic life. Nontidal wetlands help to protect streams and other bodies of water by filtering sediment and intercepting and retaining excess nutrients such as phosphorus and nitrogen and other pollutants from upland runoff.

A reduction in the potential damage from fast moving storm or flood water is another benefit of nontidal wetlands. Large volumes of water are temporarily stored in nontidal wetland areas and released gradually which reduces erosion and property damage. Wetland plants are also effective in lessening bank erosion because their extensive and complex root systems hold soil in place and reduce sedimentation.

The scenic beauty and aquatic qualities of these special areas provide many opportunities for recreation and education. Nontidal wetlands have a natural beauty which has inspired painters and writers for centuries. They are now joined by enthusiasts with cameras, video and sound recorders. There is also endless opportunity for recreation such as fishing and hunting as well as hiking, bird watching, canoeing and other activities. The financial benefit of these wetland-dependent activities to the economy is significant.

Nontidal Wetland Classification

Nontidal wetlands are classified according to the dominant type of vegetation. Nontidal wetland types on Pocomoke State Forest are forested, scrub-shrub, emergent and aquatic bed.

Forested wetlands include swamps dominated by trees over 20 feet in height and many wooded floodplains. They are the most common type of nontidal wetlands. Common vegetation includes red maple and black gum. Forested wetlands fill the habitat requirements for many species of wildlife. Depending upon the degree and permanence of soil saturation or inundation, these habitats support species ranging from whitetail deer and forest interior dwelling songbirds, to waterfowl and fish. Along streams they help prevent pollutants and sediment from entering the water.

Scrub-shrub wetlands include true shrub swamps or wetlands dominated by trees over 20 feet in height. True shrub wetlands are relatively uncommon. Some bogs are classified as scrub-shrub wetlands. Plants include alder and buttonbush. They provide excellent cover and browse for wildlife. Many shrub wetlands become forested wetlands over time.

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Emergent wetlands are marsh areas characterized by herbaceous vegetation. Common emergent vegetation includes cattails, sedges and rushes. Statewide, between the 1950's and 1970's the percentage of emergent wetlands decreased more than any other wetland type.

Aquatic bed wetlands are found in some ponds and areas that are nearly always covered with water. They are the least common type of vegetated nontidal wetland. Species may include herbaceous plants such as spatterdock or pickerelweed. These wetlands are an important water source for plants and wildlife during drought. Waterfowl often use aquatic bed wetlands.

Wetlands of Special State Concern

There are seven Wetlands of special State Concern (WSSC) that exist, totally or partially, within the boundaries of Pocomoke State Forest. These wetlands exhibit uncommon features such as rare, threatened or endangered species or unique biological communities. The singular nature of these areas makes the evaluation of management practices in their vicinity of particular importance.

Wetlands of Special State Concern on Pocomoke State Forest:
<p><i>Dividing Creek Quadrangle</i> Dividing Creek Ponds Furnace Road Powerlines Oak Hill Road Powerline</p>
<p><i>Snow Hill, Wango Quadrangles</i> Nassawango Creek</p>
<p><i>Public Landing Quadrangle</i> Poorhouse Branch</p>
<p><i>Kingston, Pocomoke City Quadrangles</i> Hickory Point Cypress Swamp</p>
<p><i>Pocomoke City, Snow Hill, Girdletree Quadrangles</i> Mattaponi Natural Heritage Area</p>

Table F-1

Pocomoke State Forest

Regulation

There are approximately 275,000 acres of vegetated nontidal wetlands in Maryland, comprising 4.3 percent of the state's land mass. This figure does not include nontidal wetlands that are currently farmed. These vital resources have been declining at a rate of about 1,600 acres per year. There is an undetermined amount of nontidal wetlands in Worcester County, however, it is a significant percentage of the land area of the County.

The 1989 Maryland General Assembly passed legislation that directed the Department of Natural Resources to establish a statewide program for the conservation, enhancement, regulation, creation and monitoring of nontidal wetlands. The goal is no net loss of nontidal wetland acreage and function. The Water Resources Administration, Nontidal Wetlands Division, has written regulations and set up a permit program in order to meet this goal. Since January 1, 1991 all activities in nontidal wetlands require a nontidal wetlands permit or a "letter of authorization", unless exempted by regulation.

Activities that require permits include construction, excavation, filling, changing drainage patterns, disturbing the water level or water table, grading and removing vegetation in a nontidal wetland or within a 25-foot buffer. The buffer has been expanded to 100 feet for the Nontidal Wetlands of Special State Concern. All these areas have been designated by regulation and are mapped on the nontidal wetlands guidance maps.

Forestry activities do not require a nontidal wetlands permit from the Department of Natural Resources if the land use remains as forestry. Forestry activities are the planting, cultivation, thinning, harvesting or any other activity undertaken to use the forest resources or to improve their quality or productivity. When an erosion and sediment control plan is required for forestry activities, nontidal wetlands regulations stipulate the incorporation of best management practices to protect nontidal wetlands. These plans are reviewed and approved by local Soil Conservation Districts. For activities within a State Forest, these plans must be approved by the Maryland Department of the Environment.

Other activities that are exempt from permit requirements include agricultural activities, mowing existing rights-of-way, soil investigations, perc tests for sewage disposal fields, survey markers or survey monuments and maintenance of various serviceable structures or fills.

To achieve the goal of no net loss, after December 31, 1990, any loss of nontidal wetlands regulated under state law must be offset by mitigation. Mitigation is the creation, restoration or enhancement of nontidal wetlands that were, or will be, lost due to regulated or agricultural activities. Creation is establishing a nontidal wetland on an upland site. Restoration is establishing nontidal wetlands on former nontidal wetlands sites. Enhancement is providing additional protection to, or improving the functions of, a nontidal wetland.

Nontidal wetlands as delineated on the resource assessment maps for Pocomoke State Forest include all areas identified by the Maryland Department of Natural Resources. Included are Nontidal Wetlands of Special State Concern which have exceptional ecological or exceptional value of statewide significance.

However, not all wetlands existing on the forest have been mapped. Most Coastal Plain wetlands (including such seasonal wetlands as vernal pools, which are essential to the life cycles of many rare species and need to be surveyed

Nontidal wetland losses must be replaced by creating nontidal wetlands at the following ratios:

1:1 for emergent or farmed nontidal wetlands

2:1 for scrub-shrub and forested nontidal wetlands or emergent nontidal wetlands of special state concern, and

3:1 for scrub-shrub and forested nontidal wetlands of special state concern.

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at Pocomoke State Forest,) will only be located by visits to the site. Those wetland boundaries indicated on these maps generally represent a minimum of wetland area existing on a given site.

G. Tidal Wetlands Assessment

(The following material excerpted from The Coastal Wetlands of Maryland, 1982)

Introduction

The Maryland Wetlands Act of 1970 recognizes two categories of coastal wetlands. State wetlands are defined as "any land under the navigable waters of the state below mean high tide, affected by the regular rise and fall of the tide". Wetlands of this category which have been transferred by the state by valid grant, lease, patent or grant confirmed by Article 5 of the Declaration of Rights of the Constitution shall be considered 'private wetland' to the extent of the interest transferred. Private wetlands are "any land not considered 'state wetland' bordering on or lying beneath tidal waters, which is subject to regular or periodic tidal action and supports aquatic growth".

The inland boundary is the interface between the coastal (tidal) wetlands and upland areas or between coastal wetlands and wetlands that do not border on tidal waters.

Values of Coastal Wetlands

The coastal wetlands of Maryland are of value to man in many ways. Together with the tidewater creeks and rivers, the coastal bays, and the ocean, they form an extensive and aesthetically appealing system of open spaces. They are utilized as habitats by thousands of species of plants and animals. Many of these species, particularly the fish, shellfish, and furbearing animals, are of direct commercial value. Others provide recreation for fishermen, hunters, and naturalists. All of them provide an important education and scientific resource.

The marshes, shrub swamps, swamp forests, and submerged vegetation of the coastal wetlands are the principal sources of food for the animals that inhabit the waters of the Chesapeake Bay estuary, coastal bays, and the nearshore ocean. The details of the production, distribution, and consumption of this food supply still are not known, but the available information is adequate to demonstrate that a wealth of food is produced; that part of it is harvested directly by animals, but that much of the food is utilized in a finely pulverized form, as detritus; and that the production of fish, shellfish, waterfowl, furbearers, and other valuable forms of life would decline if the area of wetlands were reduced significantly.

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Wetland Types

Tidal wetlands in the Pocomoke River watershed fall primarily into the following categories: Brackish High Marsh, Submerged Aquatics, Wooded Swamp, and Fresh Marsh. The Tidal Wetlands within and adjacent to Pocomoke State Forest are primarily either Brackish High Marsh or Wooded Swamp.

Brackish High Marsh

Needlerush, meadow cordgrass/spikegrass, and threesquare make up the majority of wetlands that are characterized as brackish high marshes. Only three square is predominant in most of these areas that are covered by the threesquare type, but common threesquare and stout bulrush may be abundant in the more landward sections of the marshes.

Wooded Swamp

Three types of swamp forests dominate the coastal wetlands of Maryland - Baldcypress forests, red maple/ash, and loblolly pine swamp forests.

The baldcypress is a winterbare, needleleaf tree. It forms small, nearly pure stands in a few places, but it grows more commonly in narrow fringes along the margins of such streams as the Pocomoke River. The principal trees in the red maple/ash type are red maple, green ash, black gum and sweet bay. The loblolly pine swamp forest type generally occupies sites that are adjacent to brackish marshes, and the undergrowth in the pine forests may be a continuation of the marsh vegetation.

H. Mineral Resources Assessment

Introduction

The minerals assessment section is the only section under consideration which affects both surface and subsurface interests, or "rights" as it is sometimes called. A landowner usually owns the surface rights to the land or property and may or may not own the subsurface, or mineral rights to the property.

In the case of Pocomoke State Forest the State of Maryland is the landowners and has the right to utilize the surface for farming, timbering, fishing, or recreational uses within the constraints placed on it by law, regulation, or agreement. The State may or may not own the mineral rights beneath each tract of land, depending on how the mineral rights are conveyed in the deed for each tract of land.

The owner of the mineral rights may "lease" these minerals to a company to extract them in return for a production royalty. If nearby leaseholders' mineral rights are not protected by the activity, a group of leaseholders may form a "pool", with each leaseholder receiving a royalty, even if the extraction site is at a different location.

The Maryland Forest and Park Service receives royalties through both of these arrangements. If the landowner retains the mineral rights, that person or company may mine or produce the minerals themselves.

The major available mineral resources which must be considered are natural gas and oil, sand and gravel. The term "available" mineral resources does not imply "commercial" mineral resources. If these resources are inaccessible to markets they may not be extractable under present economic conditions. If economic conditions change and demand increases, available resources could become more valuable and would need to be evaluated at that time.

Regulation

Gas and Oil

The 1957 Maryland General Assembly passed legislation directing the Department of Natural Resources to establish a statewide permit program to provide for the orderly and safe development of oil and gas resources while protecting the environmental resources of the State. The Water Resources Administration has written revised regulations to meet this goal. Since November 25, 1991 all oil and gas exploration activities are required to conduct an environmental assessment, have a sediment and erosion control plan, a spill prevention, control, and countermeasures plan, a reclamation plan, a performance bond and liability insurance. Currently there are 83 gas storage and 9 gas production wells in Maryland.

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Surface Mining

In 1975 the Maryland General Assembly passed legislation requiring all surface mine operations to obtain a license and mining permit from the Department of Natural Resources. The law, as implemented on January 1, 1977, requires all surface mine operations to have a mining and reclamation plan and a sediment and erosion control plan. Each operation is also required to post a performance bond. The Water Resources Administration implemented regulations on December 11, 1989 which further define the items required to obtain a permit as well as the obligations of the permit. There are currently 48 rock quarries and 283 sand and gravel mines permitted in Maryland.

Major Available Mineral Resources

Gas and Oil

The lower Eastern Shore is underlain by a Mesozoic-aged rift basin. The basin begins in Delaware and extends southward into Virginia just south of the Maryland State line. The basin is approximately 30 km wide. There have been no exploration wells drilled within the Pocomoke State Forest Boundary; however, three dry holes were drilled in Worcester County. Based upon current geologic information and exploratory well data, the resource potential for Pocomoke State Forest is extremely low for natural gas and oil.

Sand and Gravel

Worcester County is part of the Coastal Plain province of Maryland and the Atlantic Coast. The area is a low lying, gently rolling plain. Pocomoke State Forest lies entirely within the watershed of the Pocomoke River and its tributaries Dividing Creek and Nassawango Creek.

Quaternary Alluvium, the Parsonsburg Sand, Omar, and Kent Island Formations underlie portions of Pocomoke State Forest which contain sand and gravel deposits. The quality of the material varies by location and the job specifications, therefore the deposits of these formations are not suitable for aggregate production or fill material in every location. Worcester County is located a considerable distance from major population centers, therefore most of the material mined in the county is used locally. The material is also very fine grained in comparison to materials found west of the Chesapeake Bay, with only one pit in the southern part of the County producing some gravel.

Alluvial deposits consist of largely sand, gravelly sand, and clayey swamp deposits. Sandy deposits are found along the small streams in the County. The sands are light colored, loosely consolidated, moderately to poorly sorted, fine to coarse grained. Gravel is found in isolated areas. There is one mine in the County extracting material from the Alluvial deposits along the Pocomoke River. Because of the material's common occurrence and moderate quality, the resource potential for the State Forest lands is moderate. Many private sources are available for mining alluvial plain deposits outside State Forest lands.

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The Parsonsburg Sand is predominantly a medium-grained sand which is poorly sorted. Material sizes range from the size of small boulders (rare), through cobbles, gravel, very coarse to very fine sand silt and clay. There are a few pits within the mapped outcrop producing material from the Parsonsburg Sand formation. The formation is found beneath State Forest lands on the east and west sides of the Pocomoke River. Because of the material's common occurrence and moderate quality, the resource potential for the State Forest lands is moderate. Many private sources are available for mining Parsonsburg Sand deposits outside State Forest lands.

The Kent Island Formation is predominantly interstratified clay, silt, and sand. formation is found in broad lowlands predominantly along the Pocomoke River Valley. The formation is thickest in channels thinning as distance increases away from channels. There are two mines to the east of the State Forest between Snow Hill and Pocomoke City. Because of the material's common occurrence and moderate quality, the resource potential for the State Forest lands is moderate. Many private sources are available for mining the Kent Island Formation outside State Forest lands.

The Omar Formation underlies the western portions of Pocomoke State Forest north of Pocomoke City and west of the Pocomoke River. The formation contains two major lithofacies: a light-colored sand and a dark colored sandy clay silt or silty clay. West of the Pocomoke River the light-colored sand facies is present. The upper light-colored sandy beds are mostly medium, well-sorted unfossiliferous sands, typically 15 feet thick. There are no known surface mines within this formation. Based upon current geologic information the resource potential for the Omar Formation is moderate within the State Forest. Other outcrops of the formation are available for mining on private lands outside State Forest boundaries.

I. Wildlife Assessment

Introduction

Wildlife resources are a product of the land and water, and the types of land and water cover, to a great degree, determine the amounts and kinds of wildlife present in the area. A major component in the inventory and planning of wildlife habitat management is the identification of vegetative types and their dispersion within the forest ecosystem. In a managed forest, the land manager often has a number of options available concerning the distribution and size of the timber harvest, the tree species to favor, and the schedule of timber harvesting. All of these management options directly affect the numbers and species of wildlife the land will support, because they alter three important components of vegetative communities: stand age, vegetative type and distribution of stands (U.S. Department of Agriculture, Forest Service, 1979a). Hunting seasons and bag limit adjustments also play a key role in managing the numbers and species of game animals on the forest.

While forest inventories have provided a wealth of information on timber, they have not been designed to inventory the forests from the standpoint of multiple use. From this standpoint, the species composition, quantity and spatial arrangement of the lesser vegetation becomes as important as the trees. Whereas rough, rotten, hollow, or dead trees might have little or no value for timber, these same trees are valuable wildlife habitat (U.S. Department of Agriculture, Forest Service, 1979b). Continuous forest inventory techniques currently in use could be adjusted to provide valuable information on understanding species which provide browse and cover for various species.

Both the U.S. Department of Agriculture (1979b) and the U.S. Department of the Interior (1977) have developed intensive and comprehensive procedures for the inventory and evaluation of wildlife habitats.

For the purpose of the planning effort for the Pocomoke River State Forest, wildlife assessment data was collected based upon resource inventory data presently on hand. Of major importance was the forest type and size class inventory which was completed for Pocomoke River Forest in 1989.

Inventory of Current Land and Water Cover

A. Wildlife Management Unit - Arbitrary designation used to identify various land tracts for wildlife planning purposes. May be a disjunct tract, individual watershed, or an area with a minimum amount of private land inholding.

B. Total Acres - Includes the total acres of State owned land within the designated "Wildlife Management Unit". (W.M.U.)

C. Forest Management Compartments - Identifies the "Forest Management Compartments" which are located within the W.M.U.

Table I-1
Inventory of Current Land and Water Cover

Forest Type Code: 0 = non forest
2 = northern hardwood
4 = mixed oaks
5 = cove hardwoods
6 = red maple/gum
7 = black locust
13 = pine plantation

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D. Total Acres of Forestland - Identifies the total number of acres of forestland cover within the W.M.U.

E. Total Acres by Forest Type - Identifies the total acres of forestland cover located within the W.M.U. by forest type.

F. Forest Type Age Class Distribution - Each forest type which was identified in (E) above will be broken down into the various forest age classes, i.e., (1) Seedling/Sapling, (3) Poletimber, (4) Immature Sawtimber and (5) Mature Sawtimber. The percentage of each age will be listed.

Forest Interior Breeding Birds

This group of species are those that require large contiguous tracts of forest to sustain viable breeding populations. Acreages in excess of 100 acres, and larger, are desirable. In addition, sawtimber sized trees with a closed canopy are preferred.

A mixture of hardwood species provides more bird species diversity, though appropriate habitat structure is the most important factor. A greater diversity of forest interior breeders occurs where streams or wetlands are found within forested tracts. Forest interior species include many of the warblers, vireos, scarlet tanagers, pileated woodpeckers, acadian flycatchers and whip-poor-wills. Two raptor species, red-shouldered hawks and barred owl, are also considered forest interior breeders. The Eastern Maryland forests are a stronghold of the statewide population. Permanent fragmentation of large, contiguous tracts and the overall loss of forestlands are the most serious problems affecting the species.

Non-Game Small Mammals

Twentyone (21) species of small mammals may inhabit the Pocomoke River State Forest. These include shrews, bats, woodland mice, chipmunks and flying squirrels. As a group, habitat requirements and population status of these species are not well known. Better assessment data is needed for this group.

Reptiles

Twentyeight (28) species of reptiles may occur in the Pocomoke River State Forest. Not much is known about the population status of most species. They use a variety of habitats throughout the forest. Beaver ponds, wetlands and streams are important for a variety of turtles and snakes. Downed logs are a favorite haunt of numerous snakes and lizards. More assessment data is needed for reptiles in the forest.

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Amphibians

Eighteen (18) species of amphibians may occur in the Pocomoke River State Forest. Amphibians, as a group, are primarily associated with aquatic environments, but because of biphasic lifestyle upland forested areas adjacent to wetlands are important. Many salamander species are highly terrestrial. These environments do not necessarily have to be permanent bodies of water.

Ephemeral or temporary pools and wetlands provide ideal breeding habitats for most species. Springs and seepages also provide an appropriate habitat. Permanent bodies of water that support fish populations are of less value to most amphibians. Little is known about the population status of most species of amphibians in the forest. More data is needed to assess this group. Protection of non-tidal wetlands regardless of size and their forest buffers, is an essential element for maintaining these species in the forest.

Forest Game Birds and Mammals

Forest game birds and mammals include the following species: wild turkey, whitetailed deer, and gray squirrels.

Due to the fact that 96.8% of the Pocomoke River State Forest is classified as forestland, this group of wildlife species are common residents of the forest ecosystem. The following is a brief status report for each individual species:

Whitetailed Deer

Deer survive in most forest and non-forest conditions and types. The early stage of timber rotation and intermediate cuts produce abundant deer browse and herbage that are their principle spring and summer foods. Their home range seldom exceeds 300 acres where food, cover and water are interspersed (U.S. Department of Agriculture, 1974). Deer populations are increasing on the Pocomoke River State Forest and adjacent private properties. The present effects of the gypsy moth and pine bark beetle may continue to increase deer habitat somewhat. However, the loss of oak sprouting and acorn mast combined with the advanced tree reproduction in the forest understory may be off-setting factors.

Gray Squirrel

The gray squirrel inhabits hardwood and mixed coniferous-deciduous forests dominated by seed-producing trees. Its abundance is dictated by seed crop productivity rather than by a specific plant community. Habitats include tree species such as oak, hickory, beech, maple, poplar and walnut. The mainstay of the gray squirrel is nuts - acorns, hickory nuts, beechnuts, walnuts, and hazelnuts (Merritt, 1987). They require partial hardwood stands of trees old enough to produce mast and provide dens. Supportive foods are berries, soft mast, buds, seeds and fungi.

Since 61.7% of the Pocomoke River State Forest is comprised of immature to mature mixed pine/hardwood forest, it presently provides excellent gray squirrel habitat. Any severe hardwood mortality resulting from gypsy moth defoliation will have a negative effect on gray squirrel populations.

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Wild Turkey

Good turkey habitat contains mature stand of mixed hardwoods, groups of conifers, relatively open understories, scattered clearings, well-distributed water and reasonable freedom from disturbance. Home range is about one square mile. Turkey diet consists primarily of grass and weed seeds in the fall, mast and forage in winter and spring and forage and insects in the summer. Acorns, dogwood berries, clover and pine seed are the foremost foods. Openings are essential to brood range (U.S. Department of Agriculture, 1974).

Pocomoke River State Forest offers good wild turkey habitat. Probably the most limiting factor, as far as habitat is concerned, is the fact that only 3.2% of the forest is classified as openland. Only 100 acres of the Pocomoke River State Forest is maintained in permanent wildlife openings. An additional 243 acres of seed orchards, buffer areas, research areas and utility right-of-ways, provide marginal turkey brood habitat. Of course, some of this lack of openland area is compensated for by nearby openings on private lands.

If large scale hardwood mortality occurs due to gypsy moth defoliation, this will have a negative effect on the wild turkey population.

Upland Game Birds and Mammals

For the purpose of the Pocomoke River State Forest planning effort, the following wildlife species will be classified as upland game: mourning dove, bobwhite quail, American woodcock and eastern cottontail:

Eastern Cottontail

The eastern cottontail resides in various habitats. Although no single plant community is preferred, optimal habitats include brushy areas with profuse herbaceous vegetation such as cut-over forests, thickets and agricultural areas. It is less numerous in dense forests with poorly-developed ground covers of herbaceous plants and in very open grassland (Merritt, 1987).

The eastern cottontail is generally uncommon to the Pocomoke River State Forest since 85.5% of the forest is in immature to mature forestland. It is probably locally common adjacent to the openland habitats that exist on the forest or in recently cut-over areas.

Bobwhite Quail

Interspersed open forests, brush, grass and cultivated fields are the best habitat for quail, but they survive in many forest types. Choice nesting cover is one year grass. They also nest at the edges of the forest clearings. Each nesting pair should have access to clearings one-fifth acres or larger. Eighty-five (85) percent of the quail diet consists of seeds. Legumes, grass, and weed seeds are the most important foods (in that order). Normal range is 40 acres (Merritt, 1987).

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Due to the limited amount of early successional stage habitat, agricultural areas and openland found on the Pocomoke River State Forest, bobwhite quail are not commonly reported.

American Woodcock

The American woodcock is a migratory game bird wintering in the warmer southeastern Atlantic and Gulf Coast states and breeds primarily in the northern midwest and northeastern states (Sanderson, 1987). The breeding range overlaps much of the winter range with Maryland near the southern limit of the breeding range. During the breeding season, woodcock are fairly common in the coastal plain regions of Maryland to include the Pocomoke River State Forest.

Woodcock habitat in Maryland is generally associated with the early stages of forest succession, thickets or open stages of shrubs and small trees adjacent to damp or wet areas. Woodcock prefer areas with little or no vegetation covering the ground (Sanderson, 1977).

Although woodcock continue to exist statewide, total population numbers, as counted by the United States Fish and Wildlife Service, have shown a decline in breeding density since the early 1970s (Bortner, 1990).

Habitat does exist for American woodcock in Pocomoke River State Forest. Any silvicultural efforts creating early successional stage habitats near wetland areas, would be of benefit to woodcock populations.

Mourning Dove

The mourning dove is a migratory game bird common throughout Maryland's agricultural areas.

Mourning doves are found primarily in agricultural areas. They use hedgerows, wood margins, woodlots and residential areas as nesting and rearing sites. Cover for nesting is found in trees and shrubs where flimsy nests of grasses and twigs are built.

Food for adult doves consists of seeds of most weeds and waste grains from corn and wheat fields. Young and adult doves eat a few insects during the summer.

Due to its habitat requirement, the mourning dove is not a common resident of the Pocomoke River State Forest. Low populations may exist adjacent to openland habitats or near private agricultural lands adjacent to the forest.

Waterfowl

Aquatic habitats located within and surrounding the Pocomoke River State Forest, support several species of waterfowl. Open water areas include the Pocomoke River, its tributaries, and several swamps. Waterfowl use of these habitats include nesting, foraging and resting areas.

Wood ducks and mallards are the most common resident species. Wood ducks nest in tree cavities and man-made structures along wooded shorelines and upland areas. Young birds feed exclusively on animal matter, such as aquatic and terrestrial insects. As the birds mature, their diet shifts to vegetable matter, primarily acorn, and other forms of hard and soft mast. Mallards nest in marshy areas and along

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protected shorelines using cattails, grassy areas and fallen logs for cover. Mallards are highly adaptive feeders who use numerous native and agricultural foods. Native plant materials include wild millets, grasses, smartweeds and rushes. Agricultural foods consist of numerous types of waste grain including corn, wheat, barley and oats.

Black ducks and hooded mergansers may occasionally nest in the Pocomoke River State Forest (Wm. Harvey, per comm.). Black ducks nest in a variety of habitats, but are dependent on dense ground cover. Hooded mergansers, like wood ducks, are cavity nesters and utilize similar habitats.

A breeding flock of resident Canada geese exists on nearby lakes and ponds. Current breeding activity appears to be isolated from the state forest, but periodic use of the area is expected.

Numerous species of waterfowl use the aquatic habitat of the Pocomoke River State Forest as stopovers or resting areas during migration. Ducks, geese and swans have been observed periodically throughout these habitats. Appendix G lists the waterfowl known or suspected to occur in the Pocomoke River State Forest at different times during migration.

Current management of waterfowl in the Pocomoke River State Forest is limited to erection and maintenance of wood duck nesting boxes. Management commensurate with watershed protection should adequately address this group's needs.

Aquatic Furbearers

Aquatic furbearers on the state forest include beaver, mink, muskrat and river otter. This group, though taxonomically diverse, are commonly dependent upon aquatic habitats. Historical management schemes have centered around habitat protection and regulated trapping for recreational and economic opportunity.

Beaver

The beaver is America's largest rodent. It is known for its valuable fur. Unregulated trapping during the nineteenth century significantly reduced beaver populations. Aided by other wildlife management and its own prolific breeding habits, the beaver has successfully repopulated much of its former range.

Beavers are found throughout Maryland and are common in the Pocomoke River State Forest. They are dependent upon plentiful, constant sources of water with nearby woody vegetation. They quickly modify their environment using rocks, sticks and mud to build dams and protective lodges. Entirely vegetarian, they prefer soft plant foods including grasses, ferns, stems and leaves of aquatic and terrestrial plants. They also eat the bark, twigs and buds of aspen, maple, willow, birch, alder and cherry trees.

Currently, beavers are considered common throughout the Pocomoke River State Forest. Regulated trapping and mandatory tagging provide useful data on beaver harvests and subsequent populations.

Muskrat

Musk rats live on or near the still or slow moving water of ponds, marshes, streams, and rivers. They build lodges of vegetation or burrow into stream banks and dams. Both lodges and burrows have underwater entrances. Musk rats feed primarily on the roots and stems of aquatic plants, such as cattails and bulrushes, as well as a small amount of animal protein, such as crayfish, fish and mussels. Highly reproductive, mature females may produce two to four litters per year. Muskrat habitat in the forest appears to be good and subsequent population levels range from moderate to high.

Mink

The mink is a semi-aquatic member of the weasel family. They live at the edge of lakes, streams and rivers in forested areas. Opportunists, they hunt along the streambanks of rivers and dive to locate aquatic animals. Prey include muskrats, mice, rabbits, shrews, fish, frogs, crayfish, insects, snakes, waterfowl and other birds. Due to the shy, secretive nature of minks, little is known about mink populations at the Pocomoke River State Forest. Studies indicate an individual mink requires approximately three miles of stream on the riverbank.

River Otter

The river otter is an elusive aquatic member of the weasel family. Otters were once found in watershed areas across the State. At present, breeding populations are limited to Maryland's Eastern Shore. The Pocomoke River State Forest contains a watershed that is considered extremely valuable habitat.

Upland Furbearers

Striped Skunk, Raccoon and Opossum

Due to the generalized habitat requirements, omnivorous and opportunistic food habits and adaptability to human encroachment, these species are generally abundant throughout the Pocomoke River State Forest. In spring and summer months, all three species prefer to reside near streams, spring seeps, ponds and edges to seek aquatic prey, but will frequent other areas. Den trees and snags are utilized by raccoons.

Red Fox

The red fox is associated with brushy early successional areas such as old fields, pasture borders and farmland, usually close to water. Some of these habitat types occur on private inholdings (utility line R.O.W.s) in the Pocomoke River State Forest and a few are found on state forest land. Due to the limited acreage of preferred habitat the red fox is present, though not abundant.

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Gray Fox

The gray fox is closely affiliated with hardwood forest typified by abundant, brushy cover. Its feeding habits are similar to the red fox with rabbits, mice, rats and other wild mammals contributing up to 75% of its diet.

Other food items vary according to seasonal availability. The Pocomoke River State Forest provides this type of habitat, it can probably be assumed that the gray fox is generally common in the forest.

Population Estimates

Estimates of the relative abundance of wildlife species was made for the Pocomoke River State Forest using the best information available. Numerical estimates were made whenever possible, from harvest data. Where insufficient information was available to allow for direct population estimates, density, distribution, and habitat information were obtained from the literature. Estimates obtained for these sources were reported as a relative abundance, e.g., as status unknown, common, or abundant. When such data can be sufficiently refined, estimates were reported in appropriate ranges of animals per square mile.

Assessing wildlife population abundance is not an exact science. Wildlife populations are cyclic and the numbers of individuals within a population are constantly fluctuating. Such factors as changes in habitat quantity and quality, numerous mortality factors including predation, disease, and weather, and annual fluctuations in nesting success effect the number of individuals on the land at one time. Generally speaking, those wildlife species with short life spans undergo more dramatic fluctuations in population numbers than do more long-lived species.

The following ranking system was established to attempt to describe the relative abundance of wildlife populations of the Pocomoke River State Forest. These judgments were made knowing the habitat needs of a given wildlife species and the quantity of the habitat type which exists on the Pocomoke River State Forest. Additional considerations that were used to rank species included: the known research that has been conducted on a given species, i.e., harvest rates for certain game species, Maryland breeding bird atlas data, public sightings, etc.

The following five characteristics were established to quantify the relative abundance of a given wildlife species or species group in the Pocomoke River State Forest.

1. Unknown Status: Describes a species which has secretive habits, and/or has habitat needs which are unknown or limited on the Pocomoke River State Forest, and for which existing data is not sufficient to determine its recent population status.

2. Rare: Describes a species which is listed on the State and/or Federal Threatened and Endangered Species List, are potential candidates for listing and usually require further investigation into their rarity and endangerment status, or are thought to be secure at present but are worthy of attention because of limited distribu-

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tions, declining populations, or ecological vulnerability. These native wildlife species of the Pocomoke River State Forest are among the rarest and most in need of conservation and management.

3. Uncommon: Describes a species which has been documented to occur in the Pocomoke River State Forest, but too infrequently to be considered common. Most of these species have specific habitat requirements which are limited in availability in the Pocomoke River State Forest at the present time. Many of these species are known to occur in less than 25% of the Pocomoke River State Forest.

4. Common: Describes a species which has specific forest habitat requirements, but one which is distributed throughout the forest due to the availability of its habitat. Many of these species are known to occur more than 25%, but less than 50% of the total forest.

5. Abundant: Describes a species which may be described as a forest habitat generalist, is frequently reported, and probably occurs in 50% of the forest.

Table I-2.

Wildlife Abundance

Wildlife Species	Relative Abundance			
	A. Non-Game Birds	Wintering	Migration	Breeding
Great Blue Heron				3
Green-backed Heron				3
Great Egret				3
Snowy Egret				3
Black-crowned Night-Heron				3
Yellow-crowned Night-Heron				2
Black Vulture				4
Turkey Vulture				5
Osprey				3
Northern Harrier				2
Bald Eagle				2
Sharp-shinned Hawk				2
Cooper's Hawk				2
Red-shouldered Hawk				3
Broad-winged Hawk				2
Red-tailed Hawk				4
American Kestrel				3
Spotted Sandpiper				1
Rock Dove				3
Black-billed Cuckoo				1
Yellow-billed Cuckoo				5
Eastern Screech Owl				4
Great Horned Owl				5
Barred Owl				4
Long-eared Owl				1
Common Barn Owl				2
Chuck-will's-widow			3	

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Wildlife Abundance cont.

Wildlife Species	Relative Abundance		
	Wintering	Migration	Breeding
A. Non-Game Birds, cont'd.			
Whip-poor-will	3		
Chimney Swift	3		
Ruby-throated Hummingbird	3		
Belted Kingfisher	3		
Red-headed Woodpecker	3		
Red-bellied Woodpecker	5		
Yellow-bellied Sapsucker	3	3	1
Downy Woodpecker	5		
Hairy Woodpecker	4		
Pileated Woodpecker		4	
Eastern Phoebe		3	
Northern Flicker		5	
Acadian Flycatcher			4
Eastern Wood Pewee			5
Great crested Flycatcher			5
Least Flycatcher			3
Eastern Kingbird			4
Purple Martin			3
Northern Rough-winged Swallow			3
Barn Swallow			5
Blue Jay			5
American Crow			5
Fish Crow			4
Carolina Chickadee			5
Tufted Titmouse			5
Red-breasted Nuthatch	4	4	
White-breasted Nuthatch			3
Brown-headed Nuthatch			3
Brown Creeper	4	4	
Carolina Wren			5
House Wren			3
Winter Wren	4	4	
Golden-crowned Kinglet	4	4	4
Veery	4		3
Swainson's Thrush	4	2	
Hermit Thrush		4	4
Wood Thrush			5
American Robin			4
Gray Catbird			
Northern Mockingbird			4
Brown Thrasher			4
Cedar Waxwing			3

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Wildlife Abundance cont.

Wildlife Species	Relative Abundance		
	Wintering	Migration	Breeding
A. Non-Game Birds, cont'd.			
European Starling			4
Solitary Vireo			4
Yellow-throated Vireo			3
Warbling Vireo			1
Red-eyed Vireo			5
Blue-winged Warbler			1
Golden-winged Warbler		4	
Tennessee Warbler			3
Nashville Warbler		4	
Magnolia Warbler			5
Cape May Warbler			4
Yellow-rumped Warbler	4	5	
Black-throated Blue Warbler			5
Black-throated Green Warbler		4	4
Blackburnian Warbler		3	3
Yellow-throated Warbler			4
Pine Warbler			5
Prairie Warbler			3
Palm Warbler		3	
Bay-breasted Warbler		3	
Blackpoll Warbler			4
Cerulean Warbler			3
Black-and-white Warbler			4
American Redstart			3
Prothonotary Warbler			4
Worm-eating Warbler			3
Swainson's Warbler			2
Ovenbird			4
Northern Waterthrush		4	
Louisiana Waterthrush			3
Canada Warbler		4	
Common Yellowthroat			5
Hooded Warbler			3
Blue Grosbeak			4
Indigo Bunting			4
Rufous-sided Towhee			5
Chipping Sparrow			4
Field Sparrow			3
Song Sparrow			3
White-throated Sparrow	5	5	
Dark-eyed Junco		5	5
Red-winged Blackbird			4
Rusty Blackbird	3	3	

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Wildlife Abundance cont.

Wildlife Species	Relative Abundance		
	Wintering	Migration	Breeding
A. Non-Game Birds, cont'd.			
Common Grackle			5
Brown-headed Cowbird			5
Orchard Oriole		4	
Northern Oriole			3
Evening Grosbeak		3	
Purple Finch		3	
House Finch	3		
Pine Siskin		3	
American Goldfinch	5		
House Sparrow			3
Eastern Pipit			1
Small-footed Myotis			1

B. Non-Game Small Mammals

Indiana Myotis	1
Pygmy Shrew	2
Masked Shrew	1
Least Shrew	3
Short-tailed Shrew	5
Eastern Mole	4
Star-nosed Mole	2
Little Brown Myotis	1
Keen's Myotis	1
Silver Haired Myotis	1
Big Brown Bat	1
Red Bat	1
Hoary Bat	1
Evening Bat	1
Eastern Chipmunk	3
Southern Flying Squirrel	1
Meadow Jumping Mouse	3
White-footed Mouse	5
House Mouse	3
Meadow Vole	4
Pine Vole	3
Southern bog lemming	2
Long-tailed Weasel	1
Normandy Rat	3
Rice Rat	3
Delmarva Fox Squirrel	2

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C. Reptiles

Common Snapping Turtle	1
Eastern Painted Turtle	1
Eastern Box Turtle	1
Spotted Turtle	1
Eastern Mud Turtle	1
Red-bellied Turtle	1
Common Musk Turtle	1
Northern Fence Lizard	1
Five-lined Skink	1
Broadhead Skink	1
Ground Skink	1
Eastern Worm Snake	1
Northern Black Racer	1
Southern Ringneck Snake	1
Black Rat Snake	1
Milk Snake	1
Eastern Hognose Snake	1
Eastern Kingsnake	1
Northern Water Snake	1
Red-bellied Water Snake	1
Eastern Ribbon Snake	1
Rough Green Snake	1
Corn Snake	1
Northern Brown Snake	1
Northern Redbellied Snake	1
Eastern Garter Snake	1
Eastern Earth Snake	1
Copperhead	1

D. Amphibians

Four-toed Salamander	1
Redback Salamander	1
Marbled Salamander	1
Eastern Mud Salamander	1
Eastern Spadefoot	1
American Toad	1
Fowler's Toad	1
Northern Spring Peeper	1
Gray Treefrog	1
Cope's Gray Treefrog	1
Green Treefrog	1
Carpenter Frog	2
New Jersey Chorus Frog	1

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D. Amphibians, cont..

Green Frog	1
Northern Cricket Frog	1
Southern Leopard Frog	1
Wood Frog	1

E. Forest Game Birds and Mammals

Whitetailed Deer

During the 1993 - 94 deer hunting seasons, one hundred seventeen (117) deer were reported harvested from the Pocomoke River State Forest. Reconstructing the total deer population based upon this harvest data, the present deer population is estimated to be approximately 270 deer or (12) deer per square mile.

NOTE: These figures were computed using the 1993 reported deer harvest rate for the Pocomoke River State Forest and assuming that the total reported buck harvest is equal to 20% of the total deer population. These harvest rates were applied to the total 1992 Worcester County reported harvest to estimate the Pocomoke River State Forest population.

Gray Squirrel	5
Wild Turkey	4

During both the 1994 Spring Turkey season, a total of twentyeight (28) turkeys were harvested on the Pocomoke River State Forest. During 1994, 39% of the total Worcester County turkey harvest was reported from the Pocomoke River State Forest.

Both summer brood counts and winter track counts are periodically conducted on the Pocomoke River State Forest. Based upon these indices and hunter harvest data, it is estimated that the wild turkey population on the Pocomoke River State Forest is approximately 8 to 12 turkeys per square mile.

F. Upland Game Birds and Mammals

Eastern Cottontail	5
Bobwhite Quail	4
American Woodcock	3
Mourning Dove	5

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G. Waterfowl

Due to their transient and seasonal nature, the relative abundance of waterfowl in the Pocomoke River State Forest is difficult to determine. Therefore, abundance ranking for the most commonly observed species are included.

Canada Goose	3
Mallard	3
Black Duck	3
Blue-winged Teal	3
Green-winged Teal	2
Ring-necked Duck	2
Hooded Merganser	2
Wood Duck	4

H. Aquatic Furbearers

Beaver	3
Muskrat	4
Mink	1
River Otter	3

I. Upland Furbearers

Striped skunk	4
Raccoon	5
Opossum	5
Red Fox	5
Gray Fox	3

J. Rare, Threatened, and Endangered Fauna

Most of the species listed here have been given a relative abundance ranking of "rare" on the Pocomoke River State Forest.

Crustaceans

None Confirmed

Insects

None Confirmed

Amphibians

Carpenter Frog

In Need of Conservation

Reptiles

None Confirmed

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J. Rare, Threatened, and Endangered Fauna, cont.

Birds*

Hooded Merganser	Rare
Bald Eagle	Endangered
Northern Harrier	Rare
Sharp-shinned Hawk	Rare
Common Barn Owl	Rare
Long-eared Owl	Historical
Yellow-bellied Sapsucker	Historical
Red-breasted nuthatch	Rare
Winter Wren	Rare
Golden-crowned Kinglet	Rare
Swainson's Thrush	Extirpated
Nashville Warbler	In Need of Conservation
Yellow-rumped Warbler	Uncertain Status
Blackburnian Warbler	Threatened
Swainson's Warbler	Endangered
Dark-eyed Junco	Rare
Purple Finch	Rare

Mammals

Southern Bog Lemming

Rare - Imperiled in Maryland because of rarity (typically 6 to 20 occurrences or few remaining individuals or acres in the State) or because of some factor(s) making it vulnerable to becoming extirpated. Species with this rank are actively tracked by the Natural Heritage Program.

In Need of Conservation - An animal species whose population is limited or declining in the State such that it may become threatened in the foreseeable future if current trends or conditions persist.

Threatened - A species of flora or fauna which appears likely, within the foreseeable future, to become endangered in the State.

Endangered - A species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy.

Historical - Historically known from Maryland, but not verified for an extended period (usually 20 or more years), with the expectation that it may be rediscovered.

Uncertain Status - Possibly rare in Maryland, but of uncertain status for reasons including lack of historical records, low search effort, cryptic nature of the species, or concerns that the species may not be native to the State.

* Unless otherwise indicated, probable occurrence only

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Inventory of Current Wildlife Use

Objective

To estimate the current consumptive and non-consumptive use of wildlife.

Justification

A thorough assessment of the current uses being made of wildlife resources is essential to maintaining current and projected wildlife supply and demand assessments in support of the programs directed towards the optimum abundance and use of these resources.

Procedure

Demand is a term used to express the amount of desire by the public to harvest or otherwise utilize specific wildlife resources. The level of use of a wildlife species is a measure of the demand that has been exhibited and, in our opinion, is the most useful measure of demand available to wildlife planners.

The estimated number of people hunting and trapping wildlife species, and/or user-days of hunting or trapping effort, as well as the total harvest and harvest per person, will be summarized for the past 10 years, or to the extent of the available information. Included in the latter are harvest and effort data from hunter surveys, deer and turkey harvest data, fur tagging records, and hunting license sales and future trends.

Consumptive Wildlife Use:

The following wildlife species which are either hunted or trapped provide the majority of the consumptive use-days of wildlife oriented recreation on the Pocomoke River State Forest: whitetailed deer, wild turkey, and gray squirrel. Other resident game species which provide secondary or additional consumptive wildlife recreation are: raccoon, muskrat, cottontail rabbit, woodcock, red fox and gray fox.

Little existing definitive data is available to accurately tabulate the total user-days of consumptive wildlife use on the Pocomoke River State Forest. Limited data does exist for some species as follows:

Whitetailed Deer

Based on statewide hunter success rate statistics and applying these same rates to the deer harvest by season type on the Pocomoke River State Forest, it is possible to determine the relative number of deer hunters who utilize the Pocomoke River State Forest.

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1. Bowhunting - The 1993 deer bow harvest on the Pocomoke River State Forest was 20 deer. Considering that the statewide bowhunter success rate is 15%, this would indicate that approximately 133 total people bowhunted for deer.

2. Firearms - The 1993 deer firearms harvest on the Pocomoke River State Forest was 95 deer. Considering that the statewide firearms success rate is 34%, this would indicate that approximately 279 total people hunted on the Pocomoke River State Forest during the firearms deer season.

3. Muzzleloader - The 1993 muzzleloader deer harvest on the Pocomoke River State Forest was 2. Considering that the statewide muzzleloader success rate is 13%, this would indicate that approximately 15 total people hunted on the Pocomoke River State Forest during the muzzleloader deer season.

Based on these assumptions, the total persons hunting deer on the Pocomoke River State Forest during 1993 would equal approximately fourhundredtwentyseven (427).

To estimate the total number of user-days of recreation provided annually on the Pocomoke River State Forest by deer hunting, the 1988 - 1989 "Maryland Hunter Use Survey" data was used. This survey provided the average effort expended annually by each type of deer hunter, i.e., bowhunters - 13.8 U/D per year, firearms deer hunters - 4.0 U/D per year, and muzzleloader deer hunters - 3.7 U/D per year. Using this data, the following estimate of the total number of user-days of recreation provided annually by deer hunting on the Pocomoke River State Forest was calculated:

Bowhunting

133 bowhunters X 13.8 U/D = 1835 U/D

Firearms

279 firearm deer hunters X 4.0 U/D = 1116 U/D

Muzzleloader

15 muzzleloader deer hunters X 3.7 U/D = 56 U/D

TOTAL = 3007 user-days of deer hunting recreation annually.

Wild Turkey

During 1994, (28) turkeys were harvested on the Pocomoke River State Forest during the 4-week Spring Turkey Season. Based on statewide hunter success rates and the "Hunter Use Survey" data, the following computations were made to estimate the annual user-days of turkey hunting recreation on the Pocomoke River State Forest.

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1. A Spring harvest of 28 turkeys divided by a statewide Spring turkey success rate of .13 = 215 Spring turkey hunters.

No Fall turkey season.

Total Turkey Hunting = 215

2. 215 Spring turkey hunters X 2.9 user-days of effort per year per hunter = 624 total man days for Spring turkey hunting.

No Fall turkey season.

Total User-Days of Turkey Hunting Recreation Annually = 624.

Squirrels

Based upon data obtained from the statewide hunter use survey, 2.6% of the total user-days of squirrel hunting in Maryland occurs in Worcester County. An estimated 8,576 U/D of squirrel hunting occurs annually in Worcester County. Since 7.6% of the total forestland in Worcester County occurs on the Pocomoke River State Fores. We used this ratio to estimate the annual squirrel hunting on the Pocomoke River State Forest, i.e., $8,576 \text{ U/D} \times 7.6\% = 652 \text{ U/D}$ of squirrel hunting recreation annually.

Raccoon

- Based upon data obtained from the statewide hunter use survey, 6.2% of the total user-days of raccoon hunting in Maryland occurs in Worcester County. An estimated 2,831 U/D of raccoon hunting occurs annually in Worcester County. Since 7.6% of the total forestland in Worcester County occurs on the Pocomoke River State Forest, we used this ratio to estimate the annual raccoon hunting effort on the Pocomoke River State Forest: $2,831 \text{ U/D} \times 7.6\% = 215 \text{ U/D}$.

Consumptive Wildlife Use Summary

These four (4) game species: whitetailed deer, wild turkey, squirrel, and raccoon provide for the majority of the consumptive wildlife use on the Pocomoke River State Forest on an annual basis. It is estimated that this group provides approximately 4,498 user-days of consumptive wildlife recreation.

Additional consumptive wildlife recreation is also provided by rabbit and woodcock hunting, trapping for both aquatic and terrestrial furbearers, and water-fowl hunting.

Overall, it is estimated that approximately 6,000 user-days of consumptive wildlife oriented recreation occurs annually on the Pocomoke River State Forest.

Non-Consumptive Wildlife

Wildlife recreational activities included under this classification include: bird watching, wildlife photography, nature walks, wildlife education and research activities, and the enjoyment received by forest visitors from general wildlife observations.

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In general, these types of recreational activities are very difficult to quantify as far as the total user-days of effort expended annually, and unlike consumptive wildlife utilization, it is even more difficult to quantify if the forest visitor had a successful or meaningful recreational experience.

Pocomoke River State Forest personnel have traditionally used daily "Forest Ranger Visitor Estimate Reports" to document the numbers of visitors to the forest and the type of recreational activity involved. These records have very little use for this planning process to document non-consumptive wildlife use due to the fact that they are arbitrarily completed and, therefore, do not permit statistical analysis.

Since non-consumptive wildlife use is presumed to be a major recreational use of the Pocomoke River State Forest, it will be necessary to develop survey methodologies which enable estimates of non-consumptive wildlife use to be determined.

J. Natural Areas Assessment

Mattaponi Natural Heritage Area (NHA-31)

General Description:

More than 75 % of Mattaponi Natural Heritage Area is comprised of Southern Bald Cypress Swamp and the ecotone between Swamp and Upland Forest. As with Hickory Point Cypress Swamp Natural Heritage Area, Mattaponi NHA is part of Pocomoke Swamp which is an isolated northern extension of the Great Dismal Swamp ecosystem. Centered near the Virginia-North Carolina border, the Great Dismal Swamp ecosystem is now less than one-half of its original size due to anthropogenic activities.

In the 1930s, 159 plant species were documented for Pocomoke Swamp, with about 36% of these species near their northern limit of distribution. One of these species, Dwarf Trillium - *Trillium pusillum*, is Endangered in Maryland, and the population in Mattaponi NHA is the largest in the State. It is most abundant in the ecotone between Swamp and Upland Forest, and it also occurs on hummocks in the Swamp and in portions of Upland Deciduous Forest without dense vernal shade. Being a spring ephemeral, Dwarf Trillium is uncommon or absent under evergreens and in areas with a high density of deciduous stems such as recently logged areas.

One plant species not documented in the 1930s for Pocomoke Swamp, Floating Heart - *Nymphoides cordata*, was discovered in 1987 and is another Endangered plant species protected by the NHA. Floating Heart is an aquatic species which occurs in the interior of the Swamp.

An area of artificial sandpits harbors three additional Endangered plant species Pink Sundew - *Drosera capillaris*, Coppery St. Johns-Wort - *Hypericum denticulatum*, and Swollen Bladderwort - *Utricularia inflata*.

An Endangered bird species, Swainson's Warbler - *Limnothlypis swainsonii*, is also protected by the NHA. Breeding habitat is comprised of drier portions of the Swamp and Upland Border with dense shrub layers and partially open deciduous canopies.

Other rare and endangered species will be discovered or rediscovered in the NHA as surveys continue. For example, Hessel's Hairstreak - *Mitoura hesseli* is an obligate butterfly of Atlantic White Cedar, and it was documented in Pocomoke

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Swamp in the early 1900s. King's Hairstreak- *Satyrium kingi* has been documented recently in Pocomoke Swamp and will probably be confirmed inside the NHA during future surveys.

Management Needs:

The Natural Heritage Area must be managed pursuant to the Chesapeake Bay Critical Area Criteria. Protection of Natural Heritage Areas, and other types of Habitat Protection Areas in the Chesapeake Bay Critical Area, is partially dependent upon the location of the Critical Area Buffer. The Buffer along Pocomoke River is considerably wider than 100 feet, since the Criteria require expansion of the Buffer to encompass "contiguous sensitive areas." Contiguous sensitive areas include: the Bald Cypress Swamp, because of its hydric soils and State-listed species habitats; all of the Upland Border, because of steep slopes and State-listed species habitats; and portions of the Upland with hydric soils connected to the Swamp (e.g., streams and associated floodplains) or with rare and endangered species habitat contiguous with the Swamp such as that of Dwarf Trillium.

The following activities are specifically allowed by the Criteria in portions of the NHA inside the Buffer, assuming rare and endangered species are not affected and the activities do not conflict with other State and Federal regulations:

- Hunting
- Fishing
- Trapping
- Educational pursuits
- Scientific observation
- Non-commercial, passive recreation; e.g., Hiking, Nature Photography
- Public beaches, launching and docking facilities, fishing piers if 5 requirements are met
- Water-dependent research facilities
- Commercial water-dependent fisheries facilities

The following activities are specifically disallowed in portions of the NHA inside the buffer:

- Development activities, including structures, roads, parking areas and other impervious surfaces, mining and related facilities, or septic systems

EXCEPT: Activities associated with acceptable water-dependent facilities

- Industrial and port-related facilities, and non-public marinas

- Bridges and utilities unless no feasible alternative exists

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Exception Activities associated with acceptable water-dependent facilities cont.

Dredged spoil disposal except for:

- a. backfill for permitted shore erosion protection structures
- b. use in approved vegetated shore erosion projects
- c. placement on previously approved channel maintenance spoil disposal areas
- d. beach nourishment

Clearing of existing natural vegetation except:

- a. to provide access to private piers
- b. to install or construct a legally permitted shore protection device or measure
- c. to install or construct a legally permitted water dependent facility

Farming activities, including the grazing of livestock

Commercial harvesting of trees

Portions of Natural Heritage Areas which fall outside the Buffer are to be protected "...from alteration due to development activities or cutting or clearing so that the structure and species composition of the areas are maintained." A 100-foot, no-disturbance buffer around the sandpit area should satisfy short-term management needs. In the long-term, woody plant succession must be controlled since extant rare and endangered species are not shade tolerant. In the ancient dune system, restoration activities may be needed in areas where indigenous vegetation has been significantly impacted. However, landscape history studies will be needed before restoration plans can be formulated.

The Natural Heritage Area boundary is also the Habitat Protection Area boundary for State-listed species protection. Pursuant to the Criteria, State-listed species and habitat must be protected from development activities and disturbances unless it can be shown that these activities or disturbances will not have or cause adverse impacts on these habitats.

Hickory Point Cypress Swamp Natural Heritage Area (NHA-29)

General Description:

Hickory Point Cypress Swamp Natural Heritage Area is part of Pocomoke Swamp which is an isolated northern extension of the Great Dismal Swamp ecosystem. Centered near the Virginia-North Carolina border, the Great Dismal Swamp ecosystem is now less than one-half of its original size due to anthropogenic activities. In the 1930s, 159 plant species were documented for Pocomoke Swamp, with about 36% of these species near their northern limit of distribution.

Three Endangered plant species have been documented in the Swamp, Red Bay - *Persea borbonia*, White Spikerush - *Eleocharis albida*, and Southern Wildrice - *Zizaniopsis miliacea*. Southern Wildrice was only recently discovered, and the population in the Swamp is the only one known for the State. The rare, but not Statelisted, Sweetleaf - *Symplocus tinctoria* has also been documented for the Swamp.

Historical records exist for three other rare and endangered species; i.e., Shoreline Sedge - *Carex hyalinolepis*, Threatened; Small-fruited Beggar-ticks - *Bidens mitis*, Endangered; and Downy Milk Pea - *Galactia volubilis*, Endangered. These and other rare plant species will be rediscovered as survey efforts continue in the Swamp.

The Endangered Hessel's Hairstreak - *Mitoura hesseli* is an obligate butterfly of Atlantic White Cedar, and it was documented in Pocomoke Swamp in the early 1900s. King's Hairstreak - *Satyrium kingi*, a Threatened butterfly species, has been documented recently in Pocomoke Swamp and will probably be confirmed inside the NHA during future surveys.

Management Needs:

The Natural Heritage Area boundary includes Hickory Point Cypress Swamp and a 100-foot upland border. The Natural Heritage Area must be managed pursuant to the Chesapeake Bay Critical Area Criteria, and protection under the Criteria is partially dependent upon the location of the Critical Area Buffer. With the exception of the 100-foot upland buffer, all of this NHA falls inside the Critical Area Buffer since the latter must be expanded to include all contiguous wetlands and rare and endangered species habitat. Activities which are allowed and disallowed by the Criteria are the same as those discussed for Mattaponi Natural Heritage Area. The 100-foot upland forested border was included within the NHA boundary to protect the Swamp from excessive sediment, nutrient, or pesticide runoff and from exotic plant invasion.

The Natural Heritage Area boundary is also the Habitat Protection Area boundary for State-listed species protection. Pursuant to the Criteria, State-listed species and habitat must be protected from development activities and disturbances unless it can be shown that these activities or disturbances will not have or cause adverse impacts on these habitats.

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Dividing Creek Ponds

General Description:

Dividing Creek Ponds Protection Area encompasses two seasonal ponds which support populations of four Endangered plant species and two "uncommon" species. One of the ponds also supports a rare natural community. Only one other community of this type is known in the State.

Management Needs:

At the northern edge of the larger pond is an old, slightly overgrown ditch which may still be affecting the hydrology of the pond. A hydrological study is needed to determine if ditch filling is warranted.

The protection area boundary includes much of the forested drainage area to maintain apparently acceptable hydrological conditions and to protect the native pond flora from exotic plant invasion and destruction. Management needs of the forested buffer are unclear, and formulation of a management strategy will be dependent upon completion of a thorough landscape history analysis which focuses on differences between extant and presettlement conditions. Until then, timber management activities will be precluded from the protection area.

Furnace Road Powerline

General Description:

The Furnace Road Powerline is kept free of trees and shrubs through active management. This open habitat has boggy emergent wetlands and upland meadows which support four Endangered, one Threatened, and one uncommon plant species. Prior to settlement, natural disturbances such as fire and flood created and maintained habitat for these species. Since these natural forces have been suppressed in much of the landscape since settlement, populations of these species have become dependent upon artificially maintained areas such as powerline rights-of-way.

Management Needs:

Current management practices are generally beneficial to the rare and endangered species. However, extra care must continue to be taken to assure that woody plant management activities continue to be conducted on acceptable schedules and with minimal impact from heavy equipment.

K. Recreation Assessment

Pocomoke State Forest is an integral component of a larger greenway system which connects forest, parks and wildlife management areas and provide sites for a diversity of recreational uses. The forest contains seventy-five miles of road and trails which are primarily used for fire protection and by hunters to gain access to the forest. Several miles of trail are opened for four wheeled vehicles and motorcycles; an off road vehicle permit is required. Hunting and fishing occurs in season.

Recreational use within the Pocomoke River State Park units include camping, picnicking, boating and interpretative programs. There are campsites for family and youth group which include the basic support facilities. Fishing is permitted and boat launching ramps are provided for river access. Fishing licenses are required. A marina provides 23 boat slips, a fuel pump and transient pier. Rowboats, out-board motors and canoes can also be rented. A 25 meter swimming pool with associated facilities, bathhouse, toilets, lockers, dressing room are provided.

Contiguous to the forest on the southwest edge is the Pocomoke Sound Wildlife Management Area. Mostly tidal marsh, the 900 acre site is an excellent habitat for ducks, wading birds and shorebirds. Public hunting occurs in season.

A network of roads border the forest and form a system of scenic driving trails. The Beach To Bay Indian Trail is a designated National Recreation Trail. A route similar to the Beach to Bay Indian Trail was used centuries ago by the tribes of the Algonquin nation, including the Assateagues, Pocomokes, Manikin, Animuses and Acquinticas. The trail serves as a spine which ties together people, parks, historic sites and natural areas creating corridors of open space. These greenways provide opportunities for education, enrichment, and enjoyment as well as wildlife habitat and protection to the rivers and bays of Worcester and Somerset Counties. The Beach to Bay Trail connects Assateague Island National Seashore Park/Assateague Island State Park to Janes Island State Park linking The Nature Conservancy Trail (Furnace Town), Pusey Branch Nature Trail, Pocomoke City Nature & Exercise Trail and Pocomoke River State Forest and Park. The Beach to Bay Indian Trail was designated in 1993 as a National Recreation Trail by the United States Department of the Interior. The Viewtrail 100 is an approximately 100 mile scenic bicycle trail through Worcester County. The trail consists entirely of secondary state and county roads which link points of interest and attractions of Pocomoke City, Snow Hill, Berlin with natural features of the Pocomoke State Forest and Park.

The Pocomoke River meanders for 55 miles from its headwaters in the "Great Cypress Swamp" on the State lines of Maryland and Delaware to the Pocomoke Sound before emptying into the Chesapeake Bay. The River is designated a Maryland Scenic River and is a resource for a number of recreational enthusiasts; including watermen, fishermen, and boaters.

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Recreational Use of Pocomoke State Forest (Fiscal Year 1990 - 1993)				
Activity	1990	1991	1992	1993
Hunting	4,075	3,931	4,463	4,210
Fishing	205	325	242	184
Gathering	905	1,218	1,128	857
Sightseeing	86,238	85,947	67,054	114,567
Nature Appreciation	970	1,185	1,177	857
Hiking	467	547	425	507
Horseback Riding	450	425	519	402
ORV Riding	881	933	1,004	755
Other	1,086	900	976	875
TOTAL	95,277	95,411	77,001	123,583

Forest visitation is based on estimates from patrols and Park (Milburn Landing & Shad Landing) visitor statistics.

Table K-1.

**Recreational Use of
Pocomoke State Forest
(Fiscal Year 1990 - 1993)**

L. Historic/Cultural Resources

Pocomoke State Forest adjoins one site listed on the National Register of Historic Places. The Nassawango Iron Furnace Archaeological Site was entered on the National Register on October 31, 1975.

The Nassawango Iron Furnace Site, known now as Furnace Town Historic Site, is located at the intersection of Nassawango Creek, Old Furnace Road and Millville Road north of Snow Hill, Maryland. The National Register aspects of the site consist of the Nassawango Iron Furnace proper. Also on the twenty-five acres of Furnace Town Historic Site are a Company Store, Museum Store, Museum of Iron Manufacturing, Blacksmith Shop, Charging Ramp, Smokehouse, Church, Woodworkers Shop, Visitors' Center, Broomhouse, Printshop, Farm Implement Building, Wagon Shed, Pavillion, gardens, archeological digs and location of the Bank/General Store and Mansion House, picnic area, two hundred-car parking area, and nature trails into the Nature Conservancy holdings adjacent to Furnace Town Historical Site.

Nassawango Iron Furnace was erected in 1828 by the Maryland Iron Company to smelt iron from the bog-ore formations along Nassawango Creek. It used charcoal made from several thousand acres of forest north and west of the Furnace; and shells brought up the Potomac River from the Chesapeake Bay. It was Maryland's only bog-ore furnace. It produced some 700 tons of pig iron annually, as well as cast products, servicing the Baltimore/Philadelphia/New York market. It operated until 1850, when national economic conditions forced the bankruptcy of the last owner, Thomas Spence.

During its brief years of operation, a town of some 300 people surrounded the Furnace. Although historical documentation is slim, some 13,000 archeological artifacts assist with the interpretation of early 19th century lifestyle through educational activities at Furnace Town Historical Site.

The most significant fact about the furnace is that it made use of hot blast techniques only a few years after the idea was developed in Scotland in 1828. Nassawango Iron Furnace is the best-surviving example of the hot blast technology in the United States. Documentation of the Nassawango Iron Furnace for the Historic American Engineering Record (a recording project of the National Park Service USDI) was completed in 1989. This paved the way for the recognition of the Nassawango Iron Furnace as a National Historic Mechanical Engineering Landmark by the American Society of Mechanical Engineers in 1991.

(From informatioin supplied by Furnace Town Foundation, Inc., 1995)

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Appendix B.

Silvicultural Management Methods

Silviculture is defined as the art, science and practice of establishing, tending and reproducing forest stands with desired characteristics. This appendix addresses the forest harvest techniques available to the forest manager and the rationale for choosing a particular method.

Southern pine, specifically loblolly pine, is the principal species managed for on Pocomoke State Forest. Pine are intolerant trees, meaning they require direct sunlight to grow and develop. For this reason even-aged silvicultural practices are used to manage the forest. This can be accomplished by clearcutting, seed-tree harvest or shelterwood harvest.

Even-Aged Management

1. **Clearcutting** - This method involves the removal of all trees on the site, except those to be left for wildlife, aesthetics, or to provide a watershed buffer. Reproduction is accomplished by planting, or naturally from adjacent stands and trees felled in the stand.
2. **Seed-tree Harvest**- This involves the removal of the mature timber from an area in one cut, except for a small number of seed trees per acre left singly or in small groups. Once adequate regeneration becomes established the seed trees are harvested. Enough volume in seed trees should be left to provide a commercial harvest. The seed-tree law requires a minimum of eight (8) fourteen (14) inch diameter trees be left per acre. Seed-trees must be wind-firm, therefore they should be dominant or co-dominant trees with a well developed crown and a tapering stem.
3. **Shelterwood Harvest**- This method is very similar to the seed-tree method, but a larger number of seed-trees are left. A partial stand is retained for a seed source and additional growth. As reproduction becomes established the seed-trees are harvested in one cut or a series of partial cuttings that extend over a fraction of the rotation period.

Even-aged management is utilized to achieve specific silvicultural objectives. These objectives may include one or more of the following:

- Provide for fast and effective regeneration of high-value commercial timber species.
- Plant genetically improved tree stock.
- Create an area in the early stages of vegetative development characterized

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by a high volume of ground cover that offers protection and forage to certain wildlife species.

- Provide forest users with an assortment of dissimilar forest stand structures.
- Salvage losses from insect or disease damaged stands or regenerate vulnerable stands.
- Harvest a stand of shade-intolerant trees in the most efficient way to meet multiple use objectives.
- Minimize continual re-entries into any individual stand.
- Improve forest health and associated biological diversity.

There are several issues related to even-aged management that need to be addressed. The visual and aesthetic impact of these methods is high due to the nature of the operation. This condition is temporary, however, since even-aged management promotes rapid regeneration from natural seeding, stump sprouts and hand planting. Additionally, visual buffers can be left along scenic roadways and recreational sites.

Soil compaction, erosion and sedimentation are always a concern when logging a site, no matter what type of harvest system is used. If done in accordance with best management practices no negative impact on water quality or absorption capacity of the ground water should occur.

Another concern is the effect on wildlife. The loss of wildlife habitat due to the change in stand composition is a trade-off. While some species prefer mature stands with little understory, other species require early successional stands which provide browse and cover. Forests in all stages of stand development are needed to maintain all species of life.

Even-aged management is the most common timber harvesting method for managing shade-intolerant species on public, private and industrial lands. In some respects, even-aged management is a simulation of natural events such as wildfire, wind damage and insect and disease infestations. While there are areas where even-aged management should not be used, it is a recognized and scientifically-verified practice that should be used when appropriate.

Uneven-Aged Management

Uneven-aged management is accomplished either through single tree selection or group selection. This management technique promotes the establishment of many age classes throughout a stand, from seedlings to mature trees. It favors shade tolerant species that thrive in the understory and is most compatible with objectives based on non-timber values.

Single tree selection and group selection have been tried experimentally as a means of managing for the sustained yield of southern pine. However, techniques needed to establish these species under uneven-aged management are more complex and the resulting forest is more expensive to maintain than those needed to establish and maintain an even-aged forest.

Forest Regulation

Regulation may be achieved by allocating the harvest on the basis of (1) the area to be harvested, (2) the volume to be harvested annually, or (3) a combination of area and volume.

Volume regulation is important to insure that the forest is constantly in a state of increasing growth and that over-cutting does not occur. It is also important to the stability of the local and regional economy in that industry is confident that a basic resource is available well into the future so that employment, equipment and facility construction can be amortized with reasonable certainty.

In the management of a forest, it is important to fully evaluate the species composition, age and size class distribution and the productive capacity of individual stands (site index). Where maximum economic benefit is desirable, it is also important to consider the relative economic importance of intolerant and tolerant tree species. The tree species managed for on Pocomoke State Forest contain intolerant species which have a much greater value than intolerant species. Volume regulation assures that the annual allowable harvest is controlled by net growth.

Area regulation is also a timber management option where the allowable harvest is dependent on volume, but the annual acreage harvested is also utilized in achieving optimum size (age) class distribution.

On the Pocomoke State Forest both volume and area regulation are employed in the planning of regulation harvest. In total, the timber harvest cannot exceed the allowable volume limitations.

Cutting Priorities

There are several definitions of tree maturity. One historical measure was product (or technical) maturity. When a specific product is desired the tree was allowed to reach the size required, then it was harvested. Such products are pulpwood, poles, piling, and sawtimber.

A second definition of maturity is called financial (or economic) maturity. In some respects financial maturity can be related to product maturity; however the trees are not harvested until they reach that point (in their life span) when the rate of growth declines.

A third definition of maturity is considered biological maturity. Biological maturity allows the trees to grow into old age to when the trees are declining in health and vigor, and deterioration becomes excessive. At this point in a tree's life it is actually decaying faster than it is growing. Biological maturity is seldom desirable from a timber management prospective due to the loss of merchantable lumber, the sacrifice of short lived species, and the possibility of catastrophic disease and insect infestations.

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In state forest management, rotation lengths are compromised between financial (economic) and biological maturity, dependent upon the varied needs of, and demands upon, the natural resources of each area. As a public forest, strict adherence to either financial or biological maturity is not required or desirable.

Standard Harvest Requirements

The following requirements are pertinent to all timber sales on Pocomoke State Forest. In effect, these are "*Best Management Practices*" and are accounted for when preparing the sale, supervising the logging operation, closing the sale or otherwise embodied within the contract itself. The appropriate *BMP'S* to be employed on a particular site are determined by the DNR interdisciplinary team, and reviewed by the State Forest Advisory Committee and the general public at the Annual Work Plan meeting.

- Major skid trails, wherever feasible, will be located on soils that resist compaction and ruts, or other disturbances.
- Appropriate equipment to skid logs will be designated based on slope and the ability of the soil to resist erosion or other disturbances.
- Haul roads, wherever feasible, will be located on uplands or the highest available ground to minimize impacts.
- Haul roads will be of minimum dimension necessary to accomplish their purpose and minimize impacts.
- Haul roads will follow the natural contour of the land and shall be stabilized to minimize erosion.
- Wooden mats, filter cloth or similar temporary structures will be used to reduce compaction or creation of ruts.
- Fill material will be used only when necessary to maintain or construct a road. If needed, fill shall be excavated from uplands and shall be free from state or federally designated toxic pollutants.
- Intermittent and perennial streams will not be crossed unless absolutely necessary. When necessary, crossing will be at the shortest distance feasible, be of appropriate design, and allow unrestricted movement of aquatic life in the stream.

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- Log decks will be (a) located prior to road layout (b) located in uplands as far from streams and/or wetlands as practicable or on the highest available ground if uplands are unavailable, (c) kept to minimum size and number necessary for the operation, and (d) diversion ditches will be installed to direct water away from the deck during use.
- Trash, debris, empty lubricant containers, etc. will be collected and disposed of properly.
- Utilization of low ground pressure equipment (i.e. high flotation tires, wide tracts, etc.) will be used when soils are unable to support conventional equipment.
- Scheduling of forest harvest operations will be during periods when soils are dry or frozen and are capable of supporting conventional equipment to prevent compaction, ruts, or other significant disturbances to soils or hydrology.
- All forest harvest operations will be conducted so as to prevent impoundment of water or increase runoff.
- Harvesting will be conducted during dry periods or at times that enhance natural regeneration.
- Natural regeneration will be utilized where feasible and will be supplemented by hand planting.
- Provide scenic buffers along main travel roads and trails.
- Provide sediment control buffers adjacent to natural streams and wetlands.
- Provide buffers adjacent to rare or endangered natural communities.
- Prohibit cutting within buffers where appropriate. If cutting is necessary a buffer management plan will be submitted to Maryland Department of Environment for approval.
- Provide forested wildlife corridors between sale areas.
- Retain wildlife trees (mast and den trees), when available.
- When feasible, minimize disturbance during the May-August nesting and summer rearing season of neotropical migratory land birds.

Appendix C. Forest Fire Protection Plan

I. *Objective:* To reduce the chance of wildfire occurrence and provide for orderly and cost effective suppression and investigation of wildfires.

Fire Cause	Number of Fires	Acreage Burned
Incendiary	5	16.3
Smoking	1	.1
Miscellaneous	1	.1
Lighting	1	1.0
Equipment	1	.2
Total	9	17.7

II. *Fire History and analysis*

There have been nine fires on the Pocomoke State Forest during the eight year period from 1986 through 1994. These fires burned 17.7 acres of woodland.

The following table lists the number of fires attributable to each fire cause and the corresponding acreage burned.

Forty four percent of the total number of fires occurred on class 1 and class 2 fire danger days and fifty six percent on class 4 days. Fifty six percent of the fires occurred on weekends. Of the nine fires, five involved vehicles and three of these fire starts resulted from the attempted destruction of stolen vehicles.

No location emerged as a high frequency area. Fires occurred randomly throughout the forest.

Upon analysis of the foregoing data, it may be concluded that fire prevention should concentrate on the predominant fire cause of incendiaryism. Due to the high recreational use of the forest and associated park, prevention should also be directed toward this user group.

III. *Prevention*

A. Post the fire danger rating to inform the public. In the future, have a fire danger rating sign posted at the entrance to the Shad Landing area of the park.

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- B. Inform visitors of the fire danger during personal contact.
- C. Place fire prevention posters on park information boards.
- D. Educate forest users in regard to fire safety with campfires, smoking, and equipment use.
- E. Endeavor to prosecute incendarists or arsonists.
- F. Thoroughly investigate the cause of all fires.
- G. Increase the frequency of Ranger patrol in remote areas of forest during periods of high fire danger, especially during weekends.

IV. *Presuppression*

- A. Fire training and readiness will be given priority attention. The Fire Readiness Plan (Operation Order 84-204) will be followed.
- B. Key fire roads should be identified on state forest maps and maintained. To reduce maintenance costs and control access to remote areas of the forest, state forest roads should be gated and kept closed to vehicles during periods of high fire danger.
- C. Working with the local forestry board and county firemen's association, attempt to locate and place a dry hydrant in the vicinity of the Dividing Creek, Nazareth Church or Furnace tracts to provide a water supply for fire suppression vehicles. Currently the closest water supplies to these areas is six to eight miles away in Snow Hill and Pocomoke.
- D. The Regional Fire Manager will ensure communication of the daily fire-danger rating to the State Forest office. All personnel will be advised of the fire danger.
- E. On class 3 days and above, the Ranger assigned patrol duty will patrol in a fire suppression truck equipped to agency standards.
- F. Salvage harvesting will be conducted in areas where substantial mortality has occurred due to southern pine beetle activity.
- G. In order to reduce the potential for damage in pine plantations, prescribed understory burning should be conducted to achieve well defined objectives. A prescribed burning plan and smoke management plan will be completed in accordance with agency policy.

Volume II - Support Materials**V. *Suppression***

- A. All wildfires will be suppressed on the Pocomoke State Forest. There is a great deal of private property within and surrounding the state forest, many of these containing structures. This necessitates the need for a full suppression policy.
- B. Upon notification of a wildfire in the forest, the Ranger closest to the fire will be dispatched.
- C. Initial attack personnel will ensure protection of the fire's suspected origin for investigative purposes.
- D. Immediately after dispatch of a Ranger, the Forest Service, Lower Shore Project will be notified to respond.
- E. Until arrival of Forest Service personnel, the State Forest Ranger on the scene is the incident commander. Once the Forest Service representative arrives, he/she assumes the position of incident commander and will mobilize and demobilize resources as necessary.
- F. Fires five acres or less in size will be mopped-up cold, larger fires will be mopped-up cold for a distance of 200 feet from the control line.
- G. Following demobilization, all fire suppression equipment will be made ready by the beginning of the next burning period (1000 hours). This will be the responsibility of State Forest personnel as well as Forest Service personnel.

VI. *Rehabilitation*

- A. All trash will be removed by the day the fire is declared out. Trash at the command post, staging areas, etc. should be properly disposed of during the suppression effort.
- B. Fire roads utilized during suppression should be restored to good condition.
- C. Wherever a fireline meets a stream, extra care should be exercised to prevent sedimentation of the stream.

Appendix D. Insects and Disease

Numerous insect and disease species cause injury to trees in the coastal plain forests. Insects and disease attack all parts of trees including foliage, stem, shoots, cones, seeds, and roots. This appendix addresses the most common types of insects and guidelines for control.

Gypsy Moth

The gypsy moth is a defoliator of hardwood trees, especially oak, although after the larva are half grown they will attack conifers. Tree death occurs after two or three consecutive years of defoliation and sometimes after only one year.

The Maryland Department of Agriculture is the State's lead agency in monitoring and controlling the gypsy moth on public and private land. The Maryland Department of Agriculture has a comprehensive program to reduce property loss and environmental damage. This program is the Cooperative Gypsy Moth Suppression Program and is a County-State-Federal cooperative effort that involves assistance and expertise from several agencies.

The primary objective of the suppression program is to prevent tree defoliation in excess of 50%. The secondary objective is to reduce gypsy moth populations.

All proposed treatment areas consists of woodland where gypsy moth populations have been found to be at or above 250 egg masses per acre.

Control methods included aerial application of Diflubenzuron (Dimilin) and *Bacillus Thuringiensis* (BT). Dimilin is a chemical control that affects growing caterpillars and B.T. is a naturally occurring bacteria that once ingested causes caterpillars to stop feeding. Other control methods being studied by the Maryland Department of Agriculture include gypcheck, which is a virus, and three controls that interfere with mating and reproduction of the adult moth.

In 1994 17,466 acres were defoliated by the gypsy moth in Worcester County. That same year 3,226 acres were sprayed with dimilin and 1,285 acres were sprayed with B.T. to aid in suppression efforts.

Pine Bark Beetles

Southern pine beetle, Turpentine beetles, and Engraver beetles constitute the greatest insect threat to southern pine forest. Adults cause damage by boring into the cambium and inner bark of living trees and constructing tunnels, which may girdle and kill the tree.

The southern pine bark beetle is the most destructive bark beetle in the group. It attacks trees of pulpwood and sawtimber size, which it kills by girdling and also by introducing a bluestain fungus that hastens the trees death. The stain also degrades the lumber.

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Attacks often occur when pine stands become stressed. Factors leading to tree stress include:

- Prolong moisture or drought stress in trees.
- Slow tree growth--common in overstocked and over mature stands.
- Logging, disease, storm and fire damaged trees.

The Maryland Department of Agriculture, Forest Pest Survey Section provides State Forest personnel with routine aerial surveys of the State Forest to monitor bark beetle activity. Once an outbreak area has been identified it is ground checked and assigned a control priority. Routine ground surveys are also conducted throughout the year to locate and rank outbreak areas. Additionally, the Maryland Department of Agriculture conducts a pheromone-trapping survey in the spring to monitor population levels.

The criteria in Table 1 was developed by the United States Department of Agriculture, Combined Forest Pest Research and Development Program, and is used as a guide to rate bark beetle spot growth and control priorities.

Key to Spot Growth	Spot's Classification	Risk-rating Points
A. Fresh attacks	absent	0
	present	30
B. Number of freshly attacks trees and those with developing brood.	1-10	0
	11-20	10
	21-50	20
	21-50	40
C. Pine basalarea (ft ² /acre) (Or stand density) at active head or heads.	less than 80 (low)	0
	80-120 (medium)	10
	more than 120 (high)	20
D. Average size class of timber (DBH)	pulpwood (9" or less)	0
	Sawtimber (more than 9')	10

Table 1
Guide to Rate BarkBeetle
Spot Growth and Control
Priorities

<i>Total Score</i>	<i>ControlPriority</i>
<i>0-30</i>	<i>Low</i>
<i>40-60</i>	<i>Medium</i>
<i>70-100</i>	<i>High</i>

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Control decisions depend not only on the priority of the spot, but also on the availability of crews and equipment, the size and number of trees or volume of timber in the spot, accessibility, current market conditions for beetle-killed timber, and sensitive environmental constraints.

Currently recommended control methods include (1) salvage removal, (2) cut-and-leave, (3) pile-and-burn, and (4) chemical control.

The most common control method is a salvage removal because infested trees are removed from the forest and used, giving some financial return. To be effective, a salvage cut must remove all beetle infested trees and a buffer strip of uninfested green trees.

The cut and leave method involves, felling infested trees with a buffer of uninfested trees and leaving them in the woods. The treatment disrupts spot growth and causes emerging adults to disperse into the surrounding woods.

The pile-and-burn method involves felling, piling, and burning infested trees. It can be effective but is very labor intensive and has significant environmental constraints.

Chemical control is effective in controlling bark beetles in individual trees or small groups of trees. Registered insecticides are available for killing beetles in trees that have been attacked and for preventing attacks on green trees. Chemical control is costly and subject to environmental constraints.

A new control method currently being developed involves verbenone, a compound extracted from the beetles, that is hung in bags on trees. The scent acts as a "occupied" sign, tricking the beetles into thinking the tree is already infested. The time spent searching for new trees shortens the beetle's lifespan and slows the rate of tree infestation.

Most control efforts should take place from late spring through fall to control actively spreading spots. Winter treatment may be necessary to reduce the potential of new spot development the following spring or summer.

Bark beetle problems are directly related to forest conditions. Good stand management offers the cheapest, most practical, and longest lasting means of control.

Epidemic infestations occur every 6 to 8 years. In 1993 beetle infestations reached epidemic proportions on the lower Eastern Shore. Over 150 spots on 3,000 acres were reported.

Reproduction Weevils

These insects kill pine seedlings in cutover, storm-damaged, burned or other disturbed areas. The adult weevils are attracted to the odor of fresh pine resin. They deposit their eggs in the roots of fresh pine stumps where the larva can develop. Adult weevils emerge and feed on the bark of pine seedlings. Heavy feeding can girdle the stem. The most practical method of control is to time harvest and planting to take advantage of the weevil's life cycle. Planting of treated seedlings on susceptible sites is also recommended.

Volume II - Support Materials**Pine Sawflies**

Pine sawflies have caterpillar-like larva that chew the needles of pine of various sizes. When outbreaks develop, trees on hundreds of acres may be defoliated. The trees may suffer branch mortality and growth reduction. Repeated defoliation will sometimes kill them. Healthy trees on low-risk sites, especially those that have been managed to enhance their vigor, seldom require suppression attempts. Control measures are more likely to be needed where trees are less vigorous. Trees growing on marginal sites should be enriched to increase tree vigor and sawfly resistance.

Nantucket Pine Tip Moth

Tip moth larva kill buds and twigs of young pines in natural stands and plantations. Attacks result in height growth reduction, stem deformities, and occasional mortality. Chemical control is possible, but anything that will encourage rapid seedling development, such as vigorous tree strains or ideal sites, will help reduce damage.

Appendix E. Wildlands

The Maryland Wildlands Preservation System

The Maryland Wildlands Preservation System is Maryland's counterpart to the federal Wilderness Preservation System, and consists of all those properties owned and managed by the Maryland Department of Natural Resources which were designated as State wildlands by the Maryland General Assembly.

Statutory Definition

"Wildlands are limited areas of land or water which have retained their wilderness character, although not necessarily completely natural and undisturbed, or have rare or vanishing species of plant or animal life or similar features of interest worthy of preservation for use of present and future residents of the State. This may include unique ecological, geological, scenic, and contemplative recreational areas on State lands" (Natural Resources Article, §12-1201).

Background and History

The Maryland Wildlands Act established the State Wildlands Preservation System in 1971. The first official wildland in Maryland, the Big Savage Mountain Wildland in Savage River State Forest, was officially designated by an act of the General Assembly in 1973.

As of March 1995, eleven separate wildlands have been designated on over 14,000 acres of State Park in Forest land. The existing wildlands are spread throughout the State, with two each in Allegany, Baltimore, and Worcester counties, and one in each of the following counties: Garrett, Frederick, Montgomery/Howard, Prince George's and Calvert.

Wildlands at Pocomoke

There are presently two designated wildlands within Pocomoke State Forest: the 1295 acre Pocomoke River Wildland and the 1432 acre Cypress Swamp Wildland.

The Pocomoke River Wildland, which extends from Pocomoke River Wildlife Management Area to the Shad Landing area of Pocomoke River State Park, contains a combination of cypress swamp and mixed upland hardwood forest. The area also contains a portion of the Mattaponi Natural Heritage Area.

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The Cypress Swamp Wildland is located southwest of Pocomoke City north and east of Hickory Point Road. The Cypress Swamp Wildland contains a substantial portion of the Hickory Point Natural Heritage Area.

Both Pocomoke River Wildland and the Cypress Swamp Wildland contain portions of Pocomoke Swamp, which is an isolated northern extension of the Great Dismal Swamp ecosystem. Historical occurrences of State endangered species occur at both locations.

Candidate Wildlands at Pocomoke

The Department of Natural Resources, with assistance from the Maryland Wildland Committee, the Maryland Conservation Council, and the Maryland Forests Association, has conducted an extensive inventory of DNR landholdings statewide to identify potential additional areas for inclusion in the State Wildlands Preservation System. The Inventory process utilized criteria either stated or implied in the Maryland Wildlands Law.

As a result of the inventory process three additional areas within Pocomoke State Forest (Onley/Porter's Crossing, Lankford's Discovery/Cypress Swamp Addition, and Shad/Van de Graf, which is partly within the Shad Landing section of the Pocomoke River State Park).

The 400 acre Lankford's Discovery/Cypress Swamp Addition would provide a westward extension to the existing Cypress Swamp Wildland. The Cypress Swamp complex contains a number of plant species at their northern limit of distribution, and therefore unusual for Maryland. Just west of the Cypress Swamp is Lankford's Discovery, a 282 acre tract composed primarily of tidal marsh.

The Onley/Porter's Crossing tract is located three miles north of Snow Hill just south of Porter's Crossing. Although roadless and remote, the 415 acre site is popular with Pocomoke River canoeists were identified as potential Wildlands. An excellent example of the Pocomoke River Swamp system, the Shad/Van de Graf site expands the Pocomoke River Wildland 2+ miles upstream to the mouth of Nassawango Creek. Together with the existing Wildland, a nearly six mile protected corridor would extend along the southeastern banks of the Pocomoke. The 490 acre site is known to support a wide variety of wildlife species, including migratory birds.

Legislative action on Candidate Wildlands is expected during the 1996 session of the General Assembly. These areas, if formally designated, will be incorporated into the Special Management Zone at that time.

Appendix F. The Chesapeake Bay Critical Area Preservation Act

One of the goals of the Critical Area Act and Criteria is to provide for the beneficial use of resources such as forests while protecting their water quality and wildlife values. Forests are recognized as a protective land use and should be managed in such a manner that wildlife, water quality, timber, recreation and other values can be maintained, recognizing that, in some cases, these uses may be competing.

The 1984 Chesapeake Bay Critical Area Preservation Act defined the "Critical Area" as all waters of and lands under the Chesapeake Bay to the head of tide and all land and water areas within 1,000 feet beyond the landward boundaries of State or private wetlands and heads of tide. The law was one of Maryland's responses to the documentation of the deterioration of water quality and biological communities of the Chesapeake Bay.

The law created the Critical Area Commission to develop criteria for development and resource utilization activities in the Critical Area based on the following goals:

- Manage adverse impacts on water quality that result from pollutants discharged from structures or conveyances that have runoff from surrounding land.
- Conserve fish, wildlife, and plant habitat.
- Establish land use policies for development and resource utilization in the Chesapeake Bay Critical Area that accommodate growth and also address the fact that, even if pollution is controlled, the number, movement, and activities of persons in that area can create adverse impacts.

The Critical Area Act and Criteria require the identification and conservation of Habitat Protection Areas. These areas include:

- A naturally vegetated 100-foot buffer from tidal wetlands, tidal waters and tributary streams
- Threatened and endangered species and their habitats
- Significant plant and wildlife habitat (i.e. colonial water bird nesting sites, Natural Heritage Areas, forest interior dwelling bird breeding habitat)
- Anadromous fish spawning areas

Volume II - Support Materials**The following requirements are specific to timber harvesting:**

- A forest management plan is necessary for all timber harvesting occurring within any one-year interval that affects one or more acres of forest or developed woodland in the Critical Area. The plan shall be prepared by a registered professional forester and be reviewed and approved by the Forestry Division and the Fish, Heritage and Wildlife Administration of the Department of Natural Resources.
- A sediment control plan is required for all harvests of 5,000 square feet or more of disturbed area in the Critical Area, including harvesting on agricultural lands.
- Cutting or clearing of trees within the 100-foot buffer is prohibited except for loblolly pine and tulip poplar which may be cut to within 50 feet of the landward edge of mean high water and perennial tributary streams, or the edge of tidal wetlands provided that the cutting does not occur in any other Habitat Protection Area.
- Disturbance to stream banks and shorelines must be avoided.
- The area disturbed or cut shall be replanted or allowed to regenerate in a manner that assures the availability of cover and breeding sites for wildlife.

Appendix G. Scenic River Designation

“The Pocomoke River and its tributaries possess unique natural and scenic resources that are unequaled by those of any other river on the Eastern Shore of Maryland. This uniqueness led to the designation of the river and its tributaries as initial components of the Maryland Scenic and Wild Rivers system in 1971”. (Maryland Scenic Rivers: The Pocomoke, Planning for Its Scenic, Wild and Recreational Resources)

Definition of a Scenic River

A Scenic River is a *“free flowing river whose shoreline and related land are predominantly forested, agricultural, grassland, marshlands or swampland with minimum of development for at least 2 miles of the river length”* [Natural Resources 8-402(d)(2)].

Definition of a Wild River

A Wild River is a *“free flowing river whose shoreline and related lands are undeveloped, inaccessible except by trail or predominantly primitive in a natural state for at least 4 miles of the river length”* [Natural Resources Article 8-402(d)(3)]

Scenic and Wild Rivers Program

The Scenic and Wild Rivers Project of DNR - Greenways & Resource Planning is responsible for the inventory of the rivers of the State and for preparing plans that address the protection, preservation and appreciation of designated rivers. The Scenic and Wild Rivers System was created by the General Assembly with the creation of the Scenic and Wild Rivers Act in 1969.

Scenic and Wild Rivers Plan

Greenways & Resource Planning prepares a plan for each designated river that provides for the preservation and management of river related resources. Activities through which the public can appreciate the value of these areas as Scenic and Wild Rivers are featured in the plan to the extent these activities are practicable in the area.

Upon completion of a Scenic or Wild River Plan, the Secretary of Natural Resources submits the plan and any additional recommendations to the governing body of every county through which the designated river flows for their approval and recommendations. The plan is then submitted to the Scenic and Wild Rivers Review Board for approval.

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Scenic and Wild Rivers Review Board

The Scenic and Wild Rivers Review Board is responsible for reviewing inventories, plans and regulations proposed by the Department. It is also responsible for making recommendations for river management plans and studies which recommend including additional rivers in the System. The Review Board consists of the Secretaries of Natural Resources, Agriculture, and Environment, the Director of the Maryland Office of Planning and a member of the Garrett County Commissioners, who vote on matters pertaining to the wild portion of the Youghiogheny.

Scenic and Wild Rivers Advisory Board

Each individually designated river also has its own Scenic and Wild River Advisory Board. These Boards are responsible for reviewing inventories, plans studies and regulations applicable to their jurisdictions and for making recommendations on such matters to the Scenic and Wild Rivers Review Board.

Designation Process

The designation process involves four steps: an inventory of the river's resources is conducted to determine its eligibility as a Scenic or Wild River; local governments officially propose or endorse the designation of the river; the Scenic and Wild River Review Board reviews and endorses the proposal; and the Maryland General Assembly officially designates the river.

The Scenic and Wild River Act mandates the preservation and protection of natural values associated with the rivers designated as Scenic and/or Wild. Each unit of State and local government, in recognizing the intent of the Act and Scenic and Wild Rivers Program, is required to take whatever action is necessary to protect and enhance the qualities of a designated river.

The Pocomoke Scenic River Plan

The Maryland Scenic Rivers: The Pocomoke, Planning For Its Scenic Wild and Recreational Resources (1982) is a comprehensive management plan prepared by the Department of Natural Resources (Maryland Scenic and Wild Rivers Program). The study has three major components: an inventory of the river corridor's biological and recreational resources, general management recommendations and implementation techniques.

The recommendations address a number of practices that should be considered in the implementation of the Pocomoke State Forest Ten-Year Resource Management Plan to avoid conditions that may impact the visual landscape and/or water quality.

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The resource use recommendations are grouped in 8 major categories: water quality and flow, fish and wildlife structures, forestry practices, public access, recreation, dredging, filling and other earth moving activities, and others.

In principle, the plan promotes maintaining biodiversity and sensitive habitats; protecting the fish, flora and fauna, and visual quality through conscientious conservation practices; and the provision of opportunities for passive recreation and public access.

Implementation of the plan is the responsibility of the Department of Natural Resources and the Somerset and Worcester counties' offices of planning and zoning.

Appendix H. Maryland Recreational Opportunity Spectrum (ROS)

Recreation in our state forests is more than just camping, fishing, and hiking. Research has shown that people choose a specific setting for each of these activities in order to realize a desired set of experiences. For example, camping in a large undeveloped setting with difficult access and few facilities offers a sense of solitude, challenge and self-reliance. In contrast, camping in a setting having easy access and highly developed facilities offers more comfort, security, and social opportunities.

The purpose of the Maryland Recreation Opportunity Spectrum (MROS) is to provide a framework for defining the types of outdoor recreation opportunities the public may desire, and indicate the most appropriate recreational settings in a state forest. There are four major classes for forest use: Developed Areas (D), Roaded Natural (RN), Semi-Primitive Motorized (SPM), and Semi-Primitive Non-Motorized (SPNM). Maintaining a broad spectrum of these classes is important to provide people with choices for a recreational experience. ROS is also flexible; it can be further subdivided into subclasses as the need arises.

ROS is a helpful tool for recreation planning that can be used to:

- Inventory existing opportunities.
- Analyze the effects of other resource activities.
- Estimate the consequences of management decisions on planned opportunities.
- Link user desires with recreation opportunities.
- Identify complementary roles of all recreation suppliers.
- Develop standards and guidelines for planned settings and monitoring activities.
- Help design integrated project sets for forest plan implementation.

A major end product of recreation planning and management is the visitor experience. The key to providing the best recreational experience for the forest visitor is the setting and how it is managed. Resource managers can facilitate or discourage desired experiences by the way setting indicators are controlled. Setting indicators include: access, remoteness, facilities, social encounters, visitor impacts, the natural environment, and the visitors themselves.

After the forest has been evaluated, it is mapped according to recreational class from semi-primitive non-motorized to developed areas. The following matrices provide a cross-reference between the recreational class indicated on the map and the setting indicators. The result is a decision making tool that recommends compatible uses of a resource for existing and planned recreational activities and limits of acceptable change.

Setting Indicator: Access

Access includes type and mode of travel. Highly developed access generally reduces the opportunities for solitude, risk, and challenge, and can increase visitor use and environmental impact. However, it can enhance opportunities for socializing, and visitor safety and comfort. Accessibility for persons with disabilities can be organized along the ROS framework. Access in developed settings should be barrier-free. Conversely, travel ways should ideally be limited to a trail system when entering more primitive areas of the forest.

Limits of Acceptable Change

Compatible:
describes acceptable conditions found in the setting for a given recreational class

Partially Compatible:
represents conditions that are not generally compatible, but may be necessary under some circumstances to meet management objectives.

Incompatible:
defines conditions that do not permit the creation or maintenance of a given setting. Where unacceptable conditions are unavoidable, a change in setting will often result.

Class (indicated on Map)	Cross-country Travel	Non-motorized Trails	M otorized Trails	Full Access
Semi-primitive Non-motorized	COMPATIBLE		Inconsistent	Incompatible
Semi-primitive Motorized				Partially Compatible
Roaded Natural				
Developed Areas				

Setting Indicator: Remoteness

Remoteness refers to the extent thr forest visitor is removed from the sights and sounds of human activity and disturbance. A lack of remoteness is important for some setting experiences (See matrix on following page). The remoteness indicator can be used for example when locating a rifle range, or an area of intensive ORV use.

Class (indicated on map)	Out of sight & sound of human activity < 1/4 mile walk	Distant sight &/or sound of human activity < 1/4 mile from motorized travel	Distant sight &/or sound of human activity < 1/4 mile from any full access roads	Remoteness of little relevance
Semi-primitive Non-motorized	COMPATIBLE	Partially Compatible	Partially Compatible	Incompatible
Semi-primitive Motorized			Partially Compatible	Partially Compatible
Roaded Natural				
Developed Areas				

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Setting Indicator: Social Encounters

This factor refers to the number and type of encounters between recreation parties along travelways or camping areas within sight or sound of others. This setting indicator measures the extent to which an area provides experiences such as solitude, or the opportunity for social interaction. Increasing the number of visitors to an area changes the kind of recreation experience offered, attracting new users and causing others to leave. As an example, camp sites that are designed to accommodate group camping should ideally be situated in more developed forest areas.

Class (Indicated on map)	6 parties or less met per day, less than 3 visible parties seen at campsite	6-15 Parties met per day, 6 or less parties seen at campsite	Moderate to High contact in developed sites on roads & trails	Large numbers of users on site & in nearby areas high number of social encounters
Semi-primitive Non-motorized		Partially Compatible	Incompatible	Incompatible
Semi-primitive Motorized			Partially Incompatible	Incompatible
Roaded Natural		COMPATIBLE		Incompatible
Developed Areas				

Setting Indicator: Visitor Management

This includes the degree to which visitors are managed and controlled as well as the level of information and services provided for visitor enjoyment. In some opportunity settings, controls are expected and appropriate. For instance, people sometimes seek developed settings for security and safety. Elsewhere, on-site controls may detract from desired experiences, such as independence, self-reliance, and risk-taking.

The type and level of information, and where it is provided to the visitor, may facilitate or hinder certain types of recreational experiences. On-site interpretive and directional signing may adversely affect the visitor where experiences such as self-discovery, challenge, and risk are important. In other situations, on-site information may be essential to achieve desired experiences. Generally, on-site information is more appropriate at the developed end of the spectrum, while off-site sources are preferable at the primitive end.

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Setting Indicator: Visitor Management (cont.)

Class (indicated on map)	Subtle if any on-site regimentation or on-site information facilities	Noticable on-site controls, simple information facilities	Regimentation & controls obvious and numerous	Regimentation and controls obvious and numerous, complex information exhibits
Semi-primitive Non-motorized	COMPATIBLE	Partially compatible	Incompatible	
Semi-primitive Motorized		Partially compatible		
Roaded Natural		Partially compatible	Partially compatible	
Developed Areas				

Setting Indicator: Facilities and Site Management

This indicator refers to levels of site development. Few facilities and limited site modification are compatible in more primitive areas of the forest, and can enhance feelings of self-reliance and independence. Facilities that provide comfort, convenience, and opportunities for socializing, are appropriate in developed locations.

Class (indicated on map)	No Facilities for user comfort use of natural materials for site protection only	Some Facilities for user convenience, built from non-synthetic materials	Facilities designated for user comfort, intensive recreation, office and maintenance
Semi-primitive non-motorized	COMPATIBLE	Incompatible	
Semi-primitive motorized			
Roaded Natural			
Developed Areas			

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Setting Indicator: Visitor Impact

Visitor impact refers to the adverse effects of visitor use on the environment. The relevant question for managers is not "how can impacts be prevented", but rather, "how much change will be allowed and which actions are appropriate for control." The following matrix suggests appropriate actions for controlling impacts on soil and vegetation. Impacts on wildlife habitat, air, water, and sound quality affect the visitor's experience as well. Visitor impacts can alter wildlife habitat or displace wildlife species, including indicator species, which provide an important means of monitoring recreation related impacts on fish and other wildlife. Maintaining air, water, and noise quality standards in the face of visitor impacts is important in all ROS classes.

Class (indicated on map)	Unnoticeable Impacts	Limited Site Hardening	Extensive Site Hardening
Primitive Non-motorized	COMPATIBLE	Partially Compatible	Incompatible
Semi-primitive Motorized		Partially Compatible	
Roaded Natural			Partially Compatible
Developed Areas			

Setting Indicator: The Natural Environment

Refers to the degree of a human disturbance on the natural environment: for instance, it affects the visitor's experience when enjoying nature through birdwatching or hiking. This indicator is portrayed by using a compatible visual objective (VQO) for each setting, as shown in the following matrix.

	High	Moderate	Lower*1
Semi-primitive Non-motorized	COMPATIBLE	Partially compatible	Incompatible
Semi-primitive Motorized			Partially compatible
Roaded Natural			
Developed Areas			

**1 For definitions of management practices- High, Moderate and Low, refer to MVMS.*

Recreational Class Criteria (Definitions)

I. Semi-Primitive Non-Motorized

Remoteness Criteria

An area designated at least 1/4 mile from all roads, railroads or trails with year-round motorized use. An area can include the existence of primitive roads and trails if usually closed to motorized use.

Setting characterization

Characterized by a predominately natural or natural-looking environment of moderate-to-large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Public motorized use is not permitted.

Experience characterization

High probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility and self reliance through the application of woodsman and outdoor skills in an environment that offers challenge and risk.

Activity characterization

Examples include viewing scenery, hiking and walking, primitive camping, hunting, fishing, horses, nature study, and general information.

Evidence of Humans Criteria

Natural setting typically has the least amount of management activity in the R.O.S. class criteria.

II. Semi-Primitive Motorized

Remoteness Criteria

An area designated within 1/4 mile of OHV-designated trails; but not closer than 1/4 mile from county, state or full-use forest roads.

Setting Characterization

Characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Public ORV use is permitted on designated trails.

Volume II - Support Materials**Experience Characterization**

Moderate probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsman and outdoor skills in a environment that offers challenge and risk. Opportunity to use motorized equipment while in the area.

Activity Characterization

Examples include ORV (off-highway vehicle), mountain biking, viewing scenery, hiking and walking, primitive camping, hunting, fishing, nature study, and general information.

Evidence of Human Criteria

Natural setting may typically have a moderate amount of management activity compared to other R.O.S. classes.

III. Roded Natural**Remoteness Criteria**

An area designated within 1/4 mile from forest, county, state roads and railroads.

Setting Characterization

Characterized by predominantly natural-appearing environments with moderate evidences of the sights and sounds of man. Interaction between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident. ORV and general public motor vehicle use is usually permitted on all designated ORV trails as well as state, county and full-service forest roads.

Experience Characterization

About equal probability to experience affiliation with other user groups or for isolation from sights and sounds of humans. Opportunity to have a high degree of interaction with the natural environment. Challenge and risk opportunities associated with more primitive type of recreation are not very important. Practice and testing of outdoor skills might be important. Opportunities for both motorized and non-motorized forms of recreation are possible.

Activity Characterization

Examples include primitive dispersed family and group camping, organized use, interpretive services, ORV (off-road vehicle) use, OHV (off-highway vehicle) use, mountain biking, viewing scenery, hiking and walking, primitive camping, hunting, fishing, nature study, and general information.

Evidence of Human Criteria

Roaded natural areas often have a full range of forest management activities.

IV. Developed Areas**Remoteness Criteria**

No distance criteria.

Setting Characterization

Characterized by a moderately to substantially modified natural environment. Visitor interaction is often moderate to high. Facilities are present for special activities, and designed for use by large numbers of people.

Experience Characterization

Probability for experiencing affiliation with individual and groups is prevalent, as is the convenience of sites and opportunities. With the exception of managed vista points, these factors are generally more important than the setting of the physical environment. Opportunities for wildland challenges and test of outdoor skills are generally unimportant.

Activity Characterization

Examples include medium density camping, organized use, boat launch, multi-car parking, visitor center use, shooting range, interpretive services, ORV (off-road vehicle) use, OHV (off-highway vehicle) use, mountain biking, fishing, viewing scenery, hiking and walking, nature study, and general information.

Evidence of Human Criteria

Developed areas allow the full range of management activities.

(The preceding material has been adapted from the USDA Forest Service, *ROS PRIMER AND FIELD GUIDE*, U.S. Government Printing Office 1990)

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Appendix I.

Maryland Visual Management System (MVMS)

Most visitors to public forests have a mental image of what they expect to see. According to several studies, these visual expectations vary from one geographic region to another. However, regardless of the region, people do expect to see naturally appearing landscape character in public forests. The Visual Management System was devised in order to meet these expectations.

The *visual landscape* is a basic resource to be treated with equal consideration with other forest resources. The Maryland Visual Management System (MVMS) provides the framework to manage this resource.

The objectives of MVMS are to:

1. Establish criteria for identification and classification of scenic quality.
2. Establish quality objectives for alteration of the visual resource.
3. Provide the freedom to explore viable alternatives in order to attain the appropriate visual quality objectives.
4. Replace the existing travel management zone with a more flexible method for mitigating visual impacts within the viewsheds of different types of roads and trails.

The Characteristic Landscape

The characteristic landscape is the naturally established landscape being viewed. It visually represents the basic vegetative patterns, land forms, and water forms which are observed by the visitor. In some cases, the types of management activities applied to viewsheds are affected by this benchmark.

Three elements affect the characteristics of landscapes and how they should be managed: These include the distance from the observer of the area being viewed (**Visual Distance**), the scenic quality or significance of the scenery (**Landscape Variety Class**), and the frequency of visitor travel in specific areas of a forest (**Sensitivity Level**). In general, outstanding scenery that is frequently observed by numerous forest visitors merits stronger considerations for preserving the landscape. On the other end of the spectrum, areas that are infrequently traveled, and that do not possess significant scenery, have less stringent recommendations for viewshed preservation.

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These three elements - **Visual Distance**, **Landscape Variety Class**, and **Sensitivity** - are delineated on forest map overlays. The following descriptions provide the criteria used for each of these elements when mapping the MVMS overlay.

Visual Distance

Visual Distance is the distance from the observer of a particular landscape, and is used to describe the part of a characteristic landscape that is being inventoried or evaluated. Visual distance may be categorized as follows:

Foreground

Distances at which details can be perceived. Normally in the foreground the individual boughs of trees form texture. The foreground is usually limited to areas within 1/4 to 1/2 mile of the observer.

Middleground

Extends from the foreground zone to 3-5 miles beyond the observer in open areas, less in forested areas of the Eastern temperate zone. Texture is characterized by masses of trees in stands of uniform tree cover. Individual trees are discernible only in sparse stands or open areas.

Background

The remaining view extending beyond the defined middleground. Texture in stands of uniform tree cover is weak to non-existent.

Landscape Variety Class

There are three classes which identify the scenic quality of the natural landscape:

Class A - Distinctive

Refers to areas where features of land form, vegetation patterns, water forms, or rock formations are of unusual or outstanding visual quality, or have regional, state-wide or national significance.

Class B - Common

Refers to those areas where features contain variety in form, line, color and texture or combinations thereof but which tend to be common throughout the character type (regional landscape) and are not outstanding in visual quality.

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Class C - Minimal

Refers to those areas whose features have little change in form, line, color, or texture. Includes all areas not found under Classes A and B.

How Landscape Variety Class is Determined

A frame of reference must be developed by which to judge the physical features of an area as distinctive, common or minimal. Ranking the Class B features within the area should be done first as a means of establishing a benchmark from which distinctive and minimal can be judged. Class A landscapes have relatively diverse variety in form, line, color, and texture. Correspondingly, Class C features have very little variety in form, line, color, and texture. Some landscape character types have very little land falling into Class C.

The following table was designed to aid in determining the landscape variety class for the Eastern Coastal Plain Physiographic Province. This table serves as a general guide only; the presence of any one feature within a given landscape may or may not qualify it for a particular class.

LANDSCAPE VARIETY CLASSES

	Class A Distinctive	Class B Common	Class C Minimal
Land Form	Any form of discernible topographic relief excluding manmade land forms.	-----	0 % slopes
Vegetation	High degree of pattern in vegetation, large mature stands, or unusual or high diversity in plant species.	Continuous vegetation cover with distinct strata. Common diversity in plant species.	Continuous vegetation cover without visible strata. Monotypic juvenile stands.
Water Forms - Streams & Wetlands	Large defined stream or small streams with consistent flow, or presence of wetlands.	Smaller streams with inconsistent flow. Some manmade ditches not recently maintained.	Little or no presence of water or wetlands.

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Sensitivity Levels

Sensitivity levels are a measure of people's concern for scenic quality. Levels are determined for land areas viewed by those are traveling through the forest on developed roads and trails, as well as those who are recreating at streams and other water bodies. Three sensitivity levels are employed, each identifying a different assumed level of user concern for the visual environment, based on frequency of use. These are:

Level 1 (High Sensitivity)

Heavily traveled roads and trails

Level 2 (Moderate Sensitivity)

Moderately traveled roads and trails

Level 3 (Lower Sensitivity)

Less traveled roads and trails

The following table illustrates a hierarchy used to establish the criteria for determining sensitivity levels:

SENSITIVITY LEVELS

Types of Travel	LEVEL ONE (High Sensitivity/ Heavily Traveled)	LEVEL TWO (Moderate Sensitivity/ Moderately Traveled)	LEVEL THREE (Lower Sensitivity/ Less Traveled)
Roads	Interstates and State, County & Forest roads that function for recreation access	State, Forest & County roads that provide less important recreation access	Forest and County roads that do no provide significant access
Land/ River Trails	Popular, well traveled trails such as circuit trails or longer trails serving to connect recreation areas	Trails less traveled by those with a major concern for aesthetics	Trails least traveled by those with a major concern for aesthetics

Visual Quality Ratings

All forest lands have been mapped as to visual distance (foreground, middle ground, and background), sensitivity level (level 1 - highly sensitive/heavily traveled, level 2 - moderately sensitive/moderately traveled, or level 3 - lower sensitivity/less traveled), and landscape class (A-Distinctive, B-Common, C-Minimal). Using abbreviations for these three landscape characteristics, a composite code is assigned to each area of the forest.

For example, the designation of an area in the forest as **fg1A** would indicate that the viewshed is less than 1/4 mile from a likely observer (foreground), the route is generally heavily traveled (sensitivity level 1), and the scenery is significant (landscape class A).

Devising measurable standards or objectives for the visual management of these lands now becomes the primary task. In order to do so, each land area is first assigned a **visual quality rating**, based on its combination of landscape characteristics (distance, sensitivity level, and landscape variety class). The visual quality rating expresses a general value of the importance of preservation of a landscape or viewshed. There are three visual quality ratings **High Value, Moderate Value and Lower Value**.

The following table shows how the three landscape characteristics are combined to determine the visual quality rating. It is important to emphasize that the delineations of the values are subject to change due to ongoing forest management and planning activities. The table is intended to serve as a guideline only.

VISUAL QUALITY RATINGS
(Based on Distance, Sensitivity, and Landscape Variety Class)

		Distance / Sensitivity Level						
		fg1	mg1	bg1	fg2	mg2	bg2	3
Landscape Variety Class	Class A	HV	HV	MV	MV	MV	MV	MV
	Class B	HV	MV	MV	MV	LV	LV	LV
	Class C	MV	MV	LV	LV	LV	LV	LV

HV-High Value
MV- Moderate Value
LV- Low Value

Implementation of the Visual Management System

Recommended Visual Management Objectives

The visual quality rating is mapped for each area of the forest. For each visual quality rating, suitable management objectives and activities have been identified in terms of visual impacts, and are described below:

- **High Value**

The objective for visual management in High Value areas is to limit management activities to those which are not visually evident. This objective may be called *retention*. Management activities strive to conform to the visual characteristics of the site or landscape. Activities attempt to repeat form, line, color, and texture which are frequently found in the characteristic landscape. Changes in the qualities of size, amount, intensity, direction, pattern etc., should not be evident.

Duration of visual impact: Impacts to form, line, color and texture contrast should be mitigated either during operation or immediately afterwards, as part of normal forest practices. It may be done by such means as seeding vegetative clearings and cut/fill slopes, planting of large stock, painting structures, etc.

Types of management: Management activities in High Value areas may include many types of selection and deferment harvests, provided they attempt to minimize changes to form, line, color or texture.

- **Moderate Value**

The objective for visual management in areas with a Moderate Value visual quality rating is *partial retention*. Management activities may introduce form, line, color, or texture which are found infrequently or not at all in the characteristic landscape, but they should remain visually subordinate to the visual strength of the characteristic landscape.

Duration of visual impact: Changes to form, line, color, and texture should be mitigated as soon after project completion as possible.

Types of management: Recommended management activities consistent with the partial retention objective include small, irregular shaped regeneration cuts, partial cuts and other practices that minimize color and texture contrast.

Lower Value

Management objectives in areas with a Lower Value rating may include *modification*, in which management activities visually dominate the original characteristic landscape. However, activities that alter the landscape should consider impacts to form, line color, or texture.

Duration of visual impact: Changes to form, line, color, and texture should be mitigated as soon as possible after the project is completed.

Additional Visual Management Objectives

Two additional short-term visual management objectives may also be used in an area of any visual quality rating when suitable.

The first objective, *rehabilitation*, is used to upgrade landscapes containing visual impacts which do not meet the quality objectives set for that particular area.

The second, *enhancement*, is for landscapes having a potential for greater natural-appearing variety. Once the short-term goal is attained, the standard applicable visual management objectives are then applied to the area.

The preceding material (Appendix I) has been adapted from *National Forest Landscape Management*, Volume 2, Chapter 1, "The Visual Management System," USDA, Forest Service, Agriculture Handbook Number 462.

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Appendix J**Acquisition**

Obtaining land through purchase, exchange, and donation.

Activity

A measure, course of action, or treatment that is undertaken to directly or indirectly produce, enhance, or maintain forest outputs or achieve administrative or environmental quality objectives.

Aesthetic

Generally, the study, science or philosophy dealing with beauty and with judgments concerning beauty.

Age Class

An interval, into which the age range of trees is divided for classification purposes.

Aggregate

All of the coarse materials, such as sand, gravel, and crushed stone, that are used in base courses on roads.

Alternative

One of several policies, plans, or projects proposed for decision making.

Aspect (Slope Orientation)

The direction toward which a slope faces - exposure.

Basal Area

Measurement of how much of a site is occupied by trees. It is determined by estimating the cross section area of all the trees in an area at breast height (4.5 feet).

Benefit (Value)

Inclusive terms used to quantify the positive results of a proposed activity, project or program expressed in monetary or nonmonetary terms.

Biological Diversity

The variety and variability among living organisms and the ecological complexes in which they occur.

Board Foot (BF)

A volume of solid wood, equivalent to a piece 1 foot square and 1 inch thick. MBF= 1 thousand board feet. MMBF = One million board feet.

Canopy

The more or less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

Carrying Capacity

Natural: The number or weight of organisms that can survive without causing deterioration of the ecosystem. *Recreational:* The number of people seeking a specific recreation use that an area can support without significant deterioration to the quality of the recreation experience or the resource.

Clearcut

A cut which removes the majority of trees left for other resource values from a designated area at one time for the purpose of creating a new even aged stand.

Conifer

Any of a wide range of predominantly evergreen cone bearing trees with needle shaped or scale like leaves such as pine, cedar or hemlock.

Cord

A unit of measurement for measuring round or split wood. A standard cord is 4x4x8 feet or 128 cubic feet. A standard cord may contain 60-100 cubic feet of solid wood depending on the size of the pieces and the compactness of these stacks.

Corridor

A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries.

Cost Effective

Achieving specified outputs or objectives under given conditions for the least of cost.

Cultural Resource

Cultural resources are the physical remains of districts, sites, structures, networks, or objects used by humans in the past. They may be historic or prehistoric, archaeological or architectural in nature. Cultural resources on the State Forest include hunting, quarrying, plant gathering, and living areas from the prehistoric period. Historic era sites are associated with farming, logging, oil, exploration, and a variety of industrial pursuits. Cultural resources are land based and are nonrenewable.

DBH

Diameter at breast height (4.5 feet).

Demand

The amount of an output that users are willing to take at a specified price, time period, and condition of sale.

Den Tree

A tree containing a natural cavity used by wildlife for nesting, brood rearing, hibernating, daily or seasonal shelter, and escape from predators.

Dispersed Recreation

In contrast to developed recreation, these activities are associated with low density use distributed over large expanses of land or water. When provided, facilities are more for protection of the environment than for comfort or convenience of the visitor.

Ecosystem

The system formed by the interaction of groups of organisms and their environment.

Ecosystem Management

Any land management system that seeks to conserve viable populations of all native species, perpetuate natural disturbance regimes on the regional scale, and allow human use at levels that do not result in long term ecological degradation.

Edge

The place where plant communities meet or where successional stages or vegetative conditions within plant communities come together.

Edge Effect

The effect on wildlife habitat created where two or more vegetative types can come together.

Endangered Species

Federal species listed in the current Federal Register as being in danger of extinction nationally throughout all or a significant portion of their ranges. State listed endangered species are those in danger of extinction in the State of Maryland as monitored by the Maryland Department of Natural Resources.

Enhancement

Improved visual condition achieved by increasing desirable variety in the landscape.

Erosion

The wearing away of the land's surface by running water, wind, ice, and other geological agents. It includes detachment and movement of soil or rock fragments by water, wind, ice or gravity. *Geological or Natural Erosion:* The normal or natural erosion caused by geological processes acting over long geologic periods and resulting in the wearing away of mountains, the building up of floodplains, coastal plains, etc. Also called natural erosion.

Even-aged Management

The application of a combination of actions that results in the creation of a stand in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes throughout the forest area). The difference in age between trees forming the main canopy level of a stand usually does not exceed 20% of the age of the stand at harvest rotation age.

Extraction

The process of mining and removing mineral deposits or oil and gas from the earth.

Floodplain

Low land and relatively flat areas joining water. The minimum area included is that subject to a 1% (100 year recurrence) or greater chance of flooding in any given year.

Forage

Portions of woody and herbaceous plants available to animals for food.

Foreground (Visual Distance)

The part of a scene, landscape, etc., which is nearest to the viewer, and in which detail is evident, usually within 1/4 to 1/2 mile from the viewer.

Forest

When used with a capital "F" this term refers to the Pocomoke State Forest, including the landbase and administrative staff.

Forest Land

Land at least 10% occupied by forest trees of any size or formerly having had such tree cover and not currently developed for nonforest use. Land developed for nonforest use includes areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, and adjoining road clearing and powerline clearing of any width.

Forest Plan

A long range plan for management of a designated area of state forest lands. This plan will provide management direction for all management programs and practices, resource uses, and resource protection measures on these lands.

Forest Road

A road wholly or partly within, or adjacent to, and serving state forest land that is necessary for the protection, administration, and use of Forest land and the use of development of its resources.

Forest Type

A natural group or association of different species of trees which commonly occur together over a large area. Forest types are defined and named after the one or more dominant species trees, such as the spruce-fir and the birch-beech-maple types.

Game Species

Wild animals hunted for sport or food.

GAP Analysis

The evaluation of the protection status of plant communities, animal species, and vertebrate species richness by geographic information system overlay of biological distribution data on a map of existing biological reserves.

General Zone

This zone consists of the operable areas remaining after all other zones are accounted for. This zone is available for most resource needs and multiple use.

Goal

A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principal basis from which objectives are developed.

Goods and Services

The various outputs, including onsite uses, produced from forest resources.

Ground Water

Aquifer: Any permeable underground formation which yields ground water. **Ground Water:** Water underneath the water table, in the zone of saturation, from which wells, springs, and base flow are supplied. **Water Table:** The upper surface of the ground water, below which saturated conditions exist. A perched water table is formed by impermeable layers lying above the surface of the main water table and tends to fluctuate considerably.

Guideline

An indication or outline of policy or conduct.

Habitat

The place where a plant or animal can live and maintain itself.

Hardwood

A broad-leaved flowering tree, as distinguished from a conifer. Trees belonging to the botanical group of angiospermae.

Headwater

The small rivulets forming the source of a stream or river.

Indigenous Species or Community

Species or communities historically native to an area, not introduced by man.

Insecticide

An agent used to control insect populations.

Interdisciplinary Team (ID Team)

A group of individuals with skills from different resource fields. An interdisciplinary team is assembled because no single scientific discipline is sufficient to adequately identify and resolve issues and problems. Team member interaction provides necessary insight to all stages of the process.

Intermittent Stream

A stream or portion of a stream that flows generally only in the wetter seasons. It is dry for a substantial part of an average stream flow year. A stream is not considered to be dry until all signs of down gradient movement of surface water have ceased; i.e., if the stream channel surface is totally dry or the water in remaining pools is totally stagnant.

Intolerant Species

Those plant species that do not grow well in shade.

Land Base

A specific area of the earth's surface and all its attributes including water bodies, from which goods services and uses can be supplied.

Land Form

A discernible natural landscape, such as a floodplain, stream terrace, plateau, or valley.

Land Management

The intentional process of planning, organizing, programming, coordinating, directing and controlling land use actions.

Land Use

The occupation or reservation of land or water areas for any human activity or any defined purposes; in these documents, the terms "use" and "land use" are interchangeable.

Management Area

An area with similar management objectives and a common management prescription.

Management Direction

A statement of goals and guidance for attaining them.

Management Practice

A specific activity, measure, course of action or treatment.

Management Prescription

Management practices and intensity selected and scheduled for application on a specific area to attain multiple use and other goals and objectives.

Mast

The fruit and nuts of such plants as oaks, beech, hickories, dogwood, blueberry and grape.

Middle Ground

That part of a scene or landscape which extends from the foreground zone to 3 - 5 miles from the observer. Texture is discernible at that distance.

Mineral

Any inorganic material. The term is used to designate broadly all material that is not animal or vegetable. It includes sand, gravel and stone.

Mineral Rights

Owning minerals beneath the surface of the ground; often it is someone other than the owner of the surface. Legal ownership of minerals, including authority to use as much of the surface as is prudently necessary to produce them.

Multiple Use

The management of all the various renewable resources of the state forest so that they are utilized in the combination that will best meet the needs of the people. The most judicious use will be made of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in the use to conform to changing needs and conditions. Some lands will be used for less than all of the resources and harmonious and

coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration being given to the relative values of the various resources. This is not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

Nonforest Land

Lands never having or incapable of having 10% or more of the area occupied by forest trees, or lands previously having such cover and currently developed for nonforest use.

Nongame Species

Animal species that are not usually hunted in this state. This classification is determined by the state legislature.

Nonmotorized Use

Land uses not requiring roads or motor vehicles.

Objective

A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals.

Off-Road Vehicle

Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland or other natural terrain. ORV's include vehicles such as 4-wheel drive units, all-terrain vehicles, motorcycles, snowmobiles, amphibious vehicles and air cushioned vehicles.

Old-Growth Forest

Relatively old and relatively undisturbed forest stands with trees of all ages and sizes, but distinguished by a preponderance of larger diameter trees, a multi-layered canopy with standing dead or dying trees and an accumulation of dead woody material on the forest floor. Old-growth forests represent the latter stages of stand development where dominant trees in the overstory show signs of decline related to old age.

Parent Material

The unconsolidated, more or less conically weathered mineral or organic matter from which the soils have developed by pedogenic processes. The C horizon may or may not consist of materials similar to those from which A and B horizons developed.

Partial Retention

A visual quality objective which in general means management activities may be evident but must remain subordinate to the characteristic landscape.

Perennial Stream

A stream that contains surface water moving down gradient in the deeper parts of its channel throughout an average stream flow year. A stream is considered to contain surface water moving down gradient even if moving surface water can only be observed in pools, but its flow is insufficient to be seen on the surface of unconsolidated sediments in the riffle areas between pools. Perennial streams are generally shown as solid blue lines on the United States Geological Survey 7.5 minute series topographic maps. For the purposes of this management plan the designation "perennial stream" applies to, but is not limited to, all streams shown as solid blue lines on the United States Geological Survey 7.5 minute series topographic maps.

Pest

A plant, animal or environmental stress which the land manager determines to be detrimental to achieving resource management objectives.

Pesticide

A general term applied to any substance used for controlling insects, weeds, rodents, fungi or other forms of plant or animal life that are considered pests. Includes insecticides, herbicides, rodenticides, fungicides, etc.

pH

A quantitative measure of hydrogen ion concentration. A pH of 7 corresponds to exact neutrality; a pH less than 7 indicates acidity; and a pH greater than 7 indicates alkalinity.

Picnicking

Eating meals in a forest environment for pleasure and relaxation.

Plantation

A forest crop or stand raised artificially, either by seeding or planting of young trees.

Policy

A guiding principle upon which is based a specific decision or set of decisions.

Predator

An animal species that obtains its food by hunting other animal species.

Prescribed Burn

A wildland fire burning under specified conditions that will accomplish certain planned objectives.

Preservation

A visual quality objective that provides for ecological change only.

Primitive

The term primitive is often used synonymously with dispersed or nondeveloped recreation or camping use.

Program

Sets of activities or projects with specific objectives, defined in terms of specific results and responsibilities for accomplishments.

Project

An organized effort to achieve an objective identified by location, activities, outputs, effects and time period and responsibilities for execution.

Public Education

Direct education on forest and park service activities or programs. Consists in part of exhibits, letters, descriptive publications, press publicity and show-me trips.

Public Involvement

A DNR process designed to broaden the information based upon which agency decisions are made by (1) informing the public about DNR activities, plans and decisions and (2) encouraging public understanding about and participation in the planning processes which lead to final decision making.

Reforestation

The natural or artificial restocking of an area with forest trees.

Regeneration

(1) The actual seedling and saplings existing in a stand. (2) The act of establishing young trees naturally or artificially.

Regeneration Cut

Removal of trees with the intention of establishing a new crop of seedlings.

Removal Cut

The final cut of the Shelterwood System which removes the remaining mature trees, completely releasing the young stand. An even-aged stand results.

Retention

A visual quality objective which in general means management activities are not evident to the casual forest visitor.

Riparian Areas

Geographically delineable areas with distinctive resource values and characteristics that are comprised of aquatic and riparian ecosystems. These areas serve to modify flood peaks and are important in groundwater reg/charge, wildlife and fish habitat, timber production and recreation opportunities. The delineation of these areas is dependent on the water regime, soil and vegetation.

Riparian Ecosystem

A transition between the aquatic ecosystem and the adjacent terrestrial ecosystem, identified by soil characteristics and distinctive vegetation communities that require free or unbound water. The soils are wet and are usually saturated for portions of the year. Vegetation types are dominated by wet-site species.

Road

A general term denoting a way for purposes of travel by vehicles (either motorized or nonmotorized).

Rotation

The period of use between the initial establishment of a stand of timber and the time when it is considered ready for cutting and regeneration.

Salvage

Dead or dying trees which occur in excess of those needed for wildlife, aesthetics or other purposes. These trees are harvested for production.

Sapling

As used in timber survey, a size class definition, trees 1.0 to 4.9" at dbh.

Sawtimber

As used in timber survey, a size class definition, softwood trees larger than 9" at dbh and hardwood trees larger than 11" dbh.

Sediment

Solid materials, both mineral and organic, that are in suspension, are being transported, or have been moved from their site of origin by air, water, gravity or ice that has come to rest on the earth's surface either above or below sea level.

Seedling

As used in timber survey, a size class definition, trees less than 1" at dbh.

Sensitive Species

Sensitive species are those plants and animals identified by a regional forester for which population viability is a concern as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Sensitivity Level

As used in visual quality management: a particular degree or measure of viewer interest in the scenic qualities of the landscape (1) most sensitive, (2) sensitive and (3) less sensitive.

Shade-Intolerant Species

Those plant species which do not grow well in a shaded environment.

Shade-Tolerant Species

Those plant species which do grow well in shaded environment. Usually tolerance decreases with age.

Shelterwood Cutting

A cutting method used in even-aged management. It is the removal of a stand of trees through a series of cuttings designed to establish a new crop with seed and protection provided by a portion of the stand.

Silt

(1) a soil separate consisting of particles between 0.05 and 0.002 millimeter in equivalent diameter; (2) a soil textural class.

Silviculture

A combination of actions whereby forests are tended, harvested and replaced.

Silvicultural System

A program for the treatment of a forested stand during its entire rotation. This includes all thinnings, harvesting and replacement treatments conducted in the lifetime of a stand. The system is usually classified by the type of forest produced.

Site Index

A measure of the relative productive capacity of an area based on the height, in feet, of the dominant trees at 50 years of age.

Site Preparation

Preparation of the ground surface before planting or preparing a seedbed for natural regeneration; it includes removal of unwanted vegetation, slash, stumps and roots from a site.

Skid Road/Trail

Travelway used to drag or transport trees from the stump to the road. Generally, a skid trail will have limited use (one or two trips) while a skid road received frequent use.

Snag

A standing dead tree, used by birds for nesting, roosting, perching, courting and/or foraging for food. There are many mammals that use snags for dens and in foraging for food.

Softwood

A coniferous tree. Trees belonging to the botanical group gymnospermae.

Soil Horizon

A layer of soil, approximately parallel to the soil surface, with distinct characteristics produced by the soil-forming process.

Soil Profile

A progression of distinct layers of soil beginning at the surface that has been altered by normal soil forming processes.

Soil Survey

A general term for the systematic examination of soils in the field and in laboratories; their description and classification; the mapping of kinds of soil; the interpretation of soils according to their adaptability for various crops, grasses and trees; their behavior under use or treatment for plant production or for other purposes; and their productivity under different management systems.

Special Management Zone

An area having uncommon or outstanding biological, geological, recreational, cultural or historical significance.

Stand (Stand of Trees)

A community of trees occupying a specific area and sufficiently uniform in composition, age, arrangement and condition as to be distinguishable from the forest on adjacent areas.

Stand Condition

A silviculture classification used to describe the present condition of a stand, particularly in relation to its need for treatment. Stand conditions are: mature, immature, low quality, space, high risk, uneven-aged, two-aged, etc.

Standard

A principle requiring a specific level of attainment, a rule to measure against.

Stream Channel

For the purpose of this management plan, a stream channel extends upstream or up-valley as far as channel cutting or sediment deposition can be observed on the surface of the land and includes the course of any near surface ground water thalweg the course of which can be determined from observations of the land surface. All buffer requirements shall be measured outward perpendicular to either side of the "stream channel".

Subsoil

The layer below the soil surface in which roots normally grow.

Succession

The gradual development of a plant community. This involves an orderly process of biotic community development with changes in species, structure and community processes with time.

Surface Rights

Ownership of the surface of the land only; right to use the surface of the land.

Sustained Yield of Products and Services

The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resource without impairment of the productivity of the land.

Thinning

Cutting made in an immature crop or stand, primarily to accelerate the diameter increment (annual growth) of the residual trees, but also by suitable selection, to improve the average from the trees that remain.

Threatened Species

Species listed as nationally threatened by current Federal register Final Rule making.

Timber Production

The purposeful growing, tending, harvesting and regeneration of regulated crops of trees to be cut into logs, bolts or other round sections for industrial or consumer use. For planning purposes, the term "timber production" does not include production of fuelwood.

Timber Sale

The cutting and removal of designated trees under the authority of a contract.

Timber Stand Improvement

Usually related to activities conducted in young stands of timber to improve growth rate and form of the remaining trees. Examples are thinning, pruning, fertilization and control of undesirable vegetation.

Tolerance

The ability of a tree to grow satisfactorily in the shade of, or in competition with, other trees.

Trail

A general term denoting a way for purposes of travel by foot, stock or trail vehicles (either motorized or nonmotorized).

Uneven-aged Management

The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

Use Permits

Permits issued by the forest and park service which authorize use of state forest lands, improvements and resources.

Utility Corridor

A linear tract of land of varying width forming a passageway through which various commodities such as oil, gas and electricity are transported.

Vertical Diversity

The diversity in an area that results from the complexity of the above ground structure of the vegetation; the more tiers of vegetation or the more diverse the species makeup, or both, the higher the degree of vertical diversity.

Viable Population

A population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area.

Visual Management (Terms Frequently Used)

(1) Characteristic Landscape/Character Type: A large area of land which has common characteristics of landforms, rock formations, water forms and vegetative patterns; (2) Edge: The line where an object or area begins or ends; serves as boundaries; (3) Enhancement: A short-term management alternative which is done with the express purpose of increasing positive visual variety where little variety now exists; (4) Rehabilitation: A short-term management alternative used to return existing visual impacts in the natural landscape to a desired visual quality; (5) Sensitivity Level: A degree or measure of viewer interest in the scenic qualities of the landscape: (a) most sensitive (b) sensitive and (c) less sensitive.

Visual Distance Zones

Areas of landscapes denoted by specified distances from the observer. Used as a frame of reference in which to discuss landscape characteristics or activities of man. These three zones are foreground (fg), middleground (mg) and background (bg).

Visual Quality Objective

A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristic landscape. The five levels of VQO are: (1) Preservation: provides for ecological changes only; (2) Retention: human activities are not evident to the casual forest visitor; (3) Partial Retention: human activities may be evident but must remain subordinate to the characteristic landscape; (4) Modification: human activity may dominate the characteristic landscape but must, at the same time, appear as a natural occurrence when viewed as foreground or middleground; (5) Maximum Modification: human activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

Water Management Zone

Area on the Forest where water and fisheries resources have been identified as the top priorities. In general the Water Management Zone consists of streams, wetlands, and waterways with a minimum 50 foot buffer, plus an additional four feet width for each 1% slope, plus all contiguous slopes of 50% or greater.

Watershed

The entire area that contributes water to a drainage or stream.

Water Table

The upper surface of the ground water.

Wetland

An area that is saturated or inundated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation adapted for life in saturated soil conditions, commonly referred to as hydrophytic vegetation.

Wildfire

Any fire that requires suppression.

Wildlife Habitat

The sum total of environmental conditions of a specific place occupied by wildlife species or a population of such species.

Wildlife Openings

Openings maintained to provide habitat or habitat components for plants and animals which require or are benefitted by early successional stages of vegetation. May include natural openings (barrens) and other openings with native or non-native vegetation. These openings are maintained by periodic treatments, such as mowing, cutting, or prescribed burning. These included openings previously identified as "wildlife openings".

Wildlife Structure

A site-specific improvement of a wildlife or fish habitat, i.e., spring development or dugout to provide water, brushpile for cover, nestbox for birds or rock and log placement in a stream for fish cover and pool creation.