Sustainable Forest Management Plan

FOR

Potomac – Garrett State Forest

Sustainable Forests for People, the Bay and Appalachia

MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

FOREST SERVICE

April 21, 2018

POTOMAC-GARRETT STATE FOREST 17,931 ACRES

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Preface

The information contained within the Potomac-Garrett State Forest Sustainable Management Plan was derived from a variety of sources. These include the *1993 Potomac-Garrett State Forest - Ten Year Resource Management Plan*, and the 2010 *Sustainable Forest Management Plan for Pocomoke State Forest*. Data presented in tables and charts that are specific to Potomac-Garrett State Forest was generated from field data collected by the Maryland Forest Service and the Maryland Wildlife & Heritage Service from 2002 through 2009. Other information contained within this document is referenced as to its source.

The 17,931 acres Potomac-Garrett State Forest is located entirely within Garrett County.

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Abbreviations

AMWI	Appalachian Mountain Woodcock Initiative
ATV	All Terrain Vehicle
AWP	Annual Work Plan
BIBI	Benthic Index of Biotic Integrity
BMP	Best Management Practices
CAR	Corrective Action Requests
CBI	Combined Biotic Index
CCC	Civilian Conservation Corps
CF	Chesapeake Forest
CFI	Continuous Forest Inventory
DNA	Deoxyribonucleic acid
DC	District of Columbia
DNR	Department of Natural Resources
DDT	Dichlorodiphenyltrichloroethane
ESA	Ecologically Significant Areas
FIBI	Fish-based Index of Biotic Integrity
FIDS	Forest Interior Dwelling Species
FSC	Forest Stewardship Council
GCN	Greatest Conservation Need
GIS	Geographic Information System
GPS	Global Positioning System
HCP	Habitat Conservation Plan
HCVF	High Conservation Value Forest
ID	Interdisciplinary
LAC	Limits of Acceptable Change
MBSS	Maryland Biological Stream Survey
MD	Maryland
NBPR	North Branch Potomac River
NHA	Natural Heritage Areas
NWR	National Wildlife Refuge
OGEMA	Old Growth Ecosystem Management Area
ORV	Off Road Vehicle
PA	Pennsylvania
PGSF	Potomac-Garrett State Forest
PHI	Physical Habitat Index
RTE	Rare, threatened, and Endangered
SAFETEA	Safe, Accountable, Flexible, Efficient Transportation Equity Act
SFI	Sustainable Forest Initiative
SMG	Soil Management Groups

SMZ	Streamside Management Zones
SRSF	Savage River State Forest
US	United States
USDA	United State Department of Agriculture
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WSSC	Wetlands of Special State Concern

Chapter 1 - Background and History of the Forest

1.1 Introduction

The history of the Potomac and Garrett State Forests began with the birth of Maryland's Forestry and Public Lands system. In 1906, John and Robert Garrett were concerned with the future of Maryland's forestlands. They had inherited 1917 acres of land from their grandfather John W. Garrett who had expanded the B&O railroad into Garrett County in the mid 1880's. Garrett County was to later be named after him. Robert Garrett donated this land to the state with the stipulation that the state must make "adequate provision for its care". He worked with the legislators of his day to establish the Maryland Forestry Conservation Act which established the State's first comprehensive forestry law and the Office of State Forester under a Board of Forestry.

Even before the establishment of the state forest, Indian trails crossed portions of what is now Garrett State Forest. The great war path (McCullough trail) is still in use as the Snaggy Mountain Road.

From 1906 the State has sought to acquire significant holdings for the conservation of forest resources here in the county. When possible, both surface and mineral rights were acquired, though in many cases the mineral rights had been separated well before the state’s acquisition. By 1940 , most of what is now the Potomac State Forest had been purchased, accounting for 7,745 acres. By 1948, most of what is the Garrett State Forest had been acquired adding another 12,031 deeded acres of state forest lands. In 1961 as recreational use of these forests began to develop into recreation areas, Herrington Manor and Swallow Falls recreation areas were officially designated State Parks and separated from the Forest with their own management staffs. (Table 1.1 acquisition/disposition history for Potomac and Garrett State Forests.) In 1971, what was then known as Swallow Falls State Forest was renamed Garrett State Forest in honor of the original benefactors.

Another historical milestone in the history of the forests was in the 1930's when five CCC camps were activated on the Forests. They were located on Piney Mountain, Backbone Mountain, Herrington Manor, Swallow Falls, and Lostland Run. Most of the roads, trails, springs, and bridges currently in use were constructed by members of these camps.

Through the years, the State has disposed of a number of disjunct parcels, and added several

significant in holdings and adjoining properties that contribute to the overall management of the State Forest. The current State Forests now contain a total of 17,931 acres, which is about 4.2% of the total area of Garrett County and 6.4% of all of the forestland in the county.

Table 1.1 Acquisition and Disposition History of Potomac-Garrett State Forest

GARRETT STATE FOREST

YEAR	NAME	DEED	ACRES	MINERAL RIGHTS	PLOT
1906	Garrett Bros	54/425	205	No	G-A
1906	Garrett Bros	54/425	743	No	G-B
1906	Garrett Bros	54/425	936	No	G-C
1938	M.C. Thomas	118/169	135	Yes	G-D
1938	M.C. Thomas	118/169	13	Yes	G-E
1938	M.C. Thomas	118/169	674	Yes	G-G
1940	McCollough	122/363	730	No	G-H
1936	G.D. Browning	114/234	129	Yes	G-I
1936	H. White	110/227	628	Yes	G-J
1940	Masons	123/185	503	Yes	G-K
1931	W.R. Offutt	104/280	549	No	G-L
1934	R. Coddington	122/526	51	No	G-M
1934	R. Coddington	112/526	51	No	G-N
1937	P. Friend	117/122	150	Yes	G-O
1937	Linville	117/182	150	Yes	G-P
1933	J.E. Hoye	105/565	247	Yes	G-R
1930	Kendall Lumber	100/569	1085	Yes	G-S
1918	J.E. Wilson	74/384	64	No	G-T
1931	J.W. Sines	84/308	169	No	G-V
1931	C.A. Groves	97/132	38	Yes	G-U
1996	Mussleman	487/851	50	Yes	G-W
2007	T.N.C.	1337/0274	800	Yes	G-X
2008	Dilley	1372/405	10	Yes	G-Y

TOTAL 8,110 ACRES

POTOMAC STATE FOREST

YEAR	NAME	DEED	ACRES	MINERAL RIGHTS	PLOT
1931	Manor Mining	102/283	3810	Yes	P-A
1931	E.R. Hubbard	104/284	40	Yes	P-C
1936	Funkhauser	114/37	99	Yes	P-E
1941	Uphold	125/232	269	Yes	P-F
1934	H.V. Leighton	112/64	267	No	P-I
1934	R.W. Sheckells	107/398	637	Yes	P-J
1931	Manor Mining	102/283	664	Yes	P-K
1935	D.L. Wotring	112/68	198	Yes	P-L

1941	D.L. White	125/13	557	No	P-M
1941	J.J. Ashby	125/185	423	Yes	P-N
1935	Strecker Bros.	110/177	1200	No	P-O
1941	E. Smith	125/47	23	Yes	P-P
1940	D.E. Orendorf	122/370	31	Yes	P-Q
1938	Strecker Bros.	118/160	1056	No	P-S
1948	UPRC	154/140	524		P-V
1942	M.E. McCullough	126/310	520	Yes	P-W
1936	R.W. Sheckells	112/272	96	Yes	P-X
1938	M. Riley	118/235	107	No	P-Z
1938	E.A. Bernard	117/580	35	Yes	P-AA
1937	H.P. Brydon	116/211	100	Yes	P-AB
1971	S. Brown	308/445	122	No	P-AC
1933	Sheckells	105/534	200	Yes	P-AD
1931	Manor Mining	102/283	107		P-AF
1994	Tasker	626/594	52		P-AG
2003	T.N.C.	112/64	8		P-AH
1938	Roger Kerrigan	118/232	27		

TOTAL 11,145 ACRES

The following is a list of lands that were disposed of on the State Forest:

YEAR	NAME	DEED	ACRES	PLOT
1963	Swallow Falls		-218	
1963	Herrington Manor		-384	
1971	S. Brown	308/491	-120	PAE
1976	UPRC	373/117	-28	PAF
1988	land sale	118/160	-360	PT
1988	land sale	118/160	-96	PU
1990	land sale	117/64	-50	PY
2000	land sale	100/569	-68	GF

TOTAL DISPOSAL -1324 ACRES

POTOMAC STATE FOREST	11145 ACRES
GARRETT STATE FOREST	+8110 ACRES
TOTALS FOR BOTH FOREST	19255 ACRES
	-1324 ACRES

Total deeded acres held as Potomac-Garrett State Forest: = 17,931 acres

1.2 State Forest Planning & Sustainable Forest Management

The resources and values provided from state forests reach people throughout the State and beyond. These resources and values range from economic to aesthetic and from scientific to inspirational. The Department of Natural Resources is mandated by law to consider a wide variety of issues and uses when pursuing a management strategy for these forests. The importance of considering these factors is acknowledged in the Annotated Code, which establishes the following policy pertaining to state forests and parks:

> *"Forests, streams, valleys, wetlands, parks, scenic, historic and recreation areas of the state are basic assets. Their proper use, development, and preservation are necessary to protect and promote the health, safety, economy and general welfare of the people of the state. It is the policy of the state to encourage the economic development and the use of its natural resources for the improvement of the local economy, preservation of natural beauty, and promotion of the recreational and leisure interest throughout the state." (Annotated Code of Maryland, Natural Resources Article §5-102)*

The Department recognizes the many benefits provided by state forests and has established a corresponding management policy in regulation.

> *"The state forests are managed to promote the coordinated uses of their varied resources and values for the benefit of all people, for all time. Water, wildlife, wood, natural beauty and opportunities for natural environmental recreation, wildlands experience, research demonstration areas, and outdoor education are major forest benefits. "(Code of Maryland Regulations 08.07.01.01)*

To ensure that benefits are realized by and resources are protected for future generations, a statewide system of renewable resource planning has developed. These plans are the foundation for the many activities which can and should occur on state forest lands.

> *"The Department shall develop a system for long-range renewable forest resources planning. The public and private forest land resources of Maryland, including, but not limited to, wood fiber, forest recreation, wildlife, fish, forest watershed, and wilderness potential, shall be examined and inventoried periodically. As part of the forest planning process, the Department periodically shall develop, review and revise a resource plan that should help to provide for a sustained yield of forest resource benefits for the citizens of Maryland. The forest resource plan shall be made available for public and legislative review and comment.* "(Annotated Code of Maryland, Natural Resources Article §5-2l4)

The Sustainable Forest Management Plan for Potomac-Garrett State Forest has been prepared in consideration of these many uses and benefits. The concept of Sustainable Forest Management will be the guiding principle behind the management of Potomac-Garrett State Forest. Sustainable Forestry is defined in COMAR Regulations 08.01.07.01

> *"Sustainable forestry" means the stewardship and use of forests and forest lands in a way,*

and at a rate, that:

(a) Maintains their biodiversity, productivity, regeneration, capacity, vitality, and potential to fulfill, now and in the future, relevant ecological, economic, and social functions at local and regional levels; and

(b) Does not cause damage to other ecosystems.

1.3 Planning Process

The new Sustainable Forest Management Plan for Potomac-Garrett State Forest has been developed to replace the former 10-Year Resource Management Plan that was developed in1993. The initial draft of the PGSF Sustainable Plan was crafted from sections of the former 10-Year Plan. The information utilized in this draft was originally prepared by the Forest Manager with assistance from an interdisciplinary planning team. The PGSF Sustainable Forest Management Plan has been reviewed by representatives from the following agencies:

Maryland Department of Natural Resources
- Maryland Forest Service
- Maryland Park Service
- Maryland Wildlife & Heritage Service
- Freshwater Fisheries Division
- Land Acquisition & Planning

The PGSF Sustainable Plan will be presented to the Potomac-Garrett Citizens Advisory Committee for additional review & comments. From there the plan will go through a 30 day public comment period.

The original planning process for the ten year plan included extensive opportunity for public participation, and relied on public feedback in the refinement of management goals and implementation strategies. The new sustainable plan will adhere to a similar policy. One of the benefits of the new plan format is that it will be open for continual updates as additional resource information is developed. As updates are completed the revised plan will be reviewed by the Citizen Advisory Committee.

Resource inventory and assessment information for Potomac-Garrett was first compiled with the 'line plot cruise' cover typing and stand inventory in 1959. This data was updated with the Continuous Forest Inventory (CFI) done in 1975. This CFI was followed with an updating of the state forests stand level data in 1985, followed broad looks at forest inventory conditions in the CFI of 1990 and again in 2000 from which all recent management decisions have been drawn.

In the past 10 years, the forest has changed considerably at both the hand of man and through the forces of nature. Silvicultural activities and response to weather damages (including the Ice Storm of October 2002, as well as insect infestations; most notably Gypsy Moth infestations in 1989,1990,1991,1992,1994,2008 and 2009), have affected the forest and therefore directed forest

management activities through the last decade. Forest stand delineation and inventory is presently being undertaken to document and assess the present conditions on the forest.

1.4 Purpose and Goals of the Plan

The Sustainable Forest Management Plan for Potomac-Garrett State Forest updates and expands the previous 10-Year Resource Management Plan. This plan is intended to provide guidance and direction for forest staff to base daily decisions on the management of the forest. The plan also provides direction to the Forest Manager in the preparation of the Annual Work Plans and to DNR staff in the preparation of related resource protection guidelines for sensitive habitats.

Included within the appendices, are forest modeling projections of growth rates and sustainable harvest levels, as well as several detailed sections outlining planning and management tools which support the proposed management direction and strategies.

The primary goal of the Potomac-Garrett State Forest Sustainable Management Plan is to demonstrate that an environmentally sound, sustainably managed forest can contribute to local and regional economies while at the same time protecting significant or unique natural communities and elements of biological diversity.

This will be pursued subject to the following resource goals for the Forest:

A) *Manage the wetlands, waterways and floodplains of the forest to protect valuable water resources.*

- That the quality of the water flowing through the forest will not be impaired due to any actions on the land, and in many cases will be improved. Where feasible, wetlands, riparian areas, and ditches will be the site of watershed improvement practices specifically aimed at improving the quality of water entering both the Chesapeake Bay and Coastal Bays.

B) *Provide sustainable levels of diverse recreational fishery opportunities through management strategies which emphasize protection and enhancement of aquatic resources and forested riparian buffers.*

- Monitor proposed projects within Potomac-Garrett State Forest that may potentially result in adverse impacts on water quality and stream conditions and recommend design changes that will allow maintenance or improvements to stream and water quality conditions. Continue to monitor water quality and fish populations, and make recommendations for potential improvements projects.

C) *Protect and enhance biological diversity native to Potomac-Garrett State Forest and perpetuate indigenous natural communities and habitats of species which are rare, threatened, endangered, or in need of conservation.*

- Insure that management policies and actions are consistent with state and federal requirements for protecting and managing rare, threatened and endangered species of plants and animals. The Department will identify locations of rare, threatened and endangered species habitat and forest conditions associated with the habitat requirements of these species. Management actions will consider opportunities to enhance existing habitats and provide for corridors. Abundance and distribution goals for common species will be periodically updated through DNR based resource assessments. Habitat goals for common species will be reflected in forest management activities.

D) Through Sustainable Forestry practices, maintain and improve the timber resource, while at the same time protecting other resource values consistent with responsible forest management.

- That forest harvest levels comply with targets established by a long-term sustainable harvest plan. To the extent possible, harvest and thinning activity levels will produce reasonably uniform flows of products and contractor activities year-to-year. Short-term deviations due to natural disturbances, operational logistics, or unusual events are anticipated, but exceptions for an extended period will require re-evaluation of the sustainable harvest level. Spatial and timing constraints will prevent thinning or harvesting operations from concentrating impacts in any watershed or visual scene in violation of water quality goals, habitat diversity and connectivity goals, or the green-up requirements imposed by the Sustainable Forestry Initiative (SFI) Standard (See Appendix C). The plan will be re-evaluated periodically and updated according to changes in circumstances.

- That the Department makes use of the best available data to determine what activity levels are consistent with the sustainability of the forest ecosystems so that harvests will not decrease the ability of the forests to continue that average level of yield. Ecosystem sustainability means, in addition to the factors listed in goals A, C &D, no net loss in soil fertility and no loss of non-target species due to on-site forestry practices. Past and present data are limited, so future harvests will be based on adaptive response to appropriate monitoring, forecasting, and revision.

E) Provide opportunities for the enjoyment of the natural resources on the Forest by making appropriate areas available for resource-based, low impact recreational activities and environmental education programs that are consistent with the resource values of the Forest.

- That forest recreational and educational opportunities will be provided as appropriate, and are consistent with the above goals. Recreational and education program opportunities available on the forest should be integrated with those available within Potomac-Garrett State Forest. The Department will determine the appropriate levels of recreational activities on the Forest as part of its ongoing

evaluation and monitoring process.

1.5 Future Land Acquisition Goals for Potomac-Garrett State Forest

The Potomac-Garrett State Forest properties are located in Garrett County with the Potomac State Forest draining into the Potomac River and the Garrett State Forest draining into the Youghiogheny River. The addition of new parcels to Potomac-Garrett State Forest would help alleviate a number of management issues as described below and also build upon a network of well managed forest lands that would in perpetuity contribute to the goals for protecting and restoring the Chesapeake Bay. All potential acquisitions are based on a Stewardship review that scores each property on their ecological, cultural and recreational values.

Guidelines to be considered when pursuing new properties not currently in state ownership for addition to Potomac-Garrett State Forest:

1) The property is an in-holding within a Potomac-Garrett Forest Compartment and/or the parcel connects additional Potomac-Garrett Forest properties thereby creating a larger contiguous management unit.

2) The property contains significant natural resources as identified in this plan that would help contribute toward their management and protection. Examples of such resources would be Ecologically Significant Areas (ESAs) as identified in Chapter 7, Wildlife Habitat resources described in Chapter 8, Water Quality Areas (Riparian areas and wetlands) as indicated in Chapter 6 and economically important forest resources as described in Chapter 5.

3) The property improves on or provides additional access to a Potomac-Garrett Forest parcel, thereby improving on the implementation of management activities and or providing additional public access.

Properties that would meet one or all of these criteria will go through an internal DNR review process and if they are determined to be good candidates to be added to the Forest they would then be prioritized for acquisition.

Currently there are a number of potential private acquisitions being considered for addition to Potomac-Garrett State Forest that would greatly enhance management opportunities on the forest.

Chapter 2 - Resource Assessment

2.1 Garrett County

Garrett County is the westernmost county in Maryland. It is bordered by Grant County, West Virginia, to the south; to the west by Preston County, West Virginia; on the north by Fayette and Somerset Counties, Pennsylvania; and to the east by Mineral County, West Virginia, and Allegany County, Maryland. (See Figure 2.1). Garrett County is found on the Appalachian Plateau. Elevations run from 1,000 feet above sea level to a maximum of 3,360 feet above sea level, and the topography is gently rolling upland with some fairly steep ridges. The climate is a warm summer continental type. Summer high temperatures in this zone typically average between 21–28 °C (70–82 °F) during the daytime and the average winter temperatures in the coldest month are generally far below the −3 °C (26.6 °F) isotherm. The average growing season is about 122 days and can vary by as much as 2 weeks depending on the area and water availability.

Table 2.1 and Figure 2.1 show that land use patterns within the county are dominated by, forests and farmland. Taken together, forests and farmlands make up nearly 89 percent of the area within the county.

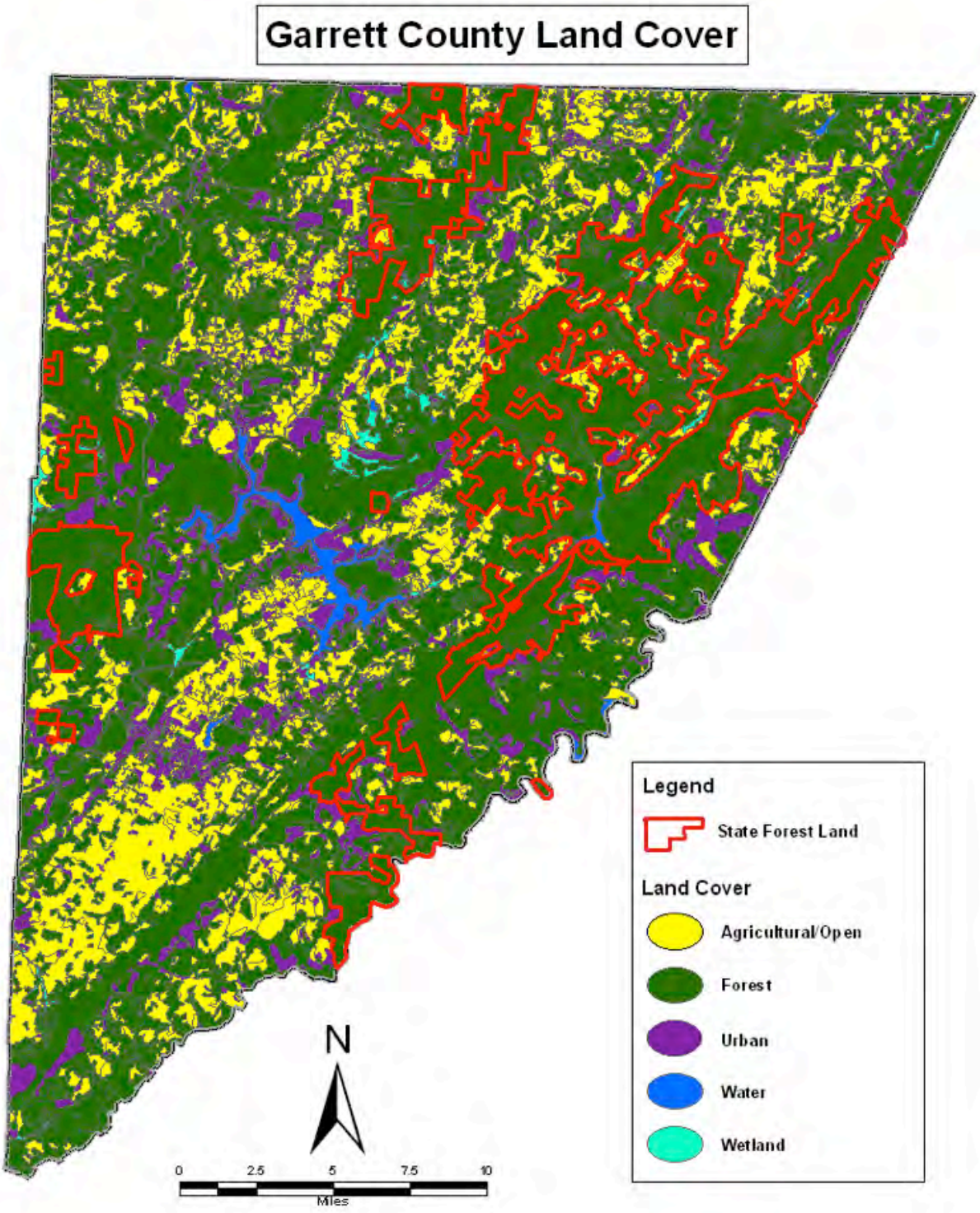
Table 2.1 : Land Use in Garrett County

Major Land Cover Category	Total Area	Percent
Urban	34,556.5	8.1%
Agriculture	100,470.1	23.6%
Forest	**279,251.5**	**65.7%**
Water	5,808.8	1.4%
Wetland	2,725.0	0.6%
Open Areas	2,240.3	0.5%
TOTAL	**425,052.2**	**100.00%**
Source: Garrett County Office of Planning		

Agriculture and forestry are the most common industries in the county. Garrett County's climate is conducive to growing crops such as hay, corn, small grains, and vegetables. According to the Census of Agriculture, 2008: 2,500 acres of corn for grain, 3,400 acres of corn for silage and 27,000 acres of hay were the top field crops. In 2007, revenue from milk and milk products

totaled 12.8 million dollars. Livestock sales of cattle and calves, hogs, sheep and goats grossed over 6 million dollars. Forest products are also a significant source of income. Forested lands are also used for recreational purposes, and hunting leases are a common income generator.

The forests and fields of Garrett County are favorable habitat for a variety of wildlife, including game species such as deer and turkey. Fishing in the county is also a major source of economic activity as well as an attraction for sportsmen and outdoor recreation.



Much of the land in Garrett County had been cleared for farming or used as farm woodlots

before the establishment of a State Forest System . 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 the State was purchasing lands for management activities, and in 1954 the Federal Government deeded its holdings to the State. In 1963, Swallow Falls State Forest Recreation Area was separated from the Forest and developed for intensive recreational use as Swallow Falls State Park. The State continues to purchase in-holdings and other ecologically important areas as large forest blocks are valued as contributors to the Maryland State Smart Growth objectives. Taking adjacent lands into state ownership is seen as a way to prevent their further loss to development, and the further fragmentation of what remains of the intact blocks of forest in the region. At the same time, keeping them in sustainable forest use is seen as a way of contributing to the future of the forest-based portion of the region's economy.

2.2 General Geology and Soils

The county is entirely within the Appalachian Plateau. The average altitude of the county is about 2,200 feet above mean sea level. The lowest point, at an altitude of about 1,000 feet, is at the mouth of the Big Savage River. The highest point is on Backbone Mountain, north of Kempton at an altitude of 3,360 feet. The most prominent ridges are Backbone Mountain, Big Savage Mountain, Meadow Mountain, Negro Mountain and Winding Ridge. Backbone and Meadow Mountains are part of a major north trending divide in the eastern United States that separates areas that drain into the Chesapeake Bay and the Gulf of Mexico.

The topography is gently rolling upland, deeply incised by streams and valleys. Some of the gently sloping to moderately sloping hills are comprised mainly with moderately deep, well drained, non-stony soils that are highly useful in farming. Most of the soils in Garrett County are naturally low in plant nutrients, are acid and some are very acid. Soils that are cultivated annually become deficient in nitrogen, phosphorus and potassium if these elements are not replenished. Lime generally is needed every three years.

Poorly drained meadows, locally called "glades", occur at the headwaters of many streams. In the valleys are soils that are useful in farming, but which are limited in capability by wetness and are used mostly for forage crops and pastures. In some areas of the county, the soils are steep or very stony, or both, and are better suited for woodland, wildlife habitat, and recreational uses than they are for farming.

2.3 Water Resources

The high elevation, rolling hills and mountainous areas create close contact between human land use activities and aquatic systems, making this region a focal point for water quality issues. Aquatic systems can be grouped into three (3) categories: groundwater, wetlands, and streams.

2.3.1 Groundwater

Ground water is an important natural resource of Garrett County. Ground water is derived from the weathered zone and from the upper part of the consolidated rock. When saturated, the soil

and subsoil supplies water to many of the springs and shallow dug wells.

Natural ground water quality throughout the watershed is variable, but concentrations of iron, calcium (hardness) and manganese tend to be high, often exceeding recommended limits for potable use. Below a depth of 800 to 1,000 feet, ground water may be too saline for potable supplies.

2.3.2 Wetlands

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.

Some nontidal wetlands, such as freshwater marshes and shrub swamps, are very obvious. However, many nontidal wetlands, such as bottomland forests, wet meadows or vernal pools 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. There are at least 73 soil types in Maryland that are known to occur in nontidal wetlands. These soils are known as hydric soils**.** Plants growing in nontidal wetlands, known as hydrophytic vegetation, are capable of living in hydric soils for at least part of the growing season.

2.3.3 Streams

The Maryland Biological Stream Survey has conducted stratified random samples of streams within the County. Based on the three ecological health indicators used by the MBSS, the overall condition of Garrett County streams during 2000-2004 was fair. The FIBI results indicate that 21% of the streams in the county were in Good condition, while 39% rated good using the BIBI. In contrast, 46% of the streams in the county scored as Poor or Very Poor using the CBI, while 23% scored as Good and 32% scored as Fair. Within the county, the greatest concentration of streams rated in Good condition was the area in and around Savage River State Forest. Another area with predominantly Good sites was the lower portion of the Youghiogheny drainage, near the Pennsylvania border. The largest concentration of streams in Very Poor condition was the area around Deep Creek Lake. The highest rated stream in Garrett County using the Combined Biotic Index (CBI) was Crabtree Creek, while the lowest rated streams included Three Forks Run, Cherry Creek, the North Branch Casselman River and Millers Run. Based on Stream Waders volunteer data, conditions were generally Good for benthic macroinvertebrates in the Youghiogheny and Savage River watersheds, and Poor or Very Poor in the area around Deep Creek Lake. Four MBSS Sentinel sites were located in Garrett County. These streams included: the Savage River mainstem, Crabtree Creek, Bear Creek, and Double Lick Run. Sentinel sites were chosen to provide a representation of the best remaining streams around the state and track natural variations in stream health. Where possible, Sentinel sites are located in watersheds with as much protected land as possible, or in areas projected to become degraded from development at a slower pace. More information about the MBSS Sentinel stream network is found in: 2000-2004 Maryland Biological Stream Survey Volume 11: Sentinel Sites

(http:www/dnr/Maryland.gov/ streams/pubs/ea05-8_sentinel.pdf).

Based on the Physical Habitat Index (PHI), 49% of the stream miles in Garrett County had Minimally Degraded habitat, 33% had Partially Degraded habitat, and 18% had Degraded or Severely Degraded habitat. Similar to the distribution of sites with high biotic integrity, the highest concentrations of sites with Minimally Degraded PHI ratings occurred in and near the Savage River State Forest, followed by the lower Youghiogheny drainage above Friendsville. The southern part of the county had the largest number of sites with Severely Degraded physical habitat.

Over 82% of the stream miles in Garrett County were rated Optimal for trash. In contrast, only 3% of streams were rated as being in Marginal condition, and none were rated as being in Poor condition. Low amounts of trash were consistently seen in and around Savage River State Forest and generally on state-owned lands, as well as the lower portion of the Youghiogheny drainage in Maryland.

2.3.4 Water Quality Indicators

To provide a means to prioritize stream systems for biodiversity protection and restoration within each county and on a statewide basis, a tiered watershed and stream reach prioritization method was developed. Special emphasis was placed on state-listed species, stronghold watersheds for state-listed species, and stream reaches with one or more state-listed aquatic fauna. Fauna considered included stream salamanders, freshwater fishes, and freshwater mussels. Rare, pollution-sensitive benthic macroinvertebrates collected during the 1994-2004 MBSS were also used to identify the suite of watersheds necessary to conserve the full array of known stream and river biota in Maryland. A complete description of the biodiversity ranking process is found in: 2000-2004 Maryland Biological Stream Survey Volume 9: Stream and Riverine Biodiversity (http:www/dnr/Maryland.gov/streams/pubs/ea05-6_ biodiv.pdf).

Of the six watersheds found in Garrett County, the Casselman and Youghiogheny Rivers were classified as Tier 1, meaning that these watersheds serve as strongholds for one or more state listed aquatic species. It is also noteworthy that these two watersheds are among the top five in Maryland in terms of stream and river biodiversity. The Savage River was classified as a Tier 2 watershed, meaning that it serves as a stronghold for one or more non-state listed species of Greatest Conservation Need (GCN), and has state-listed aquatic fauna present. In stark contrast, the Georges Creek watershed was among the lowest ranking for stream and river biodiversity in the state (83rd of 84). Any reaches that had either state-listed or GCN species, or high intactness values were highlighted to facilitate additional emphasis in planning restoration and protection activities.

2.4 Wildlife Resources

Garrett County’s rural landscape with nearly 66% forest cover and 24% agriculture provides a habitat quality that supports abundant wildlife populations and species diversity. This mixture of

largely hardwood forests dominated by oak species and abundant agriculture serves to provide a rich and abundant source of nutrition for many keystone wildlife species such as white-tailed deer, wild turkeys, and black bears. Garrett County supports a diverse wildlife community with an estimated 236 different species of reptiles, amphibians, birds, and mammals documented compared to 528 species statewide.

There are several threats and concerns that may influence wildlife populations and future habitats in Garrett County. One of the greatest threats to wildlife, not only in the county, but throughout the state is loss of habitat from increasing development. The presence and attraction of Deep Creek Lake and the resort community increases the threat of industrial and residential development. As the community and businesses expand, there may be increased demand for uses that are non-compatible with conserving wildlife habitat even on DNR lands.

Hunting is a primary recreational use of public lands in Garrett County. Pursuit of forest game species such as white-tailed deer (*Odocoileus virginianus)*, gray squirrels (*Sciurus carolinensis*), ruffed grouse (*Bonasa umbellus*), and wild turkeys (*Meleagris gallopavo*) provide the majority of hunter days. Hunting for upland wildlife such as American woodcock (*Philohela minor*) and eastern cottontails (*Sylvilagus floridanus*) is also popular. Some opportunity for waterfowl hunting also exists. Mountain biking, hiking, and cross-country skiing are also popular recreational activities that may be considered wildlife enhanced activities.

It is anticipated that the demand for hunting forest game will continue and likely increase as less private land is available to hunters. Along with this demand for hunting opportunity, it is expected that there will be increased interest in non-hunting use of public land for bird/wildlife watching.

White-tailed deer is the most popular species hunted in Garrett County and throughout the state. Along with the positive recreational benefits and population management that deer hunting provides, it also provides significant economic benefits to Maryland. A recent survey sponsored by the Association of Fish and Wildlife Agencies found that deer hunting in 2006 generated over $113 million in retail sales with a total multiplier effect of over $190 million contributed to Maryland's economy. Deer hunting in Maryland supports nearly 2,300 jobs and generates $71 million in salaries, wages, and business owner's income, $15 million in state and local tax revenue, and $16 million in federal tax revenue.

2.5 Endangered and Threatened Species of Special Concern

Species of special concern were identified by staff of the Wildlife and Heritage Service of the Maryland Department of Natural Resources and/or identified through reference to the Rare, Threatened, and Endangered Animals of Maryland and the Rare, Threatened and Endangered Plants of Maryland (2007). However, this list represents DNR's current knowledge, and is constantly changing as new information is collected.

2.5.1 Animal Species of Concern in Garrett County (State Listed)

According to the Maryland DNR, Wildlife and Heritage Service the following is a summary of current and historical rare, threatened and endangered plant and animal species found on Potomac-Garrett State Forest within Garrett County.

Animals:

Planarians:	
A Planarian, *Procotyla typhlops*	E
Crustaceans:	
An Isopod, *Caecidotea alleghenyensis*	E
Allegheny Cave Amphipod, *Stygobromus allegheniensis*	I
Franz's Cave Amphipod, *Stygobromus franzi*	I
Insects (Coleoptera):	
Appalachian Tiger Beetle, *Cicindela ancocisconensis*	E
Insects (Lepidoptera):	
Pepper-and-salt Skipper, *Amblyscirtes hegon*	I
Harris' Checkerspot, *Chlosyne harrissii*	T
Early Hairstreak, *Erora laeta*	E
Atlantis Fritillary, *Speyeria atlantis*	T
Amphibians:	
Green Salamander, *Aneides aeneus*	E
Wehrle's Salamander, *Plethodon wehrlei*	I
Mountain Chorus Frog, *Pseudacris brachyphona*	E
Reptiles:	
Northern Coal Skink, *Eumeces anthracinus*	E
Mountain Earthsnake, *Virginia valeriae pulchra*	E
Birds:	
Northern Goshawk, *Accipiter gentilis*	E
Blackburnian Warbler, *Dendroica fusca*	T
Alder Flycatcher, *Empidonax alnorum*	I
Nashville Warbler, *Vermivora ruficapilla*	I
Mammals:	
Porcupine, *Erethizon dorsatum*	I
Bobcat, *Lynx rufus*	I
Southern Rock Vole, *Microtus chrotorrhinus carolinensis*	E
Least Weasel, *Mustela nivalis*	I

Allegheny Woodrat, *Neotoma magister*	E
Long-tailed Shrew, *Sorex dispar*	I
Smoky Shrew, *Sorex fumeus*	I
Southern Water Shrew, *Sorex palustris punctulatus*	E
Appalachian Cottontail, *Sylvilagus obscurus*	I

I = In Need of Conservation (designation for animals only)
T = Threatened
E = Endangered

Please Note: There are a number of rare animals tracked by the Maryland Natural Heritage Program that are not officially State listed that occur on PGSF.

2.5.2 Plants of Special Concern (Federal and State Listed)

There are no Federally Listed plant species known to occur in Garrett County. There are a number of species of plants listed as Rare, Threatened, or Endangered by the State of Maryland. The following is a list of these species and their state status. These species are discussed in some detail in the Ecologically Significant Area portion of this document.

State Listed; Plant Species of Concern on Potomac-Garrett State Forest

Plants:

Blue Monkshood, *Aconitum uncinatum*	E
Climbing fumitory, *Adlumia fungosa*	T
Summer Sedge, *Carex aestivalis*	E
Standley's Goosefoot, *Chenopodium standleyanum*	E
Purple Clematis, *Clematis occidentalis*	E
Yellow Clintonia, *Clintonia borealis*	T
Round-leaved Dogwood, *Cornus rugosa*	E
Wild Bleeding-heart, *Dicentra eximia*	T
Glade Fern, *Diplazium pycnocarpon*	T
Goldenseal, *Hydrastis canadensis*	T
Grove Sandwort, *Moehringia lateriflora*	E
Black-fruited Mountainrice, *Piptatherum racemosum*	T
Large Purple Fringed Orchid, *Plantanthera grandiflora*	T
Jacob's-ladder, *Polemonium vanbruntiae*	T
Purple Oat, *Schizachne purpurascens*	E
Rose Twisted-stalk, *Streptopus roseus*	T
American Yew, *Taxus canadensis*	T
Small Cranberry, *Vaccinium oxycoccos*	T

I = In Need of Conservation (designation for animals only)

T = Threatened
E = Endangered

Please Note: There are a number of rare plants tracked by the Maryland Natural Heritage Program that are not officially State listed that occur on PGSF.

2.6 Plant Communities and Habitats of Special Concern

Vernal Pools : Vernal pools are typically flooded in winter to early spring or after a heavy rainfall, but are usually dry during summer. Many vernal pools are filled again in autumn. The substrate is typically dense leaf litter over hydric soils. Vernal pools typically occupy a confined basin (i.e., a standing waterbody without a flowing outlet), but may have an intermittent stream flowing out of it during high water. This community includes a diverse group of intebrates and amphibians that depend upon temporary pools as breeding habitat. Since vernal pools cannot support fish populations, there is no threat of fish predation on amphibian eggs or larvae. Characteristic animals of vernal pools include species of amphibians, reptiles, crustaceans, mollusks, annelids, and insects. Vernal pool species can be categorized as either *obligate* (species that depend upon vernal pool habitat for their survival), or *facultative* (species that are often found in vernal pools, but are not dependent on them and can successfully reproduce elsewhere).

Obligate vernal pool amphibians include spotted salamander (*Ambystoma maculatum)*, Jefferson salamander (*A. jeffersonianum*) and wood frog (*Rana sylvatica*). Fairy shrimp (Anostraca) are obligate vernal pool crustaceans, *Eubranchipus spp.* being the most common. Facultative vernal pool amphibians include fourtoed salamander (*Hemidactylium scutatum*), red-spotted newt (*Notophthalmus viridescens*), spring peeper (*Pseudacris crucifer*), gray treefrog (*Hyla versicolor*), green frog (*Rana clamitans*) and American toad (*Bufo americanus*). Numerous species of insects, mollusks and annelids occur in vernal pools. Many of these are facultative, but further research would most probably document some vernal pool obligates among these groups.

Plants that occur in mountain vernal pools are predominately hydrophytic often growing along the edges of the water or in the basin after water levels drop later in the season. In this region most of these plants are emergent such as sedges, grasses, or bulrushes. A number of these species are uncommon in the region and a few rare species such as *Carex vesicaria* and *C. tuckermanii* have been documented in Garrett County vernal pools.

Several vernal pools have been documented on or very near PGSF. A sub-set of these support populations of the Jefferson salamander, a State-wide uncommon salamander. These habitats are afforded special management protection.

Mountain Peatlands : There are a number of wetlands on the Allegheny Plateau of Maryland. Many of these, referred to as bogs or fens, are reminiscent of wetland habitats found in the northern U.S. and Canada and are collectively known as peatlands. These wetlands often are dominated by several species of Sphagnum moss (*Sphagnum spp.*), various grasses, sedges and rushes, like *Calamagrostis canadensis, Glyceria striata, G. canadensis, Eriophorum virginicum,*

Rhynchospora alba, Carex stricta, C. utricularia, C. canescens , C. atlantica, Juncus spp., and Scirpus spp. to name a few. Other characteristic plants such as round-leaved sundew (*Drosera rotundifolia*), cranberry (*Vaccinium* macrocarpon), bog goldenrod (*Solidago uliginosa*), and narrow-leaved gentian (*Gentiana linearis*) occur in these bogs. Large sections of these wetlands are often dominated by various shrubs such as speckled alder (*Alnus incana*), arrow-wood (*Viburnum dentatum*), possum-haw (*V. nudum*), winterberry (*Ilex verticillata*), and mountain holly (*Nemopanthus mucronata*). Various plants that are rare in the State also occur in a number of these wetlands. Some of these that occur on or near SRSF include, wild calla (*Calla palustris*), yellow clintonia (*Clintonia borealis*), goldthread, (*Coptis trifolia*), and small cranberry (*Vaccinium oxycoccos*).

This habitat type also supports a number of uncommon or rare animals. The dragonfly diversity is high with a number of specialized species documented. Butterflies such as the two-spotted skipper (*Euphyes bimacula*), Harris' Checkerspot (*Chlosyne harrisii*), silver-bordered fritillary (*Boloria selene*) and the Baltimore Checkerspot (*Euphydryas phaeton*) are restricted to wetland habitats. Specialized birds such as the alder flycatcher (*Empidonax alnorum*), northern waterthrush (*Seiurus noveboracensis*), red-breasted nuthatch (*Sitta canadensis*), and Nashville warbler (*Vermivora ruficapilla*) often breed in these wetland habitats. Rare mammals such as the southern water shrew (*Sorex palustris punctulatus*) and the southern bog lemming (*Synaptomys cooperi*) have been found in some of these bogs. A large number of more common animals rely on or utilize this habitat type. Coupled with the large diversity of flora found here, these wetlands are truly 'hotbeds' of biological diversity in the region. Any of these wetlands of significant size that occur on PGSF are in an ESA.

Spring Seepage Wetlands : There are numerous springs through-out PGSF. Many of these form small seepage wetlands that support unique vegetation. Characteristic vegetation includes skunk-cabbage (*Symplocarpus foetidus*), mannagrass (*Glyceria melicaria, G. striata*), seep sedge (*Carex prasina*), and rough sedge (*C. scabrata*) to name a few. Occasionally, these habitats support less common or rare plants such as grove meadow-grass (*Poa alsodes*), and large purple-fringed orchid (*Platanthera grandiflora*). Specialized odonates often utilize this habitat, as well.

Sandstone Rock Outcrops/Glades : There are three major types of special habitats on PGSF where the basis is some type of sandstone outcrop. The most dramatic are large rock outcroppings that often occur on the crests of the mountain ridges that run through the Forest. Occasionally these may exist on the flanks of a mountain rather than on the crest. A second type, which may be associated with a larger outcrop or occur as an isolated habitat, are described as rock bars or boulder fields. These moss covered rocky areas are most often under a forest canopy. A third type is described as a sandstone glade. These are formed over large sheets of bedrock and are often open to semi-open habitats.

There is some overlap in the flora and fauna that utilize these habitats, but there are some differences, as well. The large outcrops most often provide habitat for the State Endangered Allegheny woodrat (*Neotoma magister*). However, much of the habitat formally occupied by the woodrat no longer supports thriving populations. This species has been experiencing declines through-out its range. Other notable fauna that make use of this habitat are timber rattlesnakes (*Crotalus horridus*), winter wrens (*Troglodytes troglodytes*), ravens (*Corvus corax*), small-footed

bats (*Myotis leibii*), bobcats (*Lynx rufus*), and Appalachian cottontails (*Sylvilagus obscurus*). These habitats also support high densities of a number of small mammal species.

High concentrations of small mammals also occur in the forested rock bar habitats. A number of uncommon or rare species live in these habitats. The cool micro-habitat is important for the long-tailed shrew (*Sorex dispar*) and the smoky shrew (*S. fumeus*), two species often associated with this type of habitat. The rock vole (*Microtus chrotorrhinus*) also prefers this damp, cool habitat and has the most strict microhabitat requirements. The first location ever documented in the State of Maryland was on PGSF. Several sites have been documented since, all on PGSF. The rock vole is listed as Endangered in Maryland and is very rare in the entire region.

Sandstone glades represent a unique natural community type. Rather than the bedrock being broke up into fragments or boulders, the basis for this community is a large slab or sheet of bedrock with occasional boulders strewn about. The habitat is characterized by an abundance of heath type plants, stunted trees and overall sparse vegetation with an abundance of mosses and lichens. Timber rattlesnakes often utilize this habitat. A number of fine examples of this community type have been found on PGSF. All are within an ESA.

2.7 Important Wildlife Species

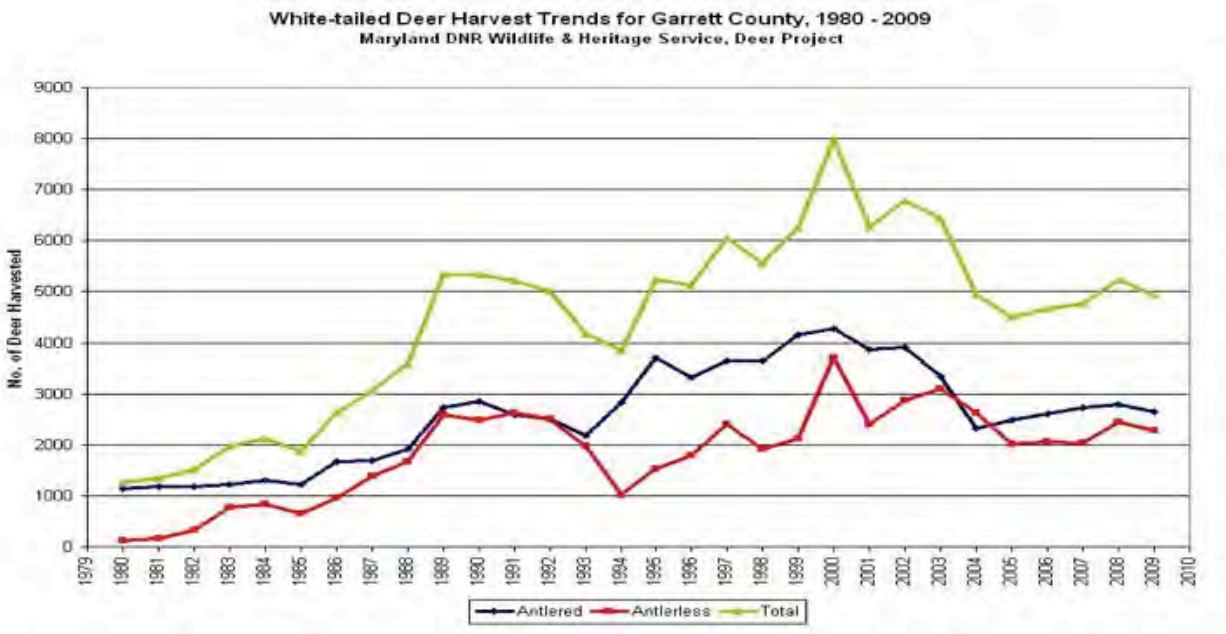
Maryland first began licensing hunters in 1916, with hunting license sales peaking at 180,000 in the early 1970's. Sales have since declined to about 135,000 now and today a Small fraction (3-4%) of Maryland residents hunt. The current number of youth hunters has shown a 70% decline from peak numbers in the early 1970's. Maryland hunters are mostly males between the ages of 30-49 years of age. Most hunters live in urban settings. Residents of Baltimore County bought 11.9% of licenses sold statewide. Residents from the five lower shore counties accounted for 9.7% of hunting licenses sold statewide.

The majority of the Potomac-Garrett State Forest acreage is open for public hunting, with exception to safety zones and other similar areas. Hunting opportunities are primarily for white-tailed deer, but other species, depending upon the site, include bear, turkey and upland birds.

There are more than 40 species of game animals that occur in Garrett County. Hunting has been a time honored tradition that continues to provide recreation, food, and quality of life in Garrett County. The large amounts of public land in the county makes it a popular destination for non-resident hunters and those from more urban areas where there is little hunting opportunity. The most popular species of game animals continue to provide for most hunter recreation days in Garrett County.

White-tailed Deer – Harvest trends indicate that white tailed deer thrive in Garrett County (Figure 2.7.1). During the 2009-10 hunting season Garrett County had the 7th highest reported deer harvest in the state. This is significant considering that most counties have a much more liberal bag limit and therefore, higher harvest potential. The reported harvest for Garrett County during the 2009-10 hunting season was a total of 4922 deer.

Figure 2.7.1: White-tailed Deer Harvest Trends



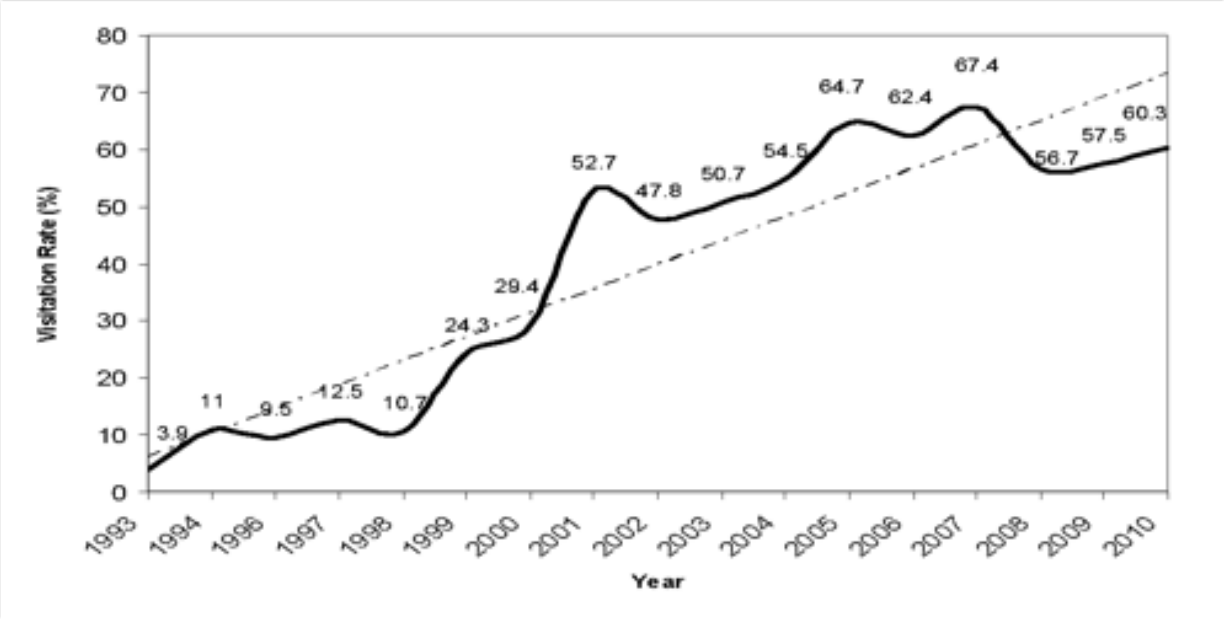
Black Bear - Currently, Maryland has a breeding population of black bears in the four westernmost counties (Garrett, Allegany, Washington, and Frederick), with the highest bear densities found in Garrett and western Allegany counties. In October 2004, DNR implemented Maryland's first bear-hunting season in 51 years. Subsequent hunts have been held each year since. DNR established a harvest quota targeting an approximate 8-12% harvest mortality. This was based on the objective of achieving 20-25% overall mortality (seasonal and nonseasonal mortality). Harvest quotas have ranged from 30-85 bears between 2004 and 2009. The harvest range for the 2010 season has been set at 65-90 bears.

In May and June 2005, DNR conducted western Maryland's most recent black bear population survey. A DNA-based, mark-recapture study was conducted across Garrett and Allegany counties. A similar study had been conducted in 2000. The results of the DNA analysis were entered into Program MARK which yielded a population estimate of 362 adult and subadult bears across the study area. The 95% CI ranged between 242 and 482 animals.

Scent station survey routes are established across known portions of the black bear range in the four western counties annually. This survey has been conducted in western Maryland since 1993. In 2010, a total of 16 routes were established containing 126 bait stations across Garrett County. Of these, 76 were visited by black bears yielding a visitation rate of 60.3%. A total of 134 bait stations were established on 17 routes across Garrett County in 2009. Of these, 77 were visited by black bears, a 57.5% visitation rate. The 2010 visitation rate was 45.9% across the whole survey area (Garrett, Allegany, Washington, and Frederick counties). Since 1993, this survey has revealed the greatest increase in visitation in Garrett County. Garrett County encompasses the heart of Maryland's core bear range and the routes in this county had an increase in the visitation rate by 2.8% (Figure 2.7.2). Despite this year's increase, the visitation rates have remained below the high rates that were present between 2005 through 2007. The

majority of bear harvests from Maryland's black bear hunting seasons since 2004 have come from Garrett County. It is possible that the lower visitation rates in Garrett County are a correlating factor of the effects of the bear hunting season. Garrett County should be the first to demonstrate this potential correlation which will be evident in a 'leveling' of the visitation rates over time. There has not been a sharp increase in the visitation rate since 2005. We will be watching the Garrett County trend closely in subsequent years.

Figure 2.7.2 Bear Visitation at Scent Stations in Garrett County



***Wild Turkey* -** Wild turkey populations have been strong in Garrett County since the rebound of suitable habitat conditions following the declines of the early 1900's. Within the last few decades, turkey numbers have remained steady in Garrett County and Potomac-Garrett State Forest. In Garrett County the turkey season is split with both a spring and fall season. It is estimated that over 10,000 hunters pursue turkeys during the spring season statewide. Garrett County ranked number one in harvested turkeys in 2010 with 345 birds reported (about 12% of the total statewide harvest). Brood habitat (typically herbaceous openings and edges) is reported by the Department to be the main limiting factor affecting populations and development of additional brood habitats should be considered a management priority on Potomac-Garrett State Forest.

***Ruffed grouse* -** Ruffed Grouse inhabit the forested mountains of Garrett, Allegany, Washington, and Frederick Counties. They have been a traditional staple for Western Region upland game bird hunters for decades. Public land grouse hunting opportunities are limited to three state forests and wildlife management areas. Data suggests that ruffed grouse populations in Maryland have remained somewhat stable since the mid-70s. However, the number of Maryland grouse hunters continues to decrease. This parallels the decline in participation of other small-game hunting, such as quail, squirrel, and rabbit. The DNR's Hunter Mail Survey for the

2006-2007 season reported an estimated 1,800 grouse hunters in Maryland. The typical grouse hunter spent average of 4 days afield and harvested about one grouse in the 2006-07 season. Although the number of grouse hunters has declined in recent years, success rates have remained stable or increased in the last few years. A grouse hunter survey was initiated in the 2008-09 hunting season. Cooperating hunters will record the number of grouse flushed and bagged per hour. This information should allow us to better estimate grouse population trends in the region.

***Furbearers* -** Resident furbearer populations are stable or growing within Garrett County. The diverse ecosystems support a rich and varied assemblage of furbearer species. They range from the solitary fisher of spruce and hemlock forests, to the more agricultural preferring red fox, to the wetland inhabiting beaver and river otter. Maryland's citizens enjoy a variety of ecological, recreational, economic, and cultural benefits from these valuable resources.

Garrett County's 13 resident furbearer species yield many user days of recreation, while also providing the nucleus for many traditionally based rural activities. The fur harvest industry is a multibilliondollar enterprise nationally and offers significant contributions to Maryland's economy.

2.8 Migratory Birds of Special Concern

Waterfowl Associated with Wetlands – Important waterfowl areas occur throughout Garrett County. Bottomland hardwood floodplains, beaver impoundments, lakes, farm ponds, and wooded wetlands serve as wood duck, mallard, teal and black duck habitat.

American Woodcock – Spring "singing ground" surveys performed by the U.S. Fish and Wildlife Service suggest that American woodcock numbers have been declining by an average of 1.9 percent per year since these surveys were started in 1968. However, population estimates are stable over the most recent 10-year period. Most woodcock biologists suspect that alterations of habitat, losses to development and changes due to maturation of abandoned farmland are the cause of the population decline. Woodcock in Garrett County use the forests as breeding and wintering habitat. Woodcock prefer moist soil areas with dense seedling/sapling cover and rich humus layers because earthworms, their primary food, are most plentiful in these habitats. State Forest lands are important to woodcock as breeding and nesting areas.

Neo-tropical migrants – Many neo-tropical migrants breed, nest or migrate through the region. One of the largest conservation concerns in the region with migratory birds is the fragmentation of forest blocks. Other conservation concerns within the region include the loss of wetlands, loss of habitat due to development, and loss of habitat due to intensive agriculture. Rather than list each bird species individually, examples of critical habitats that serve broad migrant bird guilds are listed.

2.9 Fish Species of Special Concern

Brook trout are Maryland's only native freshwater trout species and have been a popular recreational angling resource since European colonization of North America. Brook trout require

relatively pristine conditions for survival, and cannot survive when water temperatures exceed 68°F. Anthropogenic alterations to Maryland's environment over the last several centuries, including clear cutting of forests, establishment of large agricultural areas, and urbanization have resulted in the extirpation of brook trout from 62% of their historic habitat in Maryland. Of the remaining 151 populations, over half are found in Garrett County, the westernmost, mountainous, and least developed area of Maryland. The vast majority (82%) of the remaining populations are classified as "greatly reduced," meaning that within the sub-watersheds where they occur, they occupy only 1% to 10% of the area that was historically inhabited. A major difficulty in managing the brook trout resource is that only 11% of all brook trout streams and stream miles are fully within state lands. The vast majority of habitat is on private land and a mix of private/public lands. Of the immediate threats to brook trout populations in Maryland, urbanization is the most serious. In watersheds where human land use exceeds 18%, brook trout populations cannot survive. Brook trout will typically be extirpated if impervious surface area is greater than 0.5% in a watershed. There are also long-term threats, of which global warming is the most serious. Current predictions indicate that warming water temperatures over the next 100 years could eliminate brook trout populations statewide except for western Maryland (Garrett County) by about the year 2100. Concern for the status of the brook trout resource inspired the Maryland Department of Natural Resources (MD DNR) Inland Fisheries Service, which is responsible for management of statewide freshwater sport fish species, to develop a Brook Trout Fisheries Management Plan (MD DNR 2006). Partners in this effort include researchers from the University of Maryland Center for Environmental Studies Appalachian Laboratory (UMCES-AL), MD DNR Fisheries Service, and the MD DNR Biological Stream Survey (MBSS). The Maryland DNR has listed brook trout as a "Species of Greatest Need of Conservation" in the federally-mandated Maryland DNR's Wildlife Diversity Conservation Plan.

2.10 The Forests of Garrett County

Historic land cover shows the region dominated by a mixed hardwood forests with varying amounts of red spruce, white pine and hemlock. American Indians cleared small patches and burned the forest for hunting and gathering. Early settlers cleared areas for agriculture. Harvesting of the conifer component was initially done to provide building materials for housing and marine uses during the development of the east coast. Hemlock was also harvested to provide bark in the tanning industry. With the advent of railroad logging, essentially all of Garrett County was clear-cut and burned. The fires were due in part to the railroads and in part due to differences between neighbors. During the 1930's and 1950's many open areas were planted with conifers, frequently red pine and Norway spruce.

Practically no virgin forests remain in Garrett County, and most forests have been cut over several times. Many areas (including many that are once again in forest) have been cleared for conversion to agriculture in the past. Most of the forests are now even-aged and dominated by mixed oaks and some northern hardwood types as Table 2.102 illustrates. As Table 2.102 also illustrates, non-industrial private owners own the majority of the forests in Garrett County.

Table 2.10 Area of Timberland by Forest Type and Ownership Group

Garrett County		*(thousands of Acres)*	
Forest Type	**All Owners**	**Public**	**Private**
White/red/jack pine group	14.7		14.7
Exotic softwoods group	5.9	5.9	
Softwood total	20.6	5.9	14.7
Percent of Total Softwoods	100.0%	28.6%	71.4%
Oak-Hickory	179.3	66.7	112.6
Maple-Beech-Birch	76.1	14.8	61.3
Non-stocked	1.2		1.2
Hardwood total	256.6	81.5	175.1
Percent of Total Hardwoods	100.0%	31.8%	68.2%
All forest types	277.1	87.3	189.8
Percent of Total All Types	100.0%	31.5%	68.5%

Streams - Several of the State Forest lands fall within Stronghold watersheds for aquatic biodiversity (specifically part of the Casselman River and Savage River Watersheds.) Stronghold watersheds are those watersheds in the state that are most important for the protection of Maryland's aquatic biodiversity. Stronghold watersheds are the places where rare, threatened, or endangered freshwater fish, amphibians, reptiles, or mussel species have the highest numbers (abundance and number of occurrences). Special protection of these watersheds is necessary to ensure the persistence of these imperiled fauna. Additionally, parts of these watersheds are High Quality Waters (Tier II waters). States are required by the federal Clean Water Act to develop policies, guidance, and implementation procedures to protect and maintain existing high quality waters and prevent them from degrading to the minimum allowable water quality. Tier II waters have chemical or biological characteristics that are significantly better than the minimum water quality requirements. All Tier II designations in Maryland are based on having healthy biological communities of fish and aquatic insects. These are areas that have high biological integrity and are afforded additional protection under MDE's Anti-degradation regulations.

2.11 Forest Management in Garrett County

Most of the forests Garrett County are privately owned, and most are managed for multiple objectives, but chiefly for wildlife habitat to support wildlife-related recreation and for revenue from the sale of timber. The forests in Garrett County are well suited to meet these objectives because of their ability to provide valuable products and diverse habitats.

As described above, the forests tend to be dominated by mixed oaks, northern hardwoods or conifers. Most of the forests are even-aged, having regenerated from the abandonment of agricultural land in the middle of the century, or from previous clear-cut timber harvests. Some areas have probably seen timber harvests for several centuries, as both Native Americans and early European settlers cleared land and harvested wood for a variety of uses, such as building boats and houses.

Management of forests in Garrett County is done in two ways: extensive vs intensive. On

private lands extensive management frequently consists of a harvest operation when the need or opportunity arises. There is very little thought to regenerating the next forest. On public land and most industrial land intensive management is practiced. This entails tending the entire forest now and into the future

In Maryland from 1976 to 1989 the number of private forest owners grew from 95,800 to 131,000, increasing by about 2.7% per year. That calculates out to about 2,600 more owners each year. In 1976, 55% of the owners held less than 10 acres of forest; by 1989 that proportion had grown to 65%. What can be inferred from these trends is that over 2/3 of the forestland owners in the area are now essentially large-lot homeowners who will seldom be able (or desire) to manage their forest for timber production. Some properties will be managed for wildlife and recreation value, but small, fragmented pieces are limited in their capacity to produce those values, as well.

Convincing private landowners to manage forests on a long-term, sustainable plan is affected by the rapid turnover of forest properties. This produces a constantly changing clientele for forestry education, and a constantly shifting set of land management objectives that can disrupt or destroy long-term planning.

To assist the landowner with the management of their forest, there are a variety of forestry services and sources of information available. The Maryland Department of Natural Resources, Forest Service, maintains at least one forester in each county. Many landowners rely on them for impartial advice concerning timber sales, the development of forest stewardship plans and the carrying out of forest management activities such as reforestation after a timber sale. In addition, there are several private consulting foresters who assist landowners with all aspects of forest management. Most of the actual management activities, such as road building, site preparation, tree planting, and harvesting, are contracted out to separate businesses. Garrett County has access to many of these types of contractors but not in the quantity that characterize other areas of commercial forestry. Consequently some specific management practices have not been feasible because there has not been sufficient demand to support an operator.

2.12 The Forest Products Industry

Of the many commercial products that a forest in Garrett County can generate, the most valuable is hardwood veneer and sawtimber. There is typically a strong market for this because of the many local sawmills engaged in the production of dimensional lumber for the cabinet and furniture industries. There are some secondary wood industries that also provide employment to a number of regional workers.

There is also a hardwood pulpwood market in nearby Allegany County and to a lesser extent, softwood pulpwood market. There are a number of specialty markets for items like fence railing, fence posts, mine posts, railroad cross-ties, pallets and firewood. These markets plus the ones mentioned earlier have been around for decades, but the last few years the markets have been weak. A number of mills have reduced their utilization (going from 3 shifts to 1 shift) or closing down all together. There is some evidence that the markets are beginning to be a bit more robust.

From the 2007 Census of Agriculture, the value added to the county's economy from forestry is

57.4 million dollars and total outputs to the economy equal to 158.1 million dollars. In terms of employment 643 people are employed in sectors that are directly related to forestry and an additional 969 people are indirectly related to forestry.

2.13 People and Forests in Garrett County

2.13.1 Historic Settlement and Forest Use Patterns

11,000 years ago the most recent glacier moved north causing the dominant conifer cover to gradually decrease and hardwoods to become more dominant. There are some unique bog areas that are typical of much more northern climes that are still present; the 4H center and the Cranesville Swamp.has one.

Prior to European settlement it is clear that Nomadic Indian tribes traveled to and through Garrett County. There is some evidence that a few tribes stayed year round especially on the Youghiogheny River.

Forestry activities during this time consisted of clearing areas for crops (slash & burn type) and burning the woods for fruits and berries. Burning also improved the habitat for wildlife and made it easier for hunting and watching out for other tribes that were not friendly. The likely effect on the forest was a mosaic of different age classes, different sizes and different species.

As the early explorers arrived in the area, diseases greatly reduced the Indian population, much before conflict between the settlers and Indians reduced it even further. The likely effect of this population decrease was to reduce the diversity within the forests as the trees grew to quite large sizes without the practice of periodic cutting and frequent low intensity fires.

Thus when the settlers started to arrive in the area, the trees were much larger and denser than they had been during the times of large Indian populations. The settlers rapidly started clearing areas for permanent agricultural areas and fences. Some of the readily accessible white pine and red spruce trees were cut out to provide masts for ships and building materials.

A lot of the hemlock stands in the county were not cut during this period because they were located in relatively inaccessible areas and many farmers wanted to save the hemlocks for future building materials.

In 1800, there were roughly 1000 settlers who lived in Garrett County. But cheap land, improved transportation and growth along the eastern seaboard led to a settlement boon. The national road was completed in 1818 and the railroad arrived in 1852. The transportation system better connected the resource rich Garrett County to the growth needs of the east. Increased quantities of lumber, coal and wheat was shipped east.

By the early 1900’s narrow gauge railroads were used to allow logging on steeper slopes and the demand for wood products continued to increase.

The result was Garrett County was heavily cut-over, essentially clear cut within a 20 year period. The train engines frequently caused forest fires in the tops and slash that was left from the clear-cutting. And of course one way to settle a score with your neighbor was to burn their fields and woods.

The effect on the forests was that a new forest was created. This legacy we can see today as most of our older forests are the same age and are about 100 years old.

In part as a reaction to the rapid cutting of trees and the burning that was taking place, in 1906 the Garrett Brothers gave 2000 acres to the state with the provision that an agency would be created to manage the property and to institute scientific forestry. This led to the birth of the Maryland Forest Service and Garrett State Forest.

The rapid exploitation of the forests came to an end by the 1930s and logging companies moved west or converted to coal mining. The early efforts of the MD Forest Service were primarily fire suppression.

Since 1929, state foresters have allowed the timber growing stock to build up. They have planted open spaces, initiated timber stand improvement practices, and harvested poorly stocked and economically mature stands. Forestry management practices provided protections from fire, insects, disease and grazing. These practices were not able to protect the American chestnut tree from being eliminated by an exotic invasive disease – The American Chestnut blight.

In the 1930s the Civilian Conservation Corps camps were established throughout the county. Camps were located at Potomac Camp in Deer Park, Swallow Falls, New Germany and Savage River. The men in the camps assisted the forest service with fires suppression efforts, tree planting, and constructing facilities for recreational activities. They helped build numerous cabins, pavilions, and trails where hiking, biking, horseback riding, and ORV riding are still taking place.

2.13.2 Recent Population and Development Trends

Garrett County, while remaining largely rural, is within the "gravitational field" of a large (11 million people plus) urban population. The result is fairly intense pressure to convert farm and forestland to developed uses. Garrett County while the full-time population has remained fairly steady (Table 2.135.2), the pressure has come from vacation/second home buyers.

Table 2.13.2: Population Characteristics of Maryland and Garrett County

STATE	Population 2000	Population 2009 (est)	Increase %	Age–17 or less % of total, 2009	Age– 18 to 64 % of total, 2009	Age– 65 + % of total, 2009
Maryland	5,296,486	5,5,699,478	9.1%	23.7%	64.1%	12.2%
Garrett County	29,846	29,555	-1.0%	21.5%	61.1%	17.4%

Source: US Census Data(www.census.gov)

2.13.3 Maintaining Working Forests in an Urban-Affected Region

Urban populations require a constant inflow of natural services, such as food, fiber, and freshly cycled water and air. These needs create economic incentives to use undeveloped land for farming and forestry to produce these goods. But many of the natural services, such as cycling of water and air, or wildlife habitat, are not priced in a market where landowners can be financially rewarded for keeping land in forests. This lowers forest owners' ability to compete as landholders where areas urbanize.

Urbanization also creates large outflows of influence that tend too push land uses such as farming and forestry further away. Used water, air, waste material are exported from the urban areas to cheaper rural land. Farming and forestry and other open space uses are generally out-priced when push comes to shove and a large population center needs to expand or export a problem. The lands then move into higher priced uses that generally feature more houses, more highways and other developed amenities. As land use changes radiate outward, the industries such as forest products manufacturing experience supply reductions as well as growing urban attitudes that discourage or even legislate against activities like logging, trucking, or manufacturing. Where business leaders sense that the future of the industry is limited, they begin to limit investment in new facilities, and the future of the industry can become locally tenuous.

This situation is clearly affecting Garrett County, and while the Potomac-Garrett State Forest and Savage River State Forest can resist the pressures to be converted to other uses due to their status as public lands, the management of the lands will be affected by the fate of the private lands around them as well as the future of community factors such as the forest products industry and the pressures for outdoor recreation.

Knowledgeable estimates indicate that land in Garrett County is attracting market prices that are 2-5 times higher than the land's agricultural or forest value. The higher that ratio becomes, the more vulnerable the land is to conversion. By comparison, some Maryland watersheds on the Western Shore close to the Baltimore-Washington corridor have price ratios as high as 10 to 15.

Land prices cut both ways in a situation like this. High prices near the urban areas mean high taxes, and commodity producers are squeezed out of production because they can't afford to pay development-price taxes on farm or forestland. They are then forced to sell to protect their family's asset value. Garrett County, while not in the immediate high-pressure zone, is close enough to allow developers to think that distance is not as much a problem as price, so they are encouraged to build on the cheaper, more remote lands.

Vacation home and resort development is increasing. The fact that these uses are currently expanding in the county means additional focus on the area as a recreation destination, which spells more visitors, more traffic, and more residential development in the coming decades. Some of this growth will take agricultural land; some will take forests. The future of agricultural land is important to forestry, because as agricultural land gets developed, and agricultural cultural values are replaced by urban values in the region, the pressures against production

forestry will mount. That trend is already well underway and seems destined to continue in the future.

In Garrett County populations are older and less affluent than the averages for the state (U.S. Census, 1998). This sets the stage for significant amounts of land turnover, fragmentation, and land use change in the coming decades. And it leads to considerable concern for the future of rural lands as development pressures spread from Washington D.C., from Baltimore, and from Pittsburgh PA.

2.14 Landscape Considerations

2.14.1 Shifting From Stands to Landscapes

In the past, management of forests was done primarily on a stand basis, and most of the time, as stands within specific property holdings. From an ecological perspective, the stand was taken as a unit that could be accessed independent of others. Economic considerations, such as the desire to have consistent product to sell from year to year, and to minimize costs of treatments, linked the management of different stands, but otherwise it was assumed that a stand, by definition, was a management unit on which treatments could be scheduled independently of all others.

In recent years, however, there has been a strong movement toward management at a landscape level. Landscape level considerations means that the status of any specific stand, and what forestry treatments are applied to it, depend not only on its internal conditions (stand age and structure, site index, etc.) but on the condition of other stands and of other lands in a region. The landscape-level perspective leads to a view of stands within landscapes. The condition of other stands includes not only their stand age and structure, but also the frequency distribution of stands on the landscape of different kinds and stages. Landscape considerations also take into account land holdings by other landowners and government agencies. The management of a stand is perceived within a regional context.

All of the major goals of this project need to be examined from a landscape-level perspective, and decisions made in light of this perspective. Among the factors that are leading in the direction of management from a landscape level perspective are: the requirements of the Endangered Species Act; the Clean Water Act; the habitat needs of migratory species that make use of forest stands; the habitat needs of game species and other species of recreational value; the perception that recreational uses can benefit from a variety of stand types, not just from the existence of a certain kind of stand.

There are a number of examples that illustrate the landscape perspective. Recent approaches by Boise-Cascade illustrate landscape level forest management as a result of concerns with endangered species. Boise-Cascade has holdings in the southeast that are habitat of the Red-cockaded woodpecker. The company has taken the position that, while it can affect habitat for this species within its own holdings, it cannot be held responsible for the status of the species, specifically for the population abundance of the woodpecker. Instead, Boise-Cascade has initiated voluntary, cooperative agreements with other landholders and with government agencies so that planning for forest use is done on a regional basis. In this case, the decision about how a specific stand will be treated is influenced by more than the condition of that stand, and more

than the holdings of Boise-Cascade. That treatment depends on the availability of habitat for the woodpecker in an entire region, and, by voluntary action, the corporation chooses to harvest stands under its own control to meet the regional needs of the endangered or threatened species, as well as to meet its corporate needs. A similar approach dealing with the endangered Delmarva Fox Squirrel is underway on the lower eastern shore of Maryland. The Blackwater NWR in conjunction with Maryland DNR and other partners are in the process of developing a Habitat Conservation Plan (HCP) for management of the Fox Squirrel for the entire peninsula.

Similarly, the desire to have clean water leads to a consideration of water quality within a region, as well as within a specific ownership. Water quality is affected by the condition of water in the bay, on lands that are in agriculture and housing, as well as on the forestland, making clean water a landscape-level issue.

Thus a landscape-level perspective is intrinsic, if generally unspoken, in forest planning on Garrett County, and is likely to become increasingly important in the future. As the experiences and practices of Boise-Cascade illustrate this level of planning and management can be done on a voluntary, cooperative basis, and be driven by market forces. Landscape-level planning means that a stand is seen within a regional context, but this does not require that planning be done from an external or regulatory perspective.

2.14.2 Watersheds as a Landscape Issue

Regional attention to water quality in the Chesapeake Bay and its tributaries has led to concern for some of the resource management activities in use in Garrett County. Declining water quality in the Bay has resulted in major interstate efforts, many of which have identified the treatment of the land within the watershed as the primary factor in reversing the decline and restoring the Bay's aquatic environments.

In its Clean Water Action Plan, the State of Maryland identified 138 "8-digit" watersheds, averaging about 75 square miles each, as the unit of analysis most suited to identification of watershed condition and treatment priorities. The "Unified Watershed Assessment Report" published by the State evaluated clean water and other natural resource goals on these watersheds. The clean water goals were based largely on the State's biennial water quality report, prepared in response to Section 305(b) of the Federal Clean Water Act. Waters that were reported to have violated water quality standards were assigned to "Category 1," as "in need of restoration." In addition, watersheds that were not in violation of water quality standards, but which were shown to need restoration in order to meet two or more natural resource goals, are also placed in Category 1.

Category 2 watersheds are those that meet current water quality and natural resource goals, but need preventative actions to sustain existing water quality. Category 3 is high quality pristine watersheds where protection was a high priority. In selecting water quality indicators that might be most affected by forest management within the watersheds, we chose nutrient loading as discussed in Section 2.15. See chapter 3 for additional characterization of Watersheds on the State Forest.

2.15 Water Quality Issues

Forests play a pivotal role in water quality in the Chesapeake Bay. Forestlands provide a steady source of clean water to streams and tributaries. Forests act as nutrient sinks across the landscape, absorbing more nutrients than they supply. Additionally, Potomac-Garrett State Forest and Savage River State Forest contain a large amount of land in Garrett County and therefore are critical to the viability of the timber industry and consequently, the forest cover in the region. Without the infrastructure of the timber industry, forestlands may be converted to other more polluting land uses. Finally, the location and landscape position of the state forests provides opportunities to capture additional nutrients and sediments traveling across the watershed

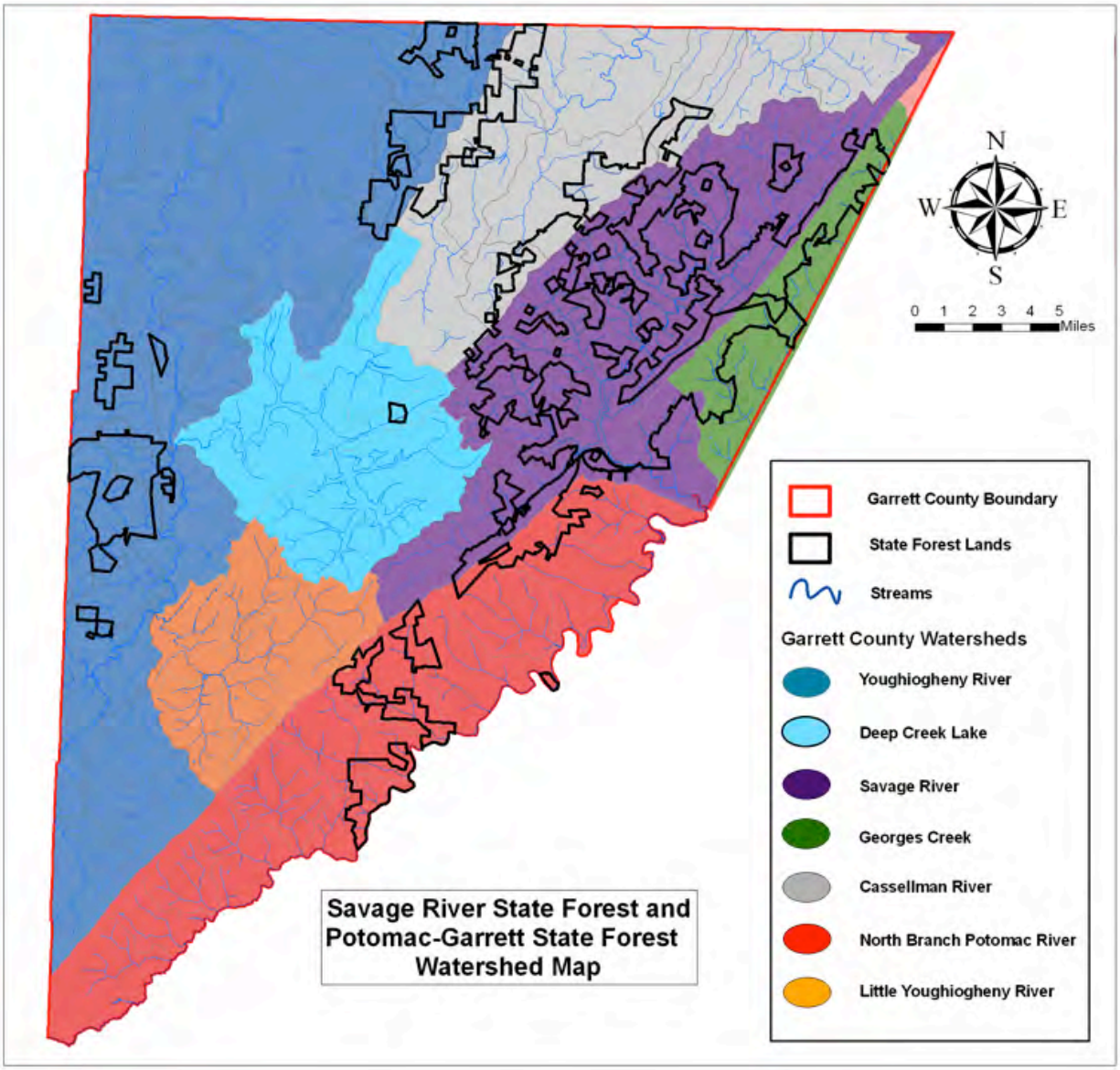
Nutrients are the largest water quality concern in Garrett County due to their negative impact on the Chesapeake Bay and its tributaries. Forests are estimated to contribute only 2 pounds of nitrogen per acre per year at the same time that they are receiving 9.5 pounds of nitrogen per acre per year from the atmosphere.

The majority of streams in Garrett County had nitrate-nitrogen levels within the range found in mostly forested streams within Maryland. An estimated 70% of stream miles were below the 1 mg/l threshold level, and no streams had values which exceeded the 5 mg/l threshold for biological effects. There was no geographic trend in the distribution of sites with elevated nitrate-nitrogen in the county.

Similar to nitrate-nitrogen, 86% of the stream miles in Garrett County had total phosphorus levels in the range of those observed in forested Maryland streams. No streams had total phosphorus levels above the threshold associated with biological effects. Sites with elevated levels of phosphorus tended to be concentrated in the southern portion of the county.
See Chapter 3 for additional characterization of water quality.

2.15.1 Potential Water Quality Impacts of Forestry Operations

Timber operations have the potential to create unacceptable impacts on water quality and the topography of Garrett County may increase the risk of significant water quality impacts relative to flatter areas. However, with proper best management practices, these impacts are generally minimal and temporary. See Chapter 5 for additional information on mitigating impacts from forestry operations.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Miles
Garrett County Boundary
State Forest Lands
Streams
Garrett County Watersheds
Youghiogheny River
Deep Creek Lake
Savage River
Georges Creek
Cassellman River
North Branch Potomac River
Little Youghiogheny River
Savage River State Forest and
Potomac-Garrett State Forest
Watershed Map

Chapter 3 - Resource Characterization

3.1 The Forests

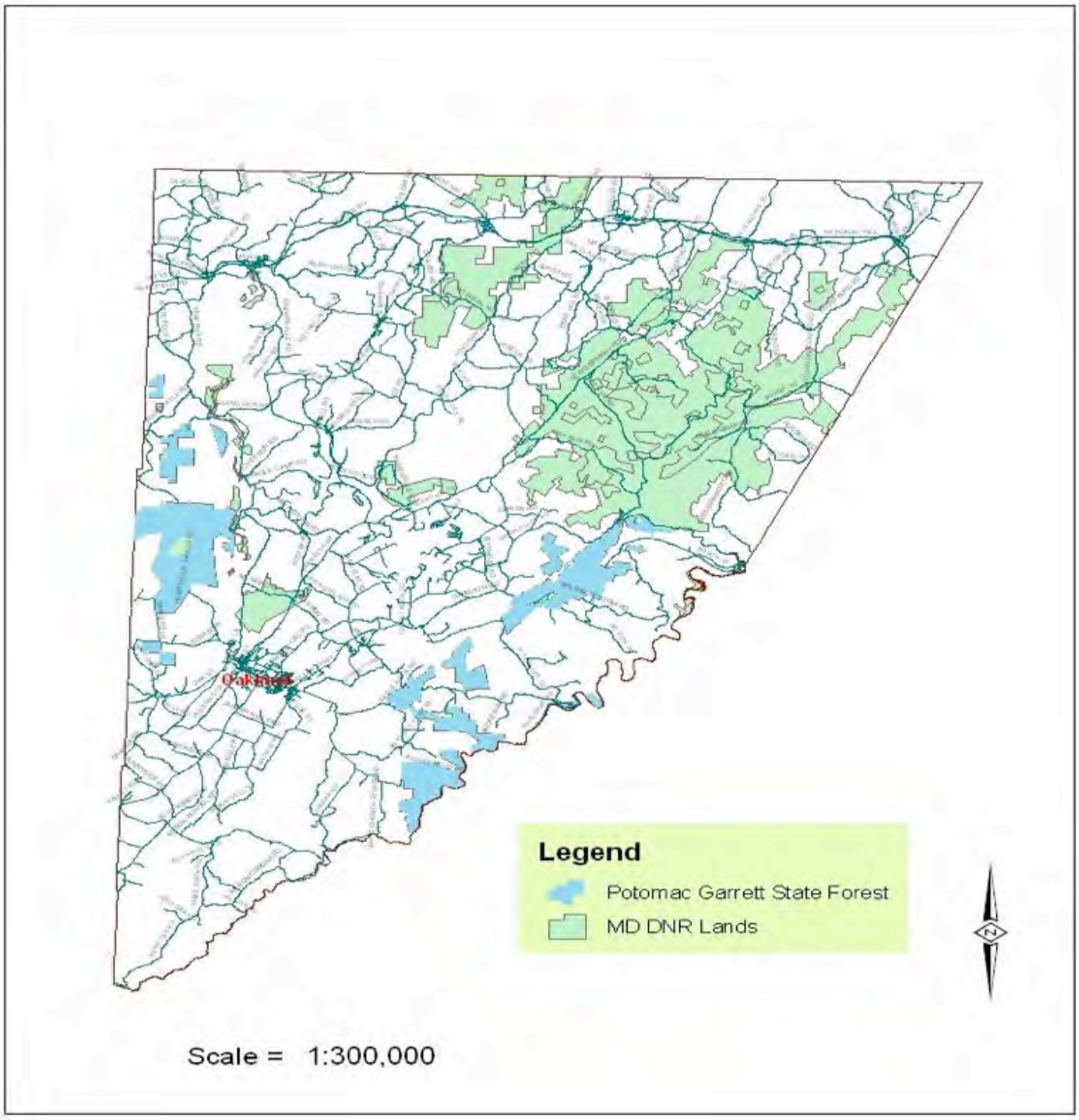


Figure 3 : Potomac-Garrett State Forest - Garrett County, MD

The Potomac-Garrett State Forest covers approximately 17,931 acres of land within Garrett County as shown in Figure 3.

	Stand Size Class							
Forest Type	**Open**	**Seedlings**	**Saplings**	**Pole-Timber**	**Small Saw Timber**	**Large Saw Timber**	**Total Acres**	**% of Total Acres**
Hemlock	0	0	0	0	254	0	254	1
Northern Hardwood	0	127	63	508	1,142	190	2,030	12
Mixed Oak	0	254	508	1,142	9,326	824	12,054	69
Cove Hardwood	0	0	0	63	888	190	1,141	7
Red Maple	0	63	190	380	634	0	1,267	7
Hardwood/ White Pine	0	0	0	0	63	0	63	1
Plantations	0	0	0	127	317	0	444	2
Non-Forested Area	128	0	0	0	0	0	128	1
TOTAL	128	444	761	2,220	12,624	1,204	17,931	100
% of Total	1	2	4	13	73	7	0	100

(Source: 2000 PGSF CFI)

3.2 Old Growth Forest

Old growth forests have generally been defined as forests in existence since pre-settlement times and lacking any significant Euro-American disturbance. The definition can differ according to climatic and eco-regional perspectives and the growth characteristics of specific native forest systems. In Maryland an old growth forest is defined as a minimum of 5 acres in size with a preponderance of old trees, of which the oldest trees exceed at least half of the projected maximum attainable age for that species, and that exhibits most of the following characteristics:

1. Shade tolerant species are present in all age/size classes.
2. There are randomly distributed canopy gaps.
3. There is a high degree of structural diversity characterized by multiple growth layers (canopy, understory trees, shrub, herbaceous, ground layers) that reflect a broad spectrum of ages.
4. There is an accumulation of dead wood of varying sizes and stages of decomposition, standing and down, accompanied by decadence in live dominant trees.
5. Pit and mound topography can be observed, if the soil conditions permit it.

It is also important to recognize that old-growth forests are not static and may not be a permanent fixture on the landscape. The forests and trees within and around them change continuously. This would be true even if human influence could be eliminated. All forests, including old-growth, succumb to natural, destructive disturbances and regenerate over time. A functional old-growth ecosystem includes the loss of old trees due to natural disturbances and the death of old trees. An old-growth system is not static, nor is it always dominated by old trees. Natural

processes dictate the age composition at any time. The important factor in this process is that the trees have the opportunity to reach old age if natural disturbances do not intercede.

Potomac-Garrett State Forest has 439 acres of Old Growth Forest found in 7 areas. The goal on PGSF is to expand the functioning Old Growth Forest system by connecting a series of forest stands identified as either old growth or "nearly old growth forest". The larger areas that contain the nearly old growth stands or areas that create meaningful connections between old growth will be mapped as old growth management zones. (Maps included in Appendix I) This process is fully described in the Department's Old Growth Management policy and *"Management Guidelines for the Conservation and Protection of Old-Growth Forest"*.

3.3 Forest Production

A significant portion of Potomac-Garrett State Forest had been managed for industrial forest production for decades, and was a major contributor to the region's forest products economy. Five pine sawmills and two pulpwood-chipping operations provided an outlet for timber from local forests, which are largely isolated from outside markets by water and distance. Under the new sustainable management plan the harvesting of forest products to support local economies will continue to be an important goal of this forest. However, when harvests are proposed, all environmental factors are considered in the development of annual work plans. These plans are reviewed by an interdisciplinary team of resource professionals from the Department and the local Citizens Advisory Committee for the Forest which is followed by a Public Comment period. Potomac-Garrett State Forest makes up about 6.4% of the productive forests in Garrett County; (See Tables 3.3.1 and 3.3.2e 10). As the State Forest system in Garrett County includes both PGSF and Savage River State Forest, the State Forest system comprises almost 26% of all of the forestland in the county. In the past these forests produced about 15-20% of the annual timber harvest in the region.

Table 3.3.1 : Potomac-Garrett SF and Savage River SF as a % of Garrett County

	State Forest	SF as % of	SF as % of
State Forest	Acres	County Area	County Forest
Savage River	54,324	12.8%	19.0%
Potomac-Garrett	17,931	4.3%	6.4%
Totals	72,566	17.1%	25.4%

*additional source: USDA Forest Service-Forest Statistics for Maryland: 1986 and 1999

Table 3.3.2 : Potomac-Garrett State Forest as a % of Forest by County

	*Total	*Total	PGSF	PGSF as % of	PGSF as % of
County	Area acres	Forest acres	acres	Total Area	Total Forest
Garrett	425,052	279,251	17,931	4.2%	6.4%

*Source: Garrett County Office of Planning.

3.4 Water Quality

Water quality is a major environmental concern, fueled by the fact that nutrient contributions from airborne pollution as well as local development and agriculture have been cited as a basic cause of water quality decline in recent decades. The Potomac-Garrett State Forest management plan focuses on several aspects of this issue, including the protection of water quality buffers to remove as much nutrients as possible. This can be accomplished through the maintenance of healthy, growing forests that will maximize nutrient uptake and by controlling other management impacts on soils where the risk of direct nutrient transport into shallow groundwater or surface waters is high.

3.5 Watersheds

The Potomac-Garrett State Forests are located within three of Maryland's 8-digit watersheds. These watersheds are Potomac River Upper North Branch and Savage River in the Chesapeake Bay Drainage and the Youghiogheny River in the Ohio River Drainage.

The total miles of streams by Strahler stream order in each watershed is presented in Table 3.5.1

Table 3.5.1 : Strahler Stream Order by Watershed

	Stream Order				
Watershed	1st	2nd	3rd	4th	5th
Potomac River Upper North Branch	90.7	22.1	7.5	33.1	0
Savage River	96.3	21.8	16.8	5.0	0
Cheasapeake Bay Total	**187.0**	**43.9**	**24.3**	**38.1**	**0**
Youghiogheny River	166.8	52.5	30.0	7.1	19.8
Ohio River Total	**166.8**	**52.5**	**30.0**	**7.1**	**19.8**
Grand Total	353.8	96.4	54.3	45.2	19.8

3.5.1 Stream Conditions

The Maryland Biological Stream Survey (MBSS) has randomly sampled streams across the state of Maryland to assess stream ecological condition. Stream condition is measured using information collected from the fish and the benthic macroinvertebrate communities. This information is analyzed and reported in one of four categories; good, fair, poor or very poor. The results for the three Potomac-GarrettState Forests watersheds are presented in Table 3.5.1.1 for fish and Table 3.5.1.21 for benthic macroinvertebrates compared with statewide watershed condition.

Table3.5.1.1 : Estimated Percent of Stream Miles in Each Watershed By Category; Fish Index of Biotic Integrity Compared to Statewide Condition

Watershed	Good	Fair	Poor	Very Poor	Not Rated
Potomac River Upper North Branch	10.0	20.0	40.0	30.0	0.0
Savage River	57.1	28.6	7.1	0.0	7.1
Youghiogheny River	18.8	31.3	50.0	0.0	0.0
STATEWIDE	**26.0**	**25.0**	**21.0**	**19.0**	**9.0**

Table 3.5.1.2: Estimated Percent of Stream Miles in Each Watershed By Category; Benthic Index of Biotic Integrity Compared to Statewide Condition

Watershed	Good	Fair	Poor	Very Poor	Not Rated
Potomac River Upper North Branch	20.0	40.0	30.0	10.0	0.0
Savage River	85.7	7.1	7.1	0.0	0.0
Youghiogheny River	37.5	25.0	25.0	12.5	0
STATEWIDE	**26.0**	**28.0**	**30.0**	**16.0**	**0**

3.5.2 Aquatic Biodiversity

The Potomac-Garrett State Forest is located within two of the 159 Stronghold Watersheds. Stronghold Watersheds are the 12-digit watersheds that are the most important to protect in order to preserve Maryland's aquatic biodiversity. More information on Stronghold Watersheds can be found on the MBSS website (http://www.dnr.state.md.us/streams/pdfs/StrongholdFactSheet.pdf). The stronghold watersheds in the Potomac-Garrett State Forest are important for the conservation of several state rare, threatened, or endangered species. These species include Johnny darter, mottled sculpin, and brook trout.

The MBSS has collected information on non-native aquatic species. Eleven non-native fishes have been found on or in close proximity to the Potomac-Garrett State Forest. The eleven non-native species are fathead minnow, golden shiner, brown trout, rainbow trout, largemouth bass, smallmouth bass, black crappie, rock bass, green sunfish, pumpkinseed and bluegill.

The MBSS has a long-term monitoring network called the Sentinel Site Network. This is a network of 27 sites used to monitor the natural variability of streams and to investigate the possible effects to streams due to global climate change. These sites are the highest-quality sites identified by the MBSS with the least amount of anthropogenic influence in the upstream catchment. Two of the twenty-seven Sentinel Sites have portions of their upstream catchment

located within the Potomac-Garrett State Forest.

3.5.3 Special Areas

Bull Glade Run is located on Garrett State Forest property. The MBSS has sampled Bull Glade Run 15 times during 1994 and 1995. No fish were observed at any of the 15 sampled stream sites. The upstream land use to all of the sites, calculated from the National Land Cover Dataset, is forest. MBSS field crews noted that the natural setting around sites appeared to be a bog. There is little evidence of anthropogenic stressors to the stream, and the field crews did not note evidence of acid mine drainage at the sites. Measure pH values were low at all sites. It is likely that Bull Glade Run is naturally acidic.

3.6 Soils

The forest features varying topography, ranging from the gentle slopes typically found on the Garrett Forest, to characteristic, steep, rugged ridges above the North Branch that are found on the Potomac State Forest. Elevations range from1,800 feet along the Potomac River at Lostland Run, to over 2,900 on the windswept spine of Backbone Mountain. Soils are often steep, stony, or both and are ideally suited for woodlands, wildlife habitat and recreation. These soils are generally productive for producing forest crops, and given reasonable management care and judicious application of “Best Management Practices” soil erosion and sediment runoff is seldom a problem. Seasonally wet conditions affect the timing and type of management activities.

In the process of plan development, the soils on the forest were classified into 8 Soil Management Groups (SMG), based on soil characteristics directly affecting forest management.

Table 3.6.1 (8) Soil Mmanagement Ggroups for Potomac–Garrett State Forest and aAssociated Mmanagement Cconsiderations.

SMG1	**Very Poorly Drained to Poorly Drained Mapping Units with Moderate Limitations Affecting Construction of Haul Roads and Log Landings**
SMG2	**Very Poorly Drained to Poorly Drained Mapping Units with Severe Limitations Affecting Construction of Haul Roads and Log Landings**
SMG3	**Somewhat Poorly Drained to Moderately Well Drained Mapping Units with Moderate Limitations Affecting Construction of Haul Roads and Log Landings**
SMG4	**Somewhat Poorly Drained to Moderately Well Drained Mapping Units with Severe Limitations Affecting Construction of Haul Roads and Log Landings**

SMG5	**Well Drained Mapping Units with Slight to Moderate Limitations Affecting Construction of Haul Roads and Log Landings**	
SMG6	**Well Drained Mapping Units with Severe Limitations Affecting Construction of Haul Roads and Log Landings**	
SMG7	**Soil Mapping Units that are Variable and have no Defined Drainage Class with Moderate Limitations Affecting Construction of Haul Roads and Log Landings**	
SMG8	**Soil Mapping Units that are Variable and have no Defined Drainage Class with Severe Limitations Affecting Construction of Haul Roads and Log Landings**	

To facilitate plan development and future management, digital soils data is available from USDA Natural Resources Conservation Service in Garrett County.

When the current land cover was compared to the soil survey data, it was clear that the majority of Potomac-Garrett State Forest occurs on SMG's 5,6 & 8 indicating that most of the forest poses challenges to carrying out timber harvest operations or for that matter any on the ground activity. Particular care must be taken and the site limitations must be considered when planning any management work. This requires the watchful eye of technically skilled forest management staff to be in the field and on the ground overseeing any and all field work. It is also important to be flexible in scheduling field activities to be able to accommodate and work around the site limitations and often difficult weather conditions.

3.7 Complexes

To facilitate management planning of the Potomac-Garrett State Forest, the forest was grouped into complexes. A complex is defined as contiguous properties made up of individual tracts that make sense to be managed as one unit. This involves some arbitrary decisions, since there are often minor gaps of private ownerships within individual units. The resulting management units provide a very useful tool for developing individual operating plans that then comprise the annual work plan on the forest. Table 3.7.1 reflects the identification of the 9 Complexes.

Table 3.7.1 Potomac-Garrett State Forest Complexes

Complex	Total Acres	% of Total Acres
P01 – Wallman/Laurel	2419	13
P02 – Lostland	2189	12
P03 – North Hill	980	5
P04 – Backbone Mtn./Spring lick	4725	26
G05 – Snaggy Mtn.	5499	31
G06 – Hutton	387	2
G07 – Piney Mtn./Comp 47	1359	7
G08 – White Rock	247	3
G9 – Frenchmans Point	126	1

Totals	17931	100

Size Class	Count	Ac Sum	Ac Avg.	Min	Max
0-99	0	0	0	0	0
100-499	3	760	253	126	387
500-1999	2	2339	1170	980	1359
2000+	5	14877	2975	2189	5499

Two (2) of the “complex” management units on Potomac-Garrett State Forest are less than 400 acres in size. These smaller tracts include: The Hutton Tract which contains a portion of the original land grant donation given the State by the Garrett Brothers in 1906, marking the beginning of the Forest Service and Maryland's public lands system as we know it. This area is now set up as the Kindness Demonstration Forest Area. The other smaller tract is the White Rock Area which had been acquired for protection of significant RTE species.

3.8 Compartments

Historically, the state forest has been managed by compartment units. Compartments being sub sets within the broader more general ‘Complex” units, and being the working basis of all historic management and record keeping for the forest. A compartment is defined as contiguous area made up of individual stands that make sense to be managed as one unit. Compartments are often divided by physical boundaries such as roads, streams, ridge lines, etc. This involves some arbitrary decisions, since there are often minor gaps of private ownerships within individual units. The resulting management units provide a very useful tool for developing individual operating plans that then comprise the annual work plan on the forest. Table 3.8.1 & 3.8.2 reflect the identification and distribution of the 4950 Compartments.

Table 3.8.1 Potomac Garrett State Forest Compartments

Compartment	Acres	Compartment	Acres
3	265	26	446
4	327	27	126
5	1093	29	299
6	459	30	349
7	583	31	213
8	383	32	801
9	297	33	389
10	209	34	312
11	553	35	346
12	219	36	258
13	92	37	313
14	1012	38	338
15	289	39	660
16	523	40	110
17	141	41	410

18	280	42	260
19	274	43	199
20	535	44	188
21	148	45	689
21	315	46	426
22	260	47	246
23	439	49	247
24	261	50	362
25	698	51	845

Size Class	Count	Ac Sum	Ac Avg.	Min	Max
0-400	32	8315	260	92	389
401-600	9	4374	486	410	583
601-900	5	3693	739	660	845
901 +	2	2105	1053	1012	1093

Adjoining land uses such as agriculture or development may constrain forest management activities such as prescribed fire. These forests provide needed habitat and aesthetic diversity as well as the opportunity for water quality improvement projects to buffer the impact of surrounding lands. The Department must weigh the effects of various management activities as they may affect adjoining properties and seek to always maintain good community relations with neighbors.

Private forest landowners are under increasing economic pressure to convert their land to development as populations grow and industries expand. Maintaining local economic uses and technical resources that help individuals keep their land in forests is crucial to maintaining or expanding the amount of forestland in Garrett County. Thus the concern for the economic effects of this plan, and the value of these forests for transferring technical knowledge to other owners are both central to the management of Potomac-Garrett State Forest. By maintaining these working landscapes and contributing to the timber industry, local markets and infrastructure (logging crews, mills, etc.) will be available to private landowners thus reducing the need to convert land to other uses. This is consistent with the Garrett Brothers mission for the original land donation.

Chapter 4 - Land Management Area Guidelines

4.1 Land Management Areas

Due to the diverse landscape of the Potomac-Garrett State Forest, this plan will not make specific prescriptions for each tract. Rather, the planning team identified specific areas based on physical attributes that need to dominate future management decisions.

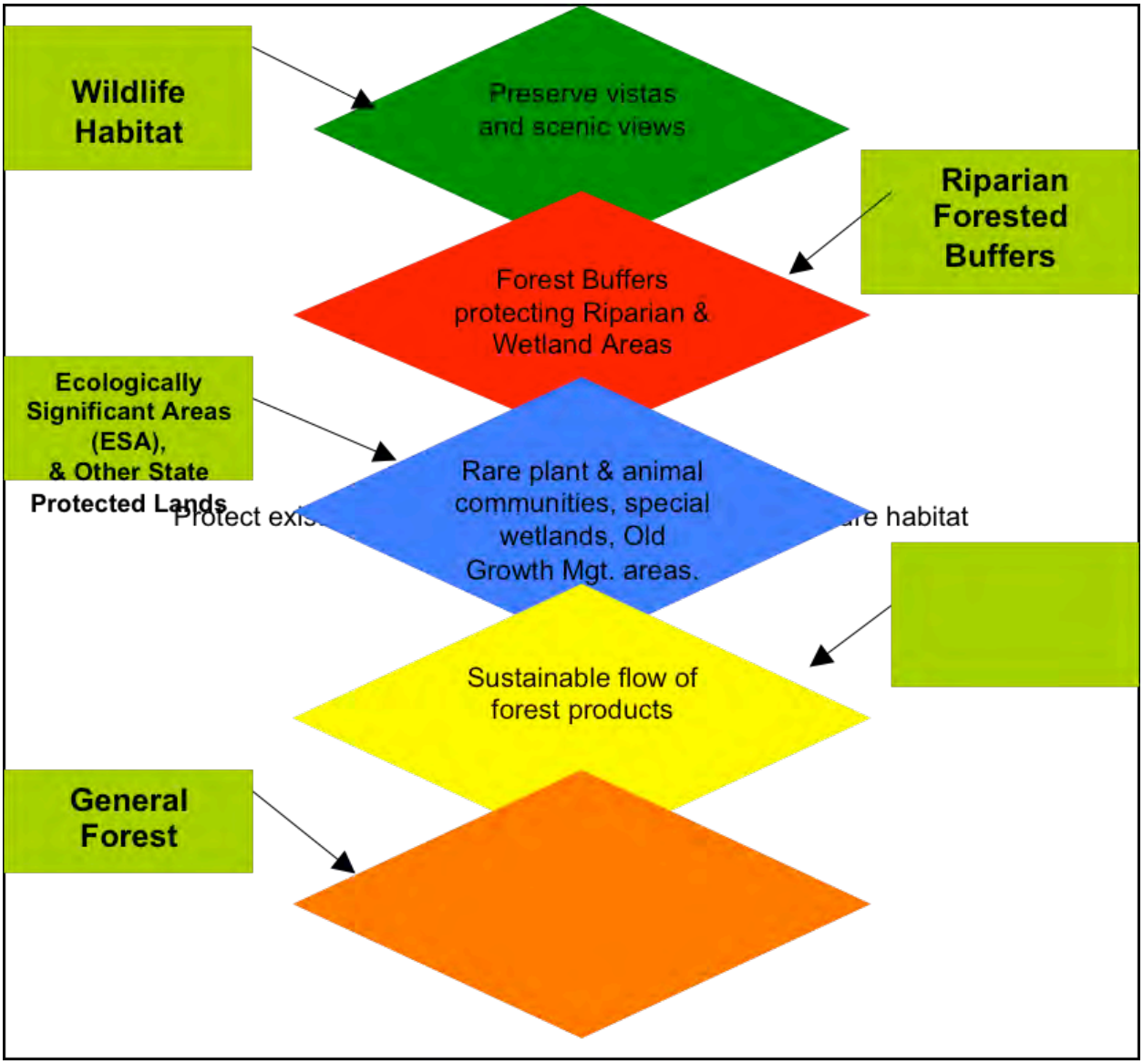


Figure 4.1 : Schematic of Land Management Area guidelines

Figure 4.1 illustrates the sequence of identifying these areas for planning purposes. Beginning on top, the general forest management area is first constrained by identifying the ecologically significant areas where a particular site requires special management attention. This is followed by riparian forest buffers or wetland buffers. Next wildlife habitat areas may need to be established, where a special combination of management recommendations are required by a species or suite of species. Finally, attention must be paid to the visual impact of a practice, considering its location or neighbor concerns. Recommendations for each area have been developed and are listed in this plan and they serve to provide guidelines to field managers, who will need to address each situation on the basis of good inventory, analysis, and planning methods. Additionally there are special sites within each of these areas that fall into the High Conservation Value Forest (HCVF) designation. These are areas to be managed and protected because of identified unique conservation values. See Chapter 5 for additional information.

4.2 General Forest

One of the goals of this project is to maintain an economically sustainable forest and contribute to the local economy through providing forest-related employment and products. Most of this forest area is in hardwood stands. See Chapter 5.

4.3 Ecologically Significant Areas (ESA) and Other State Protected Lands

Sites containing rare plant and or animal communities will be identified and managed for their special qualities. The DNR Wildlife & Heritage Service will be involved in assuring that special sites are properly inventoried, marked, and managed, and that adequate records are created and maintained for each site. Specific prescriptive management recommendations are being developed for each site by the Wildlife and Heritage Service. A breakdown on the locations and description of the special sites that have been identified on the Potomac-Garrett State Forest can be found in Chapter 7.

Other State Protected Lands - Most of these areas fall under an ESA. Those sites that do not are listed as additional to ESA's. These land designations are State Wildland Areas, Wetlands of Special State Concern (WSSC), and Old Growth Ecosystem Management areas. Many of these sites fall under some type of state protection through legislation.

4.4 Forested Riparian Buffers

Fifty foot riparian buffers are mapped to serve as initial starting point from which all water ways will be buffered. This 50 ft. buffer will be further extended based on the slope to the watercourse, using an additional 4 ft. for every 1% of slope to provide riparian forest buffers. Wetland buffers will be marked, established and maintained according to the guidelines listed in Chapter 6. All management activities within these areas will be designed to protect or improve their ecological functions in protecting or enhancing water quality. The long-term goal is to achieve and maintain a mature mixed forest stand except where such buffers offer opportunity to manage for unique and or critical habitat conditions; for example, wetland scrub shrub conditions found in the Bull Glade ESA, or management for woodcock habitat. Otherwise, management will generally focus on marking boundaries so that field personnel and contractors can conduct adjacent operations properly, and closely monitoring activities to prevent soil disruption or damage and protect stream bank and wetland integrity.

4.5 Wildlife Habitat Areas

The rich diversity of wildlife species located within Potomac-Garrett State Forest, from endangered to recreational game species, requires the use of a wide array of adaptive management techniques. The objective is to utilize adaptive management to address the ecological needs of this diversity of wildlife species and habitat types. Wildlife habitat is also enhanced in large measure by the riparian forest buffers and establishing other corridors where needed. Riparian forest buffers expand on water quality protection and take advantage of the

important habitat and life zones associated with riparian areas. Chapter 8 outlines goals and guidelines for these areas.

4.6 Visual Quality Areas

While these are not mapped areas, they are areas that are managed to serve as visual buffers along roads, trails, developed areas and adjacent properties to protect existing scenic quality of the area. The width and necessity of establishing such buffers will be addressed for each management activity proposal. The extent and treatment within these buffers will be determined in the field on a site by site basis.

4.7 Non-Forested Lands

These lands, although not fully identified as a particular "area" in the management plan, are estimated to cover about 3.4 % of Potomac-Garrett State Forest. They consist primarily of roads, transmission lines, wildlife food plots, and wetland areas. Some of these areas may need to be maintained in non-forest vegetation either to allow management activities on the forest, or to meet legal easement requirements. They can provide important wildlife habitat elements such as grassy areas or food plots that benefit game species management and do not interfere with forest management. Control of invading brush, trees and invasive species will be an on-going maintenance issue for these areas. Roads that are not needed for fire, management, or emergency access are considered for closure.

Chapter 5 - Forest Management

5.1 High Conservation Value Forest (HCVF)

Each portion of Potomac-Garrett State Forest is placed in a particular category depending upon the highest and best use for that site given its location and characteristics. Each zone features specific resource objectives which are accomplished through implementation of a set of management guidelines for that area. These catagoriescategories were delineated by an analysis performed by MD DNR Forest Service, Freshwater Fisheries Service, and Wildlife & Heritage Service personnel in early 2010. This analysis resulted in the identification of High Conservation Value Forest (HCVF) areas composed of: Ecologically Significant Areas (ESA), Riparian Buffers, Wetlands of Special State Concern, and Old Growth and Old Growth Ecosystem Management Areas

The concept of HCVF is to insure that existing fragile and unique ecosystems are managed to maintain their identified conservation attributes. The identification of unique values of each priority management/HCVF area along with the prescriptive management protocols was a collaborative effort between DNR Forest Service and Wildlife and Heritage Service personnel. *In most cases areas designated as HCVF do not prohibit timber harvest activities, but instead utilize forestry management operations to enhance the designated high conservation value.* However the identified High Conservation Value for each of the priority management layers indicated in Table 5.1 and Appendix I must be protected or enhanced by the activity. The total acreage in the table does not equal the total area of the forest because some of the high priority areas overlap. For instance, a riparian buffer may overlap an ESA that has a stream through it.

Acreage on PGSF not designated as HCVF is referred to as the General Management Area and is not restricted to a particular type of management, but rather is to be managed to meet the overall broad objectives of sustainable management of the forest resources.

5.2 Potomac-Garrett State Forest - Mapping

Potomac-Garrett State Forest Management Area Maps are provided in Appendix I. Compartment and stand boundaries are approximate and subject to minor revisions by the DNR Inter-disciplinary Team (ID Team) as dictated by onsite conditions verified by field review. Similarly, changes and additions to priority management layer acreages will be subject to ID Team and Advisory Committee review. The boundaries for each layer are maintained in a GIS database and are just one tool and source of information to guide the Forest Manager as to what is best for the resources at a particular site.

Table 5.21 : Potomac-Garrett State Forest Management Layers

	Acre	% Of Total Acreage
P.G.S.F.	**17,976**	**100**
General Management Area	10,043	56
*High Conservation Value Forest (HCVF) and other Protected Areas	7933	44

*Other protected areas of PGSF include known wetlands that do not fall in the HCVF area.

****HCVF Includes:**	**	% of Total HCVF Ac.
Environmentally Sensitive Areas	6574	37
Old Growth Ecosystem Management Areas (OGEMA)	2011	11
Old Growth. w/ 300' Buffer	728	4
Old Growth	402	2
Wetlands of Special State Concern (WSSC)w/ 100' Buffer	395	2
WSSC (no buffer)	193	1
Blue Line Stream w/ 50' Buffer	535	3

**These numbers will not add up to the total HCVF acreage nor do they equal 100% as in many cases they overlap.

5.3 Forest Types and Silvicultural Practices - Potomac-Garrett State Forest

Acreages listed for each forest type are only an approximation based on current forest inventory data and survey information. Acreages for each forest type will continually change over time, as additional riparian buffers are identified and established and new forest inventory data are provided.

Table 5.32 : Forest Diversity Analysis

	Stand Size Class							
Forest Type	**Open**	**Seedlings**	**Saplings**	**Pole-Timber**	**Small Saw Timber**	**Large Saw Timber**	**Total Acres**	**% of Total Acres**
Hemlock	0	0	0	0	254	0	254	1
Northern Hardwood	0	127	63	508	1,142	190	2,030	12
Mixed Oak	0	254	508	1,142	9,326	824	12,054	69
Cove Hardwood	0	0	0	63	888	190	1,141	7
Red Maple	0	63	190	380	634	0	1,267	7

Hardwood/ White Pine	0	0	0	0	63	0	63	1
Plantations	0	0	0	127	317	0	444	2
Non-Forested Area	128	0	0	0	0	0	128	1
TOTAL	128	444	761	2,220	12,624	1,204	17,931	100
% of Total	1	2	4	13	73	7	0	100

(Source: 2000 CFI of PGSF)

5.3.1 Non-Forested Lands

Included in the non-forested types, are Utilityare Utility right-of-ways, wildlife openings, bogs & swamps, administrative areas and recreation sites which amount to approximately 128 acres of open land which is less than 1% of the entire forest.

5.3.2 Mixed Oak

This is the most prominent cover type on the forest covering 69% of the forest accounting for 12,054 acres. These forests will be managed toward mature stands of mixed oak hardwood. This will be done with commercial thinning, selection harvesting, shelter wood harvesting and small-opening harvests designed to encourage regeneration of desired species such as oak. Herbicides will be limited to ground applications to achieve specific goals in improving species balance or removing invasive species. There are many HCVF areas within this forest type that contain sensitive species, management in these areas will be to protect and or enhance that protected species. Some prescribed burning applications may be used in these forest types to manage for a particular species such as oOak. Natural regeneration will be used within harvest sites, possibly supplemented with some planting of native species

5.3.3 Plantations (Conifers)

This forest type totals just over 444 acres or only 2% of the forest cover and is made up principally of Red and White pine plantations with a few acres of Norway Spruce. A variety of hardwood tree species are mixed in this forest type. Many of these stands were planted to anchor the soil on eroding fallow farm fields, with the intent of gradually regenerating fields as highly productive native hardwood stands. With such a small percent of the forest occupied by conifer cover, these stands will be managed towards mature stands with the goal of retaining the diversity of habitat values offered by this limited cover type.

The conifer plantations will be intensively managed to maintain health of the stand and a flow of forest products, unless they are located in a management zone where this is incompatible. This will be determined in the annual work plan process. Silvicultural activities will involve commercial thinning operations followed by an appropriate regeneration techniques at maturity; including clearcut and shelterwood or seed tree methods. Herbicide use may be appropriate to control species composition and regeneration establishment.

5.3.4 Cove Hardwood

This forest type totals just about 1,141 acres, or about 7% of the forest cover. It will be managed to achieve large mature trees. Most of the species that make up this type are relatively fast growing, early successional trees.

Silvicultural treatments in this type will be even-aged management systems. Like the other forest types, there are areas of cove hardwoods that are part of a High Conservation Value Forest and will be managed for other objectives.

5.3.5 Northern Hardwoods

This forest type, which totals just over 2,030 acres, accounts for 12% of the forest cover. It will be managed to achieve large mature trees. The tree species in this type, such as sugar maple and American beech are suitable for uneven-aged management systems. These forest types are frequently found on northern aspects and adjacent to streams, thus they are often associated with valuable ecosystem features. While uneven-aged management has not been frequently used on the forest, it is appropriate to use in this forest type and to protect valuable ecosystem features. Some of these stands are in the High Conservation Value Forests.

5.3.6 Red Maple

This forest type accounts for just over 1,267 acres. This type comprises 7% of the forest cover, yet shows the greatest increase in acreage between the 1990 and 2000 CFI inventories, having increased from approx. 252 acres (<1% of forest) in 1990. As Red maple is associated with virtually all of the prominent cover types on the forest, this type is one of the most likely to increase in the wake of catastrophic losses due to host specific insect or disease. The noted increase can be attributed in part to the significant losses of oaks during the numerous Gypsy Moth infestations over the past two decades. Growing conditions on much of PGSF produce a high quality and thus economically valuable Red Maple timber, though the wildlife habitat values do not match those of the mixed oak types. In general, forest management practices will favor mast producing oaks over conversion to red maple type.

5.3.7 Hemlock

This forest type is a minor component with just over 254 acres, accounting for less than 1% of the forest cover. This type is predominately eastern hemlock and frequently mixed with varying amounts of hardwoods. This timber type is typically found along river/stream borders with northern aspects. The management goal for this timber type is maintain mature stands for stream protection, water quality, and thermal protection for many wildlife species. With their tendency to be found along riparian areas, many of these stands are considered High Conservation Value Forests, and their management will generally be directed toward protecting those HCVF values.

Significant threats to this cover type include the presence of Hemlock Wooly Adelgid, which has been found in stands along both Laurel Run and Lost Land Run drainages; and large deer populations associated with hemlock stands that also serve as ‘deer yarding areas’ in the harsh Garrett County winters which can result in considerable browse damage to hemlock regeneration. Adelgid control efforts continue to involve an IPM approach including use of predatory insects, limited pesticide applications, under planting and monitoring.

This type can be managed with uneven-aged management techniques such as single tree selection.

5.3.8 Hardwood/White Pine

These forest types, which total just over 63 acres, and less than 1% of the forest cover, will be managed toward mature stands of mixed hardwood and pine species. This will be done with commercial thinning, selection harvesting, shelterwood harvesting and small-opening harvests designed to encourage regeneration of desired species. Herbicides will be limited to ground applications to achieve specific goals in improving species balance or removing invasive species. Some prescribed burning applications may be used in these forest types to manage for a particular species, such as pitch pine. Natural regeneration will be used within harvest sites, possibly supplemented with some planting of native hardwoods and/or native conifers.

5.4 Cultural Heritage and Indigenous Peoples

A number of special areas on Green Ridge State Forest have been identified, that require special consideration when developing management prescriptions. Old home sites, research areas and small cemeteries are common throughout the forest. Cultural Heritage Areas may also include historical, cultural or spiritually significant sites for indigenous peoples. Once a site has been identified and located in the field, its location and description are loaded into the forest GIS database. Protection levels can then be assigned and incorporated into the future planning efforts of forest activities. Most Special Management Areas require some form of preservation or protection. Any proposed activity or management within the vicinity of these special areas will be identified and reviewed as part of the Annual Work Plans (AWP) process. Managers are expected to make diligent field inspections to identify additional sites that may currently be located within the other management layers and consider these areas as part of planning whatever work is planned.

Performance measures to judge the adequacy of those plans, and the subsequent management actions, should include:

a) Each identified special area is appropriately marked on the ground and documented in the data set.
b) Each plan is sufficient to protect the special values identified for each area.
c) Field examination and monitoring reveals that the plan is being implemented properly and that the special values are, in fact, protected or enhanced as the plan indicated.

The Department has a commitment to recognize and respect the rights of Indigenous Peoples. It is the mission of The Maryland Commission on Indian Affairs to “promote the awareness and understanding of historical and contemporary American Indian contributions in Maryland.” The role of the State Forest management in promoting this state mission is through the following practices:

a. understand and respect traditional forest-related knowledge;
b. identify and protect spiritually, historically, or culturally important sites;
c. address the use of non-timber forest products of value to American Indians on state forests;

and

d. respond to American Indians' inquiries and concerns received.

5.5 Forest Management Guidelines

The above eight forest types have been categorized into two different forest management classifications. These different management classifications take into account all ecologically significant areas on the forest. Acreages listed under the different classifications are only estimates that will change over time as field reviews add or remove areas from one management classification to another. The management classifications are 1) High Conservation Value Forest Areas, and 2) General Management Areas. Within the High Conservation Value Forest are a number of overlapping areas such as Ecologically Significant Areas (ESA), Riparian Buffer Areas, Wetlands of Special State Concern (WSSC),Old Growth and Old Growth Ecosystem Management Areas. All other land is considered General Management Area.

5.6 General Management Areas

General Management Areas are those sites not impacted by specific restrictions of HCVF or in the four special management areas as outlined in Section 5.6below. The primary management goal for theose areas will be for thoseat identified as High Conservation Value such as an ESA.

In the designated General Management Areas, the forest will be managed on approximately 100 year rotations. The goal is to grow large high quality hardwood trees. Regeneration harvests will occur at various rotation ages based on the specific forest type.
It is important to note that production of forest products in no way precludes the contribution from these lands to other forest functions such as recreation, habitat, and water quality. In the General Management Areas, the specific forest conditions will dictate the extent of management prescriptions. For example the existing ice damaged, immature timber may be regenerated at 80 years old to restore productivity or mature oaks my be retained until sufficient regeneration can be established to assure a future fully stocked stand. In the hardwood mixed pine types, management may be limited to selection or group selection harvesting and longer rotation ages to maintain the characteristic of a mixed age natural forest.

All forest types within the General Management Areas will be managed to produce a rapidly growing, vigorous and healthy forest while supporting local natural resource based industries and at the same time protecting water quality through adherence to Best Management Practices.

5.7 High Conservation Value Forest Areas

5.7.1 Ecologically Significant Areas (ESA)

Where portions of ESA management areas overlap Wetlands of Special State Concern (WSSC) and / or Riparian Forest Buffer areas, management prescriptions will focus on enhancing and protecting the designated ESA with specific management prescriptions. See Chapter 7 of the plan for the specific definition and prescription

for each ESA.

5.7.2 Wetlands of Special State Concern (WSSC)

These wetlands contain prime examples of unique habitats. No intensive management activities will take place within these areas.

5.7.3 Riparian Forest Buffers

The designated HCVF stream buffer areas have been identified as 50 foot stream buffers along mapped "blue line" streams as defined and mapped on US Geological Survey quadrangle maps. These forests will be managed to encourage a mixed hardwood community with a combination of diverse herbaceous, mid-story, and over story plants to serve a vital role in watershed protection. Hardwood species will be encouraged to ensure maximum functions for de-nitrification, canopy diversity, woody debris, and nutrient uptake. The buffers also provide for critical habitats and other functions that enhance water quality. These riparian buffers have been designated as High Conservation Value Forest (HCVF). See Chapter 6 Water Quality Areas: High Conservation Value Forest for specific guidelines on the functions of the various water quality and habitat zones that comprise the stream buffer. Management will focus on the goal of protecting water quality and quantity, as well as improve the habitat for the native fish, associated aquatic biota and critical riparian habitat conditions.

5.7.4 Old Growth Forest and OGEMA

The old growth forest on Potomac-Garrett State Forest will be protected as HCVF and no activities are planned. The area will be monitored for invasive species, which will be suppressed if found. The remnant old growth areas will be linked by Old Growth Ecosystem Management Areas (OGEMA) to manage towards old growth conditions.

Currently, old growth forests in Maryland are located in patches that are limited in size, connectivity, and forest vegetation type. To achieve the desired vision of enhancing old growth ecosystem functionality, the current "patch" arrangement of old growth needs to be developed into a larger, connected "network" of old growth forest across the landscape. On Potomac-Garrett State Forest there are 438 acres of Old Growth Forest found over seven different sites, along with two identified patches of potential or "nearly old growth forest".

"Nearly old-growth forests" are those forests which are approaching old-growth forest status. They exhibit many of the characteristics of an old-growth forest but the oldest trees are slightly less than half their maximum age, thus they are almost old growth.

For the purposes of old-growth forest conservation, DNR defines "nearly old-growth forest" as a minimum of 5 acres in size with preponderance of old trees. See Appendix H for details on the characteristics of nearly old growth forest.

The conservation of functional old-growth forest ecosystems is the goal. Simply protecting patches of old-growth forest does not result in a functional old-growth ecosystem. A functional

system provides a multitude of values and is the desired outcome of DNR for old-growth forests. While patches of old-growth forest contain essential elements of an old-growth system, DNR will manage old-growth ecosystems in units of approximately 1,000 acres or more whenever practical. Emphasis should be given to those old-growth forests that will most likely become functional old-growth ecosystems. Some old-growth stands will be too isolated to function as an ecosystem and will be protected at the stand level.

The following guidelines are intended to protect old-growth forests while conserving and enhancing the functionality of the forested ecosystem within which the old-growth occurs.

- Designated old-growth forest will be excluded from timber harvest, including salvage, or other physical alterations.
- Designated old-growth forest will be excluded from protection from natural disturbance factors, such as native insect infestations or wild fire, unless such disturbance is introduced by an unnatural cause (e.g., exotic forest pests or invasive species) or will seriously jeopardize the continued existence of the old-growth ecosystem or significant resources adjacent to the old-growth forest.
- Control of the white-tailed deer population will be encouraged to maintain herd size at a level that does not adversely affect regeneration of trees in the understory.
- A no-cut buffer will be established to a width of at least 300 ft. from the edge of the designated old growth. This buffer may be expanded based on specific site conditions or threats. The buffer will be excluded from timber harvest or other physical alterations. Any non-forested conditions within the buffer should be reforested, whenever feasible. Salvage harvesting should not occur within this buffer.
- Old Growth Ecosystem Management Areas will be established that includes the old-growth forest(s) and its primary buffer(s). This management zone will be approximately 1,000 acres in size or greater, whenever feasible. This management zone should incorporate as many designated old-growth and nearly old-growth sites as possible. Its shape should minimize edge to area ratio and be as contiguous as possible. Silvicultural treatments within this zone should be techniques that have as their primary objective the fostering of old-growth conditions, and would include practices such as uneven-aged management and limited even-aged management, extended rotations, techniques that more closely mimic the natural disturbances found in old-growth forests, structural complexity enhancement practices, or techniques that result in retention of at least 70% of the canopy trees. Standing snags and downed coarse woody debris will be retained. Any non-forested conditions within the secondary zone should be reforested, whenever feasible. Salvage harvesting is allowable with the retention of at least 33% of dead or dying snags (not damaged live trees) and coarse woody debris. At all times, the majority of the management zone shall be in the sawtimber size class, preferably a minimum of 75%. Areas within the management zone not designated old-growth or nearly old growth at the time of initial assessment/inventory will not necessarily be managed as if they are designated old-growth.
- Nearly old-growth forests within the OGEMA should be managed as if they were designated old growth. Timber harvest or other alterations will be excluded. Protection

of natural disturbance factors, such as insect infestations or wild fire, will be excluded unless such disturbance is introduced by an unnatural cause or seriously jeopardize the continued existence of the old-growth ecosystem or significant resources adjacent to the old-growth forest. Salvage harvesting should not occur within this forest.

- Passive recreational and educational use of old-growth forests and their buffers will be allowed, including hiking and hunting. No trails or roads will be built to access the old growth. Existing trails or roads will be managed to minimize impacts to the old-growth ecosystem or should be retired, whenever feasible. No campfires shall be allowed.
- An aggressive invasive species monitoring, prevention, and control program should be developed and implemented.

On Potomac-Garrett State Forest one OGEMA (Old Growth Ecosystem Management Area) has been identified. This management area covers a total of of 2,011 acres of the Potomac State Forest. The OGEMA connects a number of smaller Old Growth Areas. See I.1.1 on Page 136.

Further field studies by the Forest Service and Wildlife & Heritage Service will be carried out to determine if areas of "nearly old growth forest" exist within the forest. As nearly old growth areas are identified they will be inventoried, mapped and reviewed by DNR OG Committee for appropriate level of protection. If determined as 'Nearly OG, the area will be buffered per the requirements of the Departments Old Growth Policy and "*Management Guidelines for the Conservation and Protection of Old-Growth Forests.*" Once identified and mapped, nearly old growth forest will become part of the High Conservation Value Forest (HCVF) layer.

5.7.5 Other Special Management Areas

A number of special areas on Potomac-Garrett State Forest have been identified that require special consideration when developing management prescriptions. Old home sites, research areas and small cemeteries are common throughout the forest. Special Management Areas may also include historical, cultural or spiritually significant sites for indigenous peoples. Once a site has been identified and located in the field, its location and description are loaded into the forest GIS database. Protection levels can then be assigned and incorporated into the future planning efforts of forest activities. Most Special Management Areas require some form of preservation/ protection. Any proposed activity or management within the vicinity of these special areas will be identified and reviewed as part of the Annual Work Plans (AWP) process. Managers are expected to make diligent field inspections for these areas as part of planning whatever work is planned.

Performance measures to judge the adequacy of those plans, and the subsequent management actions, should include:

d) Each identified special area is appropriately marked on the ground and documented in the data set.
e) Each plan is sufficient to protect the special values identified for each area.
f) Field examination and monitoring reveals that the plan is being implemented properly and that the special values are, in fact, protected or enhanced as the plan indicated.

5.8 Forest Management Activities

58.1 Regeneration & Site Preparation

Either natural regeneration or artificial regeneration will be used to re-establish stands. In all cases after a harvest practice, natural regeneration will be the preferred method to re-establish the forest. Determination on method used will be based on site surveys of regeneration within one year of the harvest. Both methods of regeneration will seek to reduce soil disturbance associated with site preparation practices. This will require careful harvest planning to achieve natural regeneration wherever possible, as well as testing new techniques and equipment that promise to achieve desired regeneration results with acceptable costs and reduced soil disturbance.

The Land Manager is responsible for developing a regeneration strategy outlining what practices will be used with each timber harvest plan, based on the specific conditions involved. Pre and post harvest data, as well as establishment surveys and BMP compliance (Best Management Practices) data will be collected and evaluated to measure the success of each regeneration project.

There will be situations where artificial regeneration using some form of site preparation would improve seedling growth and survival. Methods used will be limited to prescribed fire, herbicides and or other less intensive mechanical prescriptions followed by a combination of natural regeneration and hand planting of seedlings.

5.8.2 Vegetation Control

Outside of ESA, Core FID, and other HCVF areas, control of competing hardwood and herbaceous vegetation may be used to enhance survival and growth of desired regeneration. This control may include prescribed fire, mechanical and/or chemical treatments. Vegetation control can be done with chemical application with no adverse environmental impact if label directions and best management practices are followed. However, the Department will work to minimize the use of chemical control by exploring the use of lower application rates and prescribed burns.

5.8.3 Pre-Ccommercial Thinning

Pre-commercial thinning in 6-30 year old naturally regenerated stands is a form of density control that is useful to concentrate growth on larger stems and to maintain an even distribution of trees across the site and is a practice usually accomplished by hand crews. As management activity shifts away from intensive site preparation and more towards natural regeneration, pre-commercial thinning will play a more important role.

5.8.4 Commercial Thinning

Commercial thinning is performed several times during the life of the stand, to extract value at an earlier date while concentrating growth on more desirable, larger diameter stems. Typically, a first thinning between the ages of 30-45 years will remove 30-40% of the stocking. A first thinning will produce pulpwood-sized material. A second thinning, which typically occurs between the ages of 45-80 years, will again remove smaller diameter trees but also produce merchantable sawtimber. Based on management prescriptions for a particular site, any subsequent thinning will produce higher quality merchantable sawtimber.

5.8.5 Forest Buffer Thinning

Riparian and wetland forest buffers (in HCVF areas), as well as any other buffers such as visual buffers, are identified and established at the time thinning projects are planned. Field marking of buffers is done to establish boundaries in the field. GPS mapping provides the means to update the stand boundaries in the GIS data system. Thinning activities within buffer areas are designed to enhance buffer quality and function under the guidelines contained in Chapter 6 of this plan. They may vary from allowing no thinning where desirable vegetative conditions are well established, to a heavier thinning where dense pine stands need to be opened up to allow hardwood development. Where mechanized thinning is done within the buffer areas, special care will be taken to prevent rutting or other soil damage that could lead to reduction of buffer capacity or quality. Individual buffer prescriptions are proposed by the Land Manager and reviewed by the Interdisciplinary Team as part of the Annual Work Plan Review.

5.8.6 Regeneration Harvest

Regeneration methods will vary depending on species composition and site objectives. As most of the forest is comprised of mixed oak species, even-age management methods will be predominantly utilized. Where practical, uneven-aged methods such as selection harvests will be utilized, especially when addressing northern hardwoods stands.

The goal will be to maintain a maximum regeneration harvest area of 40 acres as per *FSC Principle #10: Plantations,* and will include Variable retention techniques that fit "Green Tree" retention requirements in keeping with Forest Stewardship Council (FSC) standards. Guidelines for clearcut harvests larger than 40 acres will be based on forest health, economic, and ecological necessity. Cutting boundaries should follow natural boundaries on land to encourage irregular shapes that help diversify wildlife habitats and improve aesthetic appearance. Clearcut harvests will not be done until adjacent stands have reached the age of five years or an average tree height of ten feet, in keeping with the SFI and FSC standards.

Forest harvests by the shelter wood method will be utilized in some areas based on ecological needs of the site with the intention of developing a new forest stand through natural regeneration.

5.8.7 Green Tree Retention

Over many years, forest managers used a locally developed practice—Habitat Retention Areas (HRA)—to define forested areas and or single trees that were set aside inside a harvest area for long-term protection. The phrasing *Habitat Retention Area* has been substituted in the Potomac-Garrett State Forest Sustainable Forest Management Plan with the nationally recognized terminology of *Green Tree Retention*.

Green Tree retention will vary greatly with each harvest site and depend heavily on factors such as riparian areas, soil types, ecologically significant areas and Legacy Trees. In designing final harvest areas on Potomac-Garrett State Forest, it is DNR Forest Service policy to retain an appropriate amount of green tree retention within the harvest area. The stated goal is to retain an area of 5 percent or more of the harvested area on all regeneration harvests of 20 acres or greater. This retention area can be in addition to or be contained in riparian forest buffers and buffers around ecologically significant species.

For example, portions of forest stands within a regeneration harvest site will be set aside as

retention areas if soil types are such that logging the area would cause considerable site damage. The retention areas will be flagged prior to logging and likely retained through the next stand rotation. Other Green Tree retention would occur if a *Legacy Tree* or a group of *Legacy Trees* are identified within the harvest site. *(Legacy trees are old trees that have been spared during past harvest or have survived stand-replacing natural disturbances.)* A legacy tree or group of legacy trees would be retained for their habitat values. These trees would likely be buffered by other trees to afford them protection during the harvest and retained through the next stand rotation.

Green Tree Retention will be planned into larger regeneration harvest areas by laying out irregular harvest boundaries allowing for peninsulas\islands of un-harvested trees. These undisturbed forest sites can function as habitat corridors, or refugia, enabling species that are sensitive to disturbance an area to persist in until the surrounding landscape is able to regenerate.

5.8.8 Prescribed Burning

The local forests were historically shaped by a regime of frequent, low-intensity wildfires, done primarily by Native Americans who used fire as their primary management tool to gain forest products such as game and edible plants. Prescribed fire can re-introduce ecological processes such as seed release and nutrient cycling that may not be possible in its absence, and can have beneficial effects on wildlife habitat through the re-distribution of nutrients and vegetation. However, reintroducing fire into the ecosystems on PGSF will require careful planning. Land Managers will need to designate areas where significant re-introductions of prescribed fire can be tested and results measured. Implementing these projects can result in training for fire management staff including the use of specialized equipment. All prescribed burning applications will be implemented using smoke management practices. Prescribed burns will not take place if smoke conditions impact sensitive areas such as roads, airports, hospitals, homes, or schools. A prescribed fire should be kept at least 1000 feet from any occupied building, unless otherwise prescribed as necessary for reducing fuel loads. Special areas that might be destroyed or damaged, such as cemeteries, will be protected from burning activities. Fire line construction will follow State BMP's.

5.9 Forest Harvesting Equipment

When planning a forest harvest, the forest manager should consider the soils, weather, seasonal restrictions, necessary harvesting equipment and other factors that may influence successfully harvesting the site.

In-woods equipment used on forest harvest operations may include: whole tree chippers, processors, feller-bunchers, grapple skidders, cable skidders, cut-off saws and forwarders.

Normally, bidding on forest harvest contracts are not restricted or limited by the equipment available to bidders. This is to maintain competitive fairness to all sized operations. However, forest harvest operations are closely monitored by the state forest staff to ensure compliance with the contract and use of Best Management Practices.

If necessary, the state forest manager can restrict the type of machinery required or allowed on the harvest site. The state forest manager has the authority to temporarily close a forest harvest operation if the conditions become too wet to prevent excessive rutting and damaging of forest soils. Seasonal restrictions may apply during late winter and early spring as the frozen soils begin to thaw. Certain sensitive areas may require specialized equipment such as dual-wheeled skidders, high floatation tires or other specialized equipment.

5.10 Chemical Use

No products on the FSC list of Highly Hazardous Pesticides will be used (see FSC-POL-30-001 EN FSC Pesticides policy 2005 or most recent equivalent) unless a derogation has been successfully awarded. The Pesticide Use Tracking Form will be used to document the identification of an area to be treated, the procedures that will be followed and who will be doing the application, including their qualifications.

The *FSC Guide: To integrated pest, disease and weed management in FSC certified forests and plantations* (FSC Technical Series, No. 2009-001) to be reviewed by the state forest manager and the Core Decision Key (Figure 1, page 16), the Pesticide Decision Key (Figure 2, page 17) and Decision Recording Sheet (Figure 3, page 18) attached to each pesticide use report with the Decision Recording Sheet having been completed by the state forest staff or contractor.

All pesticides used to control pests and competing vegetation are used only when and where non-chemical management practices are: a) not available; b) prohibitively expensive, taking into account overall environmental and social costs, risks and benefits; c) the only effective means for controlling invasive and exotic species; or d) result in less environmental damage than non-chemical alternatives. If chemicals are used, the forest manager will use the least environmentally damaging formulation and application method practical.

As opportunities are available, the state forest will employ and encourage the creation and maintenance of habitat that discourages pest outbreak; that encourages natural predators; will work with cooperating agencies to evaluation pest populations and control options; the diversification of species composition and structure; use of low impact mechanical methods; use of prescribed fire; and the use of longer rotations.

Chemicals and application methods are selected to minimize risk to non-target species and sites under the guidance of cooperating agencies such as Maryland Department of Agriculture and DNR Natural Heritage Program.

Whenever chemicals are used, the Pesticide Use Tracking Form will be used to prepare a written prescription to describe the site-specific hazards and environmental risks, and the precautions that workers will employ to avoid or minimize those hazards and risks, and includes a map of the treatment area.

Chemicals are applied only by appropriately trained and licensed workers according to State requirements.

When chemicals are used, the effects are monitored and the results are used to determine the measure of success and if treatment modifications can be employed, such as reduced application rates. Records are kept according to State requirements.

5.9 Practice Scheduling – Annual Work Plans (AWP)

Field surveys, GIS-based forest and habitat maps and associated databases and forest models such as Remsoft Spatial Woodstock will be the working tools used for the long-range management of the forest and in scheduling harvests and thinning that are listed in the annual work plans (See Chapter 10). Annual Work Plans (AWP) will list all management & restoration activities slated to occur on the Forest during each fiscal year. Annual Work Plans are posted on the DNR website for each state forest.

5.10 Non-Silvicultural Forest Management Activities

A variety of activities beyond silvicultural treatments are required to maintain the health and productive capacity of the forest. External property boundary lines will be marked and maintained either by painting and/or posting using approved procedures. This is required to protect the property from inadvertent trespass and to maintain evidence of ownership and management. Existing roads will be maintained where necessary to provide access to tracts for fire management, management activities, and appropriate recreation. Additional roads may need to be constructed in support of silvicultural operations, but these will be limited and, often, closed after the operation is finished. In many areas of the Forest, ditches will need to be maintained to insure the successful implementation of both forestry and wildlife management activities. The wildlife management activities will involve both the protection of existing habitat and the creation of new habitat for a variety of endangered species (See Chapter 7 & 8).

5.10.1 Roads

Roads are important for management and public access. Existing roads and trails will be used and maintained in a manner that minimizes erosion and piled debris along road edges. They should also be maintained to blend with the natural topography and landscape and avoid blockage of drainage systems. While additional permanent roads are not needed on the Potomac-Garrett State Forest, any road construction (even temporary access trails) will follow State BMP guidelines. For logging roads on any harvest site, logging mats should be used to reduce rutting when wet soil conditions warrant and must be removed at the completion of the harvest. Care will be taken in constructing logging entrances along public roads and in using public roads during harvesting operations. Damage to roadbeds, shoulders, ditches, culverts, and buffer strips should be avoided and promptly repaired. Roads within Riparian Forest Buffers or Wildlife Areas should be closed and re-seeded where practical. Other roads should be reviewed from time to time, and those not needed for forest or game management purposes or access should be considered for closure.

5.10.2 Forest Health

One of the key aspects for maintaining forest health is to keep the forest actively growing and not let the forest stagnate. This can be accomplished by implementing a thinning program that releases selected trees for rapid and vigorous growth. This will improve forest health through reducing plant stress and competition for moisture, light and nutrients. By maintaining actively growing trees, they are less likely to be impacted by forest insect infestations, such as the Gypsy Moth and Hemlock Wooley Adelgid. By reducing stand density through thinning and opening up the forest, wildfire intensity will also be reduced and resulting damage to trees will be lessened.

5.11 Financial Returns

The long-term goals for the forest should provide sustainable economic performance as well as contribute to water quality protection and wildlife habitat enhancement. However, if future policy changes are made to the levels of environmental protection and additional acreage is moved from "General Forest Management" to other management prescriptions, then significant impacts on financial returns could result.

Future financial projections will depend on the specific parcels, their stand condition, and the markets. Planned harvest acreages and volumes are determined through forest modeling, with express consideration for regeneration successes. Deviations larger than 10 percent from these targets should be explained in the Annual Work Plan. This should be accompanied by new model outputs indicating that the target is consistent with the goal of long-term sustainability. Understanding that in managing an unregulated hardwood forest, periodic yields may be averaged over periods of 5-10 years, varying according to stand conditions and regeneration opportunity associated with seedling development.

5.12 Forest Modeling

5.12.1 Modeling Long-term Sustainability

Achieving the goal of a sustainable and economically self-sufficient forest creates the need for forward projections that illustrate the probable effect of management activities on key forest qualities. This requires the identification of *indicators* that can be tracked over time to determine trends and relationships. Tracking requires that each indicator can be measured, monitored, or modeled in a consistent and feasible manner.

5.12.2 The Indicators

At this stage, the forest managers have identified the following indicators (others may be added as the ability to track them becomes available):.

- The amount of hardwood timber available for harvest;
- The amount of hardwood forest ready for final harvest;
- The age and species distribution of the forest trees;
- The amount of forest with sufficient established regeneration for successful regeneration

of the stand;

- The protection of critical habitat areas such as those adjoining streams, swamps or other unique areas;
- The maintenance of a generally stable flow of economic opportunities (jobs, timber sales, etc.) from the forest; and,
- The generation & maintenance of stable economic flows back to the state and counties.

5.12.3 The Forest Planning Model

The Maryland DNR Forest Service chose the Remsoft Spatial Woodstock model for development of long-term projections on the state forests. Using this software, a functional model was created for each state forest. Information on the model is available at www.remsoft.com

Spatial Woodstock is integrated with the Potomac-Garrett State Forest Geographic Information System so that a single master database can be maintained to serve ongoing forest planning, management, and information needs. The model runs 100-year projections within the estimated 200 to 300-year life span of the main tree species involved.

Modeling Potomac-Garrett State Forest requires that the forest be divided into discrete areas (called stands) that have similar soils, vegetation, age, and other characteristics. Special Management Areas (Chapter 5.6.5) must also be identified.

A detailed Forest Model utilizing the current forest database from Potomac-Garrett State Forest was run using a 100 year time frame. The results from this model run which contain a number of graphs based on the indicators listed in this section can be found in Appendix I. As stand level data collection and forest inventory work is completed, the model will be run to provide current projections.

The Maryland DNR Forest Service and Vision Forestry (the contract land manager for the Chesapeake Forest) studied available forest modeling systems and ultimately chose the Remsoft Spatial Woodstock model for development of long-term projections on the Chesapeake Forest. Therefore Remsoft should be adequate for modeling on Potomac-Garrett State Forest as well. Information on the model is available at www.remsoft.com.

Spatial Woodstock is integrated with the Chesapeake Forest Geographic Information System so that a single master database can be maintained to serve ongoing forest planning, management, and information needs. A similar configuration will be used on Potomac-Garrett State Forest. The model runs 50-year projections within the estimated 250-year life span of the main tree species involved. Modeling the State Forest requires that the forest be divided into discrete areas (called stands) that have similar soils, vegetation, age, and other characteristics. In future iterations of the plan we will be using the Oak Silvah simulator, data base and sampling protocol.

5.13 Inventory and Monitoring

A high quality inventory and monitoring program that is linked to a GIS-based data management

system is the key to a successful adaptive management program. It is, however, one of the often-neglected or under-funded parts of a land management program. This plan's successful implementation rests on the capacity of the Department to find the resources needed to support the necessary monitoring program across all the areas listed below (*See Chapter 10 – Potomac-Garrett State Forest Monitoring Plan*). An inventory and monitoring program is also one of the important aspects of the Forest Certification program (*See Forest Certification below*).

The Land Manager is responsible for developing and maintaining an interactive data collection and management system to facilitate field management as well as document activities, results, yields, etc., to provide data input to the planning models. A statistically valid and multi-tiered sampling procedure has been developed to provide data on growth rates, yield response to management practices such as thinnings, and associated environmental impacts such as water quality or habitat changes.

Monitoring for forest sustainability will require attention to the parameters listed in Chapter 1. *That will require monitoring of:*

- Forest health- as it pertains to insect and disease outbreaks.
- Soil quality – through regular soil testing, particularly on plantations where more intensive forest management is practiced.
- Biodiversity– information is needed that ties species or suites of species to particular areas, soil types, or vegetative structural conditions so that trends can be predicted under various management options and population or species increases or declines can be detected.
- Water quality, particularly as it relates to nutrient and sediment loads that can be attributed to specific forest management practices.
- Ecologically Significant Areas – an updated inventory of special areas, by type, location, and condition should be maintained to assure that none are being adversely affected by forest management activities.
- Economic performance – Data for long-term trend analysis, as well as quarterly reporting, should be developed and maintained.
- Desired response to management, i.e. condition of regeneration, insect pest control monitoring.

5.13.1 Water Quality Monitoring

Due to the special attention on water quality in the Chesapeake Bay, and the need to document more clearly how commercial forest management affects water quality, Potomac-Garrett State Forest can serve as a living laboratory for those interested in this particular field of study. Independent third-party partners such as Universities and non-profit organizations like the Chesapeake Bay Foundation are welcome to pursue a monitoring scheme, conduct research, and utilize the management actions on the land as an ongoing scientific experiment. With HWA threatening streamside Hemlock stands, an opportunity exists for baseline data collecting and a grass roots monitoring project.

Presently, the Maryland Biological Stream Survey (MBSS) includes the 3 major drainages found within the Potomac-Garrett State Forest in its state wide random sampling of streams to assess ecological conditions across the state. See section 3.5 for watershed information.

5.13.2 Timber Harvests

For Potomac-Garrett State Forest, the land manager will ensure that for each harvest operation a pre-harvest plan is developed and a post harvest 'contract compliance' and BMP inspection report is prepared and maintained on file. All harvests are monitored for their duration to assure contract compliance. An important aspect to protect water quality on timber harvest sites is to insure a certified Master Logger carries out the harvest operation.

5.13.3 Herbicide Applications

Herbicide applications are rarely used on Potomac-Garrett State Forest. However, when management conditions warrant their use, the land manager will maintain records of application rates and vegetative community response to track the effectiveness of herbicide applications. Examples of expected and planned herbicide uses include control of non-native exotic species, control of undesirable competing vegetation during forest regeneration, roadside and right-of way vegetation control, wildlife food plot management, etc. Herbicide application methods on PGSF will typically be low volume ground based spraying and/or direct cut surface treatments. Herbicides will be applied per label directions with all applications being done under the supervision of the forest manager, a certified pesticide applicator.

5.14 Forest Certification

A primary objective of Potomac-Garrett State Forest and all Maryland State Forests is to become a national model of certified sustainable forestry. As such, PGSF is seeking dual certification under both the Sustainable Forestry Initiative (SFI) standard and the Forest Stewardship Council (FSC) standard. Compliance with certification is monitored through annual audits. See Appendix B & C for details on the two certification programs.

5.14.1 Certification Guidelines Premise

It is the Department's belief that an independent review and certification of all state forest management plans and practices has the potential to improve the management of the forest and build public confidence in the quality of that management.

The initial thrust of the combined SFI/SFC certification process was begun on the Chesapeake Forest Lands on Maryland's lower eastern shore which received dual certification in June 2004. The Pocomoke State Forest received this designation in the spring of 2009; and the Potomac-Garrett State Forest, along with both Savage River and Green Ridge State Forests are seeking this same certification in the spring of 2011. As part of the process of maintaining dual certification, follow-up annual audits/inspections will continue, following the initial granting of certification. An annual Senior Management Review will also be conducted, as per SFI requirements (see Appendix F – Policy for SFI Management Review and Continual Improvement). The Maryland DNR Forest Service remains committed to resolve any audit

issues that hinder it in obtaining and or maintaining SFI/SFC certification.

5.15 Forest Stewardship Council (FSC) – Guidelines & Principles

5.15.1 Invasive Species Control

A detailed invasive species control plan will be developed in conjunction with the Wildlife and Heritage Service. In the meantime, stands that are being proposed for silvicultural treatments will be examined for invasive species and control action will be taken prior to any silvicultural treatment. Priority will be given to invasives that actively inhibit ecosystem function and/or silvical response. Site locations will be mapped and incorporated into the GIS database. Treatment recommendations will be researched, assigned, and monitored for effectiveness.

Invasive species that occupy a large area may need to be addressed through the ID Team field review process. However, specific techniques and control measures will be timed to the biology of the individual invasive plant species in order to maximize control efficacy and minimize spread and propagule production.

A detailed invasive species control plan will be developed in conjunction with the Wildlife and Heritage Service. In the meantime invasive species will be controlled aggressively and in a timely fashion when discovered in the field. Site locations will be mapped and incorporated into the GIS database. An Invasive Species Tracking Form (See Policy Handbook) will be filled out by the person discovering the invasion and reviewed by the Forest Manager. Treatment recommendations will be assigned and monitored for effectiveness.

Invasive species that occupy a large area may need to be addressed through the ID Team field review process. However, specific techniques and control measures will be timed to the biology of the individual invasive plant species in order to maximize control efficacy and minimize spread and propagule production.

5.15.2 High Conservation Value Forest (HCVF) Definition Guidelines

High Conservation Value Forests as identified within FSC Principle 9 will constitute the definition for HCVF on Savage River State Forest. They are:

- (HCV1) Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endangered species on SRSF are in the ESAs).
- (HCV2) Forest areas containing globally, regionally, or nationally significant large landscape level forests (e.g. Wildlands & OGEMAs)
- (HCV3) Forest areas that are in or contain rare, threatened or endangered ecosystems. (e.g. Old Growth Forest, Natural Heritage Areas, & Wetlands of Special State Concern)
- (HCV4) Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, Riparian Forest Buffers).

Refer to FSC Principle #9 (HCVF) in Appendix B.

Three of the six types of High Conservation Value Forests as identified within FSC Principle 9 will constitute the definition for HCVF on Potomac-Garrett State Forest. They are:

- (HCV1) Forest areas containing globally, nationally, or regionally significant concentrations of biodiversity values (e.g. endangered species on PGSF are ESA Zone 1&2).

- (HCV2) Forest areas containing globally, regionally, or nationally significant large landscape level forests)

- (HCV3) Forest areas that are in or contain rare, threatened or endangered ecosystems. (Inland sand dunes, old growth forest, (Natural Heritage Areas), & Wetlands of Special State Concern) OGEMA

- (HCV4) Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, Riparian Forest Buffers, forested areas within a 50 foot stream buffer).

Refer to FSC Principle #9 (HCVF) in Appendix B.

Potomac-Garrett State Forest Annual Work Plans (AWP) will list all management activities slated to occur within designated High Conservation Value Forest (HCVF). All HCVF areas proposed for management work will have been reviewed and approved by the Department's Inter-disciplinary Team and the PGSF citizen advisory committee.

5.15.3 Representative SamplesExamples of Existing Ecosystems (RSAs)

Representative Sample Areas (RSAs) are established on the forest for the purpose of establishing and/or maintaining an ecological reference condition; or to create or maintain an under-represented ecological condition; or to serve as a set of protected areas or refugia for species, communities and community types not captured in the High Conservation Value Forests. RSAs have been designated on Savage River State Forest and are protected in their natural state. Most of the SRSF RSAs have been included in mapping as they are designated as HCVF. However, additional RSAs will be designated and mapped to address above criterion not already established within the High Conservation Value Forests.

Most RSAs will be fixed in location. However, others may move across the landscape as natural forest succession condition changes. Furthermore, some RSAs may be manipulated to maintain the desired condition.

As stated in Chapter 1, the primary goal on the Potomac-Garrett State Forest is: *to demonstrate that an environmentally sound, sustainably managed forest can contribute to local and regional economies while at the same time protecting significant or unique natural communities and elements of biological diversity.*

This is to be achieved by objectives that include, but are not limited to, providing for clean water, maintaining soil stabilization, supporting populations of native plants and animals, protecting areas with critical functions or habitats, sustaining compatible economic uses, and providing for scenic, recreational and educational values. Accomplishing these objectives will be done through implementation of an Annual Work Plan. Copies of Annual Work Plans for Potomac-Garrett State Forest can be found on the DNR website at: http://dnr.maryland.gov/forests/Pages/workplans.aspx

Chapter 6 - Water Quality Areas: Riparian Forest Buffers and Wetlands

6.1 Introduction

Water quality areas are dominated by land-water relationships. They include streamside forests, stream banks, flood plains, wetlands, and other areas that are the contact points between land and water. (See Map I.4.1 and I.4.2 HCVF- Riparian Forest Buffers and Wetlands of Special State Concern for Potomac and Garrett State Forests.) Their management is critical to not only preventing water pollution, but cleaning up water through the filtering of sediments, uptake of nutrients, and stabilization of water temperature and flow conditions. In addition, these areas are some of the most biologically rich portions of the landscape, functioning as habitat for the widest variety of plants and animals, both aquatic and terrestrial. It is becoming generally recognized that riparian areas and wetlands are key to many biodiversity issues. It's for these reasons that these areas have been designated as High Conservation Value Forest (HCVF) since they provide connectivity from Potomac-Garrett State Forest through other public and private forestlands to the Chesapeake and the Youghiogheny River. The identification and maintenance of High Conservation Value Forest fall under Principle 9 of the Forest Stewardship Council (FSC) guidelines. See appendix B & C for information on this certification program.

There are several hundred acres of riparian forests that extend through all of the existing management areas identified in Chapter 5. The riparian acreage is a general estimate, and will need to be adjusted as field examination provides additional data and as forested non-operational wetlands are added into the riparian forest buffer totals. Field personnel will identify and establish riparian forest buffer, mark boundaries, and provide GPS coordinates for updating the GIS data system.

By and large, the management of these areas relies primarily on natural processes, such as natural establishment and succession. Management activities within these areas will be designed to maintain or improve the ecological functioning of the forest, wetland, and stream systems. Any timber or fiber production from these lands will be ancillary to other management needs.

6.2 Riparian Forest Buffers: High Conservation Value Forest (HCVF)

The primary goal of HCVF riparian forest buffers is to maintain and improve the quality of water flowing into the streams and rivers and eventually to the Chesapeake Bay and the Youghiogheny River from Potomac-Garrett State Forest. Riparian forests also provide critical habitat that is an essential element of the associated aquatic ecosystem and the diversity of wildlife that utilizes riparian areas. Therefore, the management goals for riparian forest buffers are:

1) To remove sediments, nutrients, and other potential pollutants from surface and groundwater flows;
2) To maintain shade cover for streams and aquatic systems to regulate temperature and dissolved oxygen;
3) To provide a source of detritus and woody debris for aquatic systems;
4) To provide riparian habitat and travel corridors for wildlife; and,
5) To maintain or establish native plant communities.
6) To manage these areas to meet the needs of species dependantdependent upon the special habitat conditions that may be developed within riparian areas that may not be fully developed elsewhere. Eg. To manage the scrub/shrub riparian / wetland community habitat found in Bull Glade ESA to meet the habitat needs of the various species dependant upon the early success ional habitats provided there, or development of woodcock habitat.
7) To manage these areas with extended rotations allowing these areas to develop old growth like conditions

In order to achieve these goals, the following management objectives will be used as criteria to more specifically evaluate and design potential management activities:

1) Minimize disturbance to soil structure or duff layer;
2) Avoid exposed mineral soils;
3) Prevent all rills, gullies, or ruts that may channel water flow and short circuit surface flow paths;
4) Protect mixed hardwood or mixed hardwood/conifer forest community;
5) Maintain mature forest conditions adjacent to stream; and,
6) Encourage the development of a diverse uneven-age forest community in terms of species, canopy levels, and diameter class.

6.2.1 Stand Composition

Riparian forests should be managed to encourage a mixed hardwood or mixed hardwood/conifer community with a combination of diverse herbaceous, mid-story, and over story plants. Hardwood species should be encouraged to ensure maximum functions for denitrification, canopy diversity, woody debris, and nutrient uptake. Riparian forests should favor species that have been shown to effectively take up nutrients including: red oak, white oak, red maple, quaking aspen, ash, basswood, yellow poplar, and black gum. Diversity in species and forest structure should be encouraged as a strategy to maintain forest function and resilience in the event of a major disturbance or new pest or pathogen; many pests or pathogens are limited to certain types of species or tree condition, and disturbances such as windstorms or fire can affect different species to varying extents.

6.2.2 Vegetation Management

Any vegetation management must be designed to improve the ecological functioning of the riparian forest and stream system according to management goals and objectives. If a silvicultural treatment or management prescription is conducted, it should be limited to addressing management concerns to improve or ensure the health of the riparian forest or adjacent stands. Such concerns include insects, disease, fire, wind throw, ice damage, threatened

and endangered species, critical habitat, native plant communities, invasive/exotic species, hazard fuel reduction and prescribed burning. There will be no planned clear cuts conducted within a riparian forest area. Any management activities should use the least impacting equipment; following best management practices (BMPs) and comply with all state and local regulations.

6.2.3 Roads

Roads should avoid riparian forests to the maximum extent possible and any existing roads within riparian forests should be evaluated for closure. If road construction is necessary in a riparian forest, all related BMP's for road construction should be followed including:

1) Perpendicular alignment to riparian forest to minimize impact;
2) Utilizing temporary stream crossings when possible;
3) Adequate sizing of crossing to avoid affecting flow;
4) Discarding slash and debris from right-of-way clearing outside of stream area.

6.2.4 Herbicide Use

Aerial application of herbicides is not permitted within riparian forests. If aerial spraying is planned for stands adjacent to a riparian forest, the riparian forest must be clearly designated and GPS-established to protect the riparian forest from application or drift. Chemical applications within riparian forests will only be permitted for purposes of improving the ecological functioning of the riparian forest for its management goals and will be limited to spot applications and direct application to the target plant.

6.3 Non-Operational Wetlands

Ecologically, wetlands are defined as areas that are saturated or inundated enough to influence soil characteristics and to support a wetland plant community. Under this definition, many small inclusions occur throughout PGSF as "wetlands" due to irregularities in topo and underlying soil layers that provide for perched water table. Therefore, the general forest management guidelines address some of the special management consideration required for forested wetlands.

However, some wetland areas are not suitable for timber production and therefore require their own management guidelines. These non- operational wetlands include all areas designated in the stand classification system as non-operable areas and described as bogs or swamps, but may not be included in riparian forest buffers. Non-operational wetland management guidelines will also apply to wetland buffers, which extend 100 feet from the edge of freshwater non-operational wetlands to provide upland habitat for amphibians. This buffer will need to be established in the field because some stands designated as wetlands include an adequate buffer but others do not. Many of these wetlands are also designated as HCVF.

6.3.1 The Management Goals of Wetland Areas Will Be as Follows

1) Provide high quality wetland systems including associated upland ecotones;
2) Maintain or enhance any unique biological communities that may be present;

3) Maintain or restore hydrologic and water quality functions of wetlands, including flood storage, groundwater recharge, denitrification, nutrient uptake, and sedimentation;
4) Maintain or establish a native wetland plant community.

In order to achieve these goals, the following management objectives will be used as criteria to more specifically evaluate and design potential management activities:

1) Minimize disturbance to soil structure or removal of duff layer;
2) Encourage development or maintenance of a native wetland plant community;
3) Prevent ditching (to avoid altering the hydrology of the wetland).

6.3.2 Vegetation Management

Within non-operational wetland areas, management activities should encourage the establishment of native wetland plant communities. Within the wetland buffer, management activities should encourage a healthy forest with a diversity of species, canopy levels, and diameter classes. Any vegetation management must be designed to improve the ecological functioning of the wetland system according to management goals and objectives. There should be no planned clear cuts conducted within a wetland area unless needed to re-establish or favor native wetland species. If a silvicultural treatment or management prescription is conducted, it should be limited to addressing management concerns that threaten the health of the wetland, the wetland buffer, or adjacent stands. Such concerns include insects, disease, fire, wind throw, ice damage, threatened and endangered species, critical habitat, native plant communities, invasive/ exotic species, hazard fuel reduction and prescribed burning. Any management activities should use the least impacting equipment, follow best management practices (BMP's) and comply with all state and local regulations.

6.3.3 Stand Composition

Within wetland areas and wetland buffers, emphasis will be placed on maintaining and encouraging a diverse community of native wetland plants. Particular emphasis will be placed on maintaining any unique biological communities present at a site. In forested wetland areas and buffers, emphasis will be on maintaining or encouraging native species to maximize denitrification and to provide leaf litter and woody debris as food and cover for aquatic wildlife.

6.3.4 Herbicide Use

Aerial application of herbicides will not be done within wetlands. If aerial spraying is planned for stands adjacent to a designated wetland, the wetland must be clearly designated and GPS-established to protect the wetlandriparian forest from application or drift. Chemical applications within wetlands will only be permitted for purposes of improving the ecological functioning of the wetland to meet management goals and will be limited to spot applications and direct application to the target plant of products approved for aquatic application to the target plant.

6.3.5 Roads

Roads should avoid wetland areas and wetland buffers to the maximum extent possible, and any existing roads within wetland areas should be evaluated for closure. If road construction is necessary in a wetland area, all related BMP's for road construction should be followed including:

1) Align to minimize impact;
2) Discard slash and debris from right-of-way clearing outside of wetland areas; and,
3) Avoid impacts to wetland hydrology.

6.4 Riparian Forest Buffer Delineation for High Conservation Value Forest

Riparian forest buffer establishment and layout on Potomac-Garrett State Forest will extend 50 feet from the edge of all blue line streams as indicated on the USGS maps. Establishment of additional 50 foot buffers will include other riparian areas that once examined through field review are determined, based on evidence of stream function, to be in need of a buffer. These buffers will provide additional nutrient uptake for water quality; increased forest interior habitat for wildlife and wildlife travel corridors. Unless the area contains sensitive species requiring other critical habitat conditions, they will be managed for maintenance of mature mixed forests. These areas have been identified as High Conservation Value Forest (HCVF) and will be managed to protect and maintain their important role in improving water quality as it affects the Chesapeake Bay and the Youghiogheny River System.

Actual buffer layout must be done in the field, in response to the soil, topographic, and vegetative conditions encountered in each place. For any sivicultural practices, an operational buffer of 50’ plus 4’ for every percentage of slope will be established along all riparian areas. Obviously, where a stream or wetland occurs on the interior of a Potomac-Garrett State Forest parcel, the total riparian forest created would form a minimum100 foot riparian forest corridor. In cases where the stream forms the property boundary of a Potomac-Garrett Forest tract, the best that can be done is to establish and manage the one-sided riparian forest and attempt to encourage the adjacent landowners to take similar measures.

6.5 Management and Function of Expanded Riparian Forest Buffers

Expanded riparian buffers will be managed to enhance and maintain the ecological function of the aquatic system, including enhancing the function of the forest in the removal of nutrients from overland flow and shallow underground aquifers. The first 50 feet from the stream bank is a no-harvest area regardless of current species composition, to avoid destabilizing stream banks. The buffer will vary in width based on the slope of the land. Beyond the minimum 50 ft., additional buffer will be added at a rate of 4 ft. for every 1% of slope. Management activities will encourage the creation and maintenance of uneven-aged mixed forests. Tree removals, through thinning or harvest, will be done only to improve riparian forest function and maintenance of the uneven age conditions. These areas will become no-equipment zones and tree removal will be done by cabling from beyond buffer. Periodic monitoring (e.g., every 5-10 years) of forest health and level and type of tree regeneration should be conducted to assure that riparian forests are being perpetuated and are in a condition to maintain the expected functions of stream shade, woody debris, inputs for aquatic habitat, nutrient assimilation, and protecting litter layer and soil organic matter.

This will have the added benefit of producing increased interior forest habitat for wildlife. No herbicides or fertilizers will be used in any area of the riparian buffer, except to control invasive

species.

6.6 Significant Vernal Pools

Vernal pools are defined by the MD Nontidal Wetland Protection Act (Annotated Code of Maryland §8-1201) and associated regulations (COMAR 26.23.01.01) as *a nontidal wetland in a confined depression that has surface water for at least 2 consecutive months during the growing season and:*

a) Is free of adult fish populations;
b) Provides habitat for amphibians; and
c) Lacks abundant herbaceous vegetation.

The Maryland Wildlife Diversity Conservation Plan (MD DNR 2005) defines vernal pools as small, nontidal palustrine forested wetlands with a well-defined, discrete basin and the lack of a permanent, above ground outlet. The basin overlies a clay hardpan or some other impermeable soil or rock layer that impedes drainage. As the water table rises in fall and winter, the basin fills, forming a shallow pool. By spring, the pool typically reaches maximum depth following snowmelt and the onset of spring rains. By mid-late summer, the pool usually dries up completely, although some surface water may persist in relatively deep basins, especially in years with above average precipitation. This periodic, seasonal drying prevents fish populations from becoming established, an important biotic feature of vernal pools. Many species of plants and animals have evolved to use these temporary, fish-free wetlands. Some are obligate vernal pools species, so called because they require a vernal pool to complete all or part of their life cycle. While we typically associate vernal pools with forested habitats, they can also occur in other landscape settings, both vegetated and un-vegetated (Calhoun and deMaynadier 2004), such as meadows, pastures, clearcuts, and agricultural fields.

Vernal pool basin substrate typically consists of dense mats of submerged leaf litter and scattered, coarse woody debris. During dry periods the presence of a vernal pool is often denoted by blackened leaf litter, a sign of seasonally anaerobic conditions and stained tree trunks. Herbaceous vegetation is usually absent to sparse in and around the basin, although small sphagnum patches may occur along the basin edge. A dense shrub layer may occur along the shoreline or in small patches within the basin (MD DNR 2005).

A statewide vernal pool mapping exercise was conducted in GIS during preparation of the Maryland Wildlife Diversity Conservation Plan (MD DNR 2005). All palustrine wetlands (emergent, scrub-shrub, and forested) with NWI water regime modifiers of temporarily flooded, seasonally flooded, seasonally flooded/saturated, saturated, and semi-permanently flooded (beaver) were included (Cowardin et al. 1979). This GIS layer (Fig. 10) could possibly serve as a starting point for identifying significant vernal pools on Potomac-Garrett State Forest, however this map was never ground-truthed and NWI maps often overlook smaller wetlands (Calhoun and deMaynadier 2004). Thus a concerted effort is still needed to ground-truth the existing map and to survey for significant vernal pools that have been missed. Presence of obligate and certain facultative vernal pool species could also be used to help identify these wetlands. Calhoun and

deMaynadier (2004) used the following NWI wetland classification codes to initially screen for potential vernal pools: PUB/POW (open water), PSS (scrub shrub), PFO (forested wetland), and PEM (emergent wetland), though the latter were less likely to be vernal pools due abundant herbaceous vegetation. A GIS vernal pool mapping exercise should be conducted that is a combination of methods used by the 2005 DNR effort and those of Calhoun and deMaynadier (2004).

Many states have developed vernal pool certification programs with criteria for determining "in the field" whether a wetland is truly a vernal pool. Based on these and other sources, it is recommended that the following criteria be adopted for use in determining a significant vernal pool on Potomac-Garrett State Forest. The first three criteria must be met. # 4 must be met if there are no obligate species present, and either criteria 5 or 6.

1) A depression confined to a relatively small area with no permanent above ground outlet (look for blackened leaves and staining on trees);
2) Presence of surface water for ≥ 2 months during the growing season (pond depth is usually at its maximum just prior to tree leaf out);
3) Lack of herbaceous vegetation or it is limited to the basin edges, typically sparse (<50% cover), with or without sphagnum moss;
4) Lack of established and reproducing fish population(s);
5) Evidence of breeding **obligate or indicator vernal pool species** (require a vernal pool to complete all or part of their life cycle). On the lower Delmarva Peninsula these include 5 amphibians and a crustacean group, the fairy shrimp (at least 4 species in the Order Anostraca; Brown and Jung 2005). Amphibians include marbled salamander (*Ambystoma opacum*), spotted salamander (*A. maculatum*), eastern tiger salamander (*A. t. tigrinum*. state endangered), wood frog (*Lithobates sylvaticus*), and eastern spadefoot (*Scaphiopus holbrookii*). Eggs, egg masses, larvae, transforming individuals, juveniles, and adults all would serve as positive evidence of a significant vernal pool.
6) The presence of rare or state-listed **facultative vernal pool species**. Facultative species are vertebrate and invertebrate species that frequently use vernal pools for all or a portion of their life cycle, but are able to successfully complete their life cycle in other types of wetlands. They serve as indirect indicators of vernal pool habitat. On the lower Delmarva Peninsula facultative species include 16 amphibians, 1 reptile, and 17 invertebrates (Brown and Jung 2005), However only 3 of these, all amphibians, are rare or state-listed: barking treefrog (*Hyla gratiosa*; state endangered), eastern narrow-mouthed toad (*Gastrophryne carolinensis*; state endangered), and carpenter frog (*L. virgatipes*; watchlist). Eggs, egg masses, larvae, transforming individuals, juveniles, and adults all would serve as positive evidence of a significant vernal pool.

Identifying and mapping all significant vernal pools on Potomac-Garrett State Forest is a daunting task that will require both a concerted well-funded effort for GIS mapping and ground-truthing, plus opportunistic data collection by DNR Forestry staff, consultants, and other DNR staff and partners. Brown and Jung (2005) as well as the Vernal Pool Association's website (www.vernalpool.org) should be used as primary references. A data sheet has been developed for these opportunistic surveys based on the MD Vernal Pool Task Force draft 2008 datasheets.

6.6.1 Vernal Pool Conservation and Management Prescriptions

Due to their complex bi-phasic life history, vernal pool breeding amphibians are biologically linked to both their aquatic breeding habitat and terrestrial habitat in which they forage, aestivate, and hibernate. Their population dynamics also are dependent on landscape connectivity as they operate as metapopulations. Major threats include anthropogenic destruction and alteration of their aquatic and terrestrial habitats. Management strategies require conservation of a diversity of wetland habitats that vary in hydroperiod and their surrounding terrestrial habitats (Semlitsch 2003). Semlitsch (1998) concluded that a buffer zone encompassing 95% of pond-breeding salamander populations would need to extend 534 feet from the wetland edge.

Semlitsch and Bodie (2003) observed that the 50-100 foot buffers used to protect wetlands in most states were inadequate for amphibians and reptiles. They summarized results of 40 papers describing biologically relevant core habitats surrounding wetland breeding sites and recommended that three conservation zones be established around amphibian breeding ponds. Zone 1 was the wetland and an Aquatic Buffer that extended 100-200 feet from the wetland edge. Zone 2 was the Core Habitat which extended 465-950 feet from the wetland edge. Zone 3 was a Terrestrial Buffer for Core Habitat and extended 165 feet from Zone 2. At a minimum these three zones comprise 630 feet and >1100 feet at the maximum. However, Semlitsch and Bodie (2003) did not make recommendations on what activities could occur in these areas only that managers needed to be aware that these were biologically relevant buffers.

Calhoun and deMaynadier (2004) also recommended 3 conservation zones. Zone 1 was the Vernal Pool Depression in which no disturbance should be allowed. Zone 2 was the Vernal Pool Protection Zone, a 100 foot buffer around the vernal pool in which limited timber harvesting could be allowed but only if >75% canopy cover was maintained; harvest occurred only when the ground was frozen or dry; heavy machinery use was minimized; and abundant coarse woody debris was retained. Zone 3, or the Amphibian Life Zone was a 400 foot wide buffer from Zone 2 (extends to 500 feet from vernal pool) in which partial timber harvest could occur, but only if >50% of the canopy was maintained; no openings >1 acre were made; harvest occurred only when the ground was frozen or dry; and abundant coarse woody debris was retained.

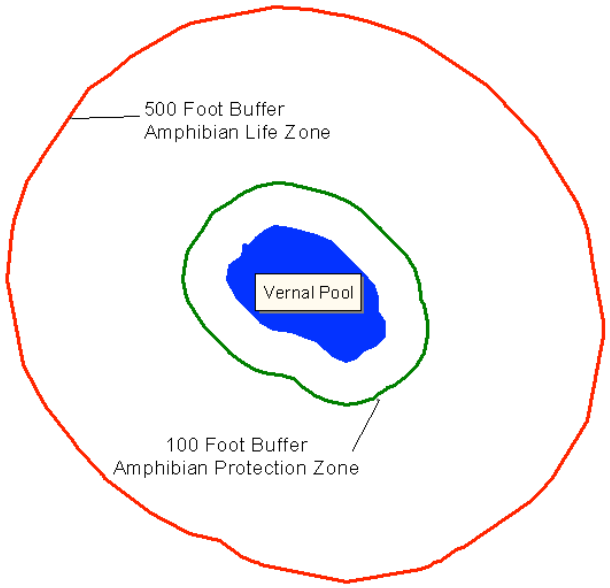
Semlitsch et al. (2009) concluded that removal of only a portion of the canopy (≤50%) minimized negative impacts to amphibians associated with select harvests and clearcuts. They noted trade-offs between either harvest method and that clearcuts should be small (<5 acres) and only used when remaining habitat was high-quality for amphibians.

Based on these papers and mindful of the need to balance conservation with sustainable forestry, the following conservation and management prescriptions are recommended for mapped significant vernal pools on Potomac-Garrett State Forest:

Zone 1: includes the significant vernal pool and extends into terrestrial habitat to 100 feet from the high-water mark. This will be called the **Amphibian Protection Zone** (Fig. 6.6.1).

***Management**:* This is a non-operable area with no herbicide or nutrient applications allowed. No new roads. No heavy equipment should traverse this area except for during restoration activities and this should be minimized, only to occur when ground is frozen or very dry. Site-specific restoration plans may be developed by Wildlife & Heritage with possibility of a "one-time only" harvest of some areas by Forestry, but this will be on a case-by-case basis.

Figure 6.6.1: Amphibian Buffer Zone Around a Vernal Pool

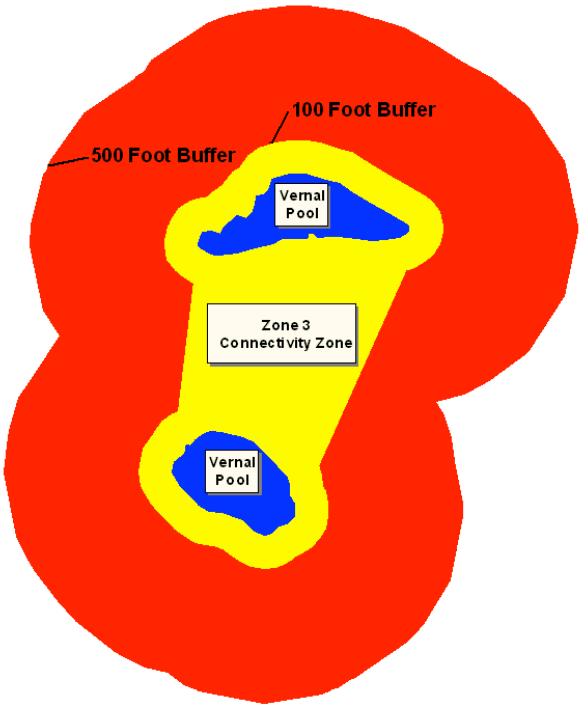


Zone 2 (Forestry responsible for management with input from Wildlife & Heritage): This area will be called **Amphibian Life Zone** (Fig. 6.6.1) – from Zone 1 to 500 feet from the wetland edge.

Management:
1) Saw timber rotations maintaining ≥ 50% canopy closure. A patch clearcut of ≤ 1 acre would be allowed in this area, but select harvests are preferred with retention of coarse woody debris and leaf litter. Natural regeneration is the preferred method; however the planting of native genotype hardwoods where appropriate, may be conducted after consultations between the Forest Manager and Wildlife & Heritage on species selection during the Annual Work Plan review process.
2) Management of Zone 2 will be done in such a way that 75% of the area contains large pole timber and saw timber age classes (10" DBH and greater) which will be managed for longer stand rotations (100 years). Forest Management activities such as commercial thinning in these stands shall maintain a minimum of 70 sq. ft. of BA with the goal that ≥50% of the stand composition will be comprised of hardwood species. When regeneration harvests occupy 25% of Zone 2, then natural regeneration must reach large pole timber size (10" DBH) before additional

regeneration harvesting occurs.
3) There will be no mechanical site preparation. Prescribed burning will be allowed as a management tool. No new roads should be built in this area.
4) Harvests and heavy equipment should be conducted only when the ground is frozen or very dry.

Figure 6.6.2: Vernal Pool Connectivity Zone for Amphibian Conservation



Zone 3 (Forestry responsible for management with input from Wildlife & Heritage): This will be called the **Vernal Pool Connectivity Zone – Special Case** (Fig. 6.6.2): from Zone 2 to 1000 feet from the wetland edge. This area is primarily to ensure that adjacent vernal pools have some habitat connectivity between them, providing microhabitat and allowing movement between breeding ponds. This Zone will only be used when 2 breeding ponds are ≤1000 feet from each other (and really encompasses the Zone 1 of each pond and connecting area). An inoperable area should be established between the two ponds that is the width of the diameter of the largest of the ponds.

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Chapter 7 - Ecologically Significant Areas (ESA) Defined

7.1 Ecologically Significant Areas (ESA) Defined

This plan uses the term "Ecologically Significant Area" to identify unique sites that have special ecological significance. These areas have been specifically delineated and must be given careful management consideration. ESA's are areas that harbor or could potentially harbor rare, threatened or endangered (RTE) species and/or unique natural community types.

On Potomac-Garrett State Forest all these areas are also designated as High Conservation Value Forest (HCVF). Rare threatened or endangered species and or unique natural community types fall under two categories of our HCVF definition, they are: *(HCV1) Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endangered species) and (HCV3) Forest areas that are in or contain rare, threatened or endangered ecosystems*.

In addition to the main criteria (RTE species and unique natural communities) used for establishing ESAs, other criteria were also used to assist in determination of ESA boundaries. These included: topography and geomorphology (based on U.S. Geological Survey topographical quads and geology maps); hydrology (based on National Wetland Inventory and State wetland maps); soil types (based on U.S. Department of Agriculture soil surveys); and water quality; expanded wetland buffers for conservation of amphibian life zones; existing Wetlands of Special State Concern (WSSC) and associated buffers; existing Natural Heritage Areas (NHAs) as designated by state law; surrounding land uses (houses, farms, etc.); and wildlife travel corridor linkages. HCVF include areas identified as old-growth and nearly old-growth forests according to criteria developed by the DNR Old-Growth Forest Committee.

Following a thorough analysis, ESA boundaries were delineated using ArcView, a geographic information system (GIS) software program. Digital geo-referenced layers for most of the above criteria were used. The ESA boundaries are a part of the Potomac-Garrett State Forest database used for planning and review purposes. In addition to the GIS exercise, a wide range of species experts also evaluated the alignment of the established ESA network to ensure that the ecological criteria were accurately applied. The Wildlife and Heritage Service conducted an exercise to develop management zones and prescriptions for ESAs (Smith & Knapp 2006) to simplify management designation for each acre of Chesapeake Forest (CF) so that each management category on the entire CF would have distinct, non-overlapping map units. This layer and associated document have not been completed for PGSF. The forthcoming layer will be similar to the one created for CF but due to vastly different land use history and current forest condition

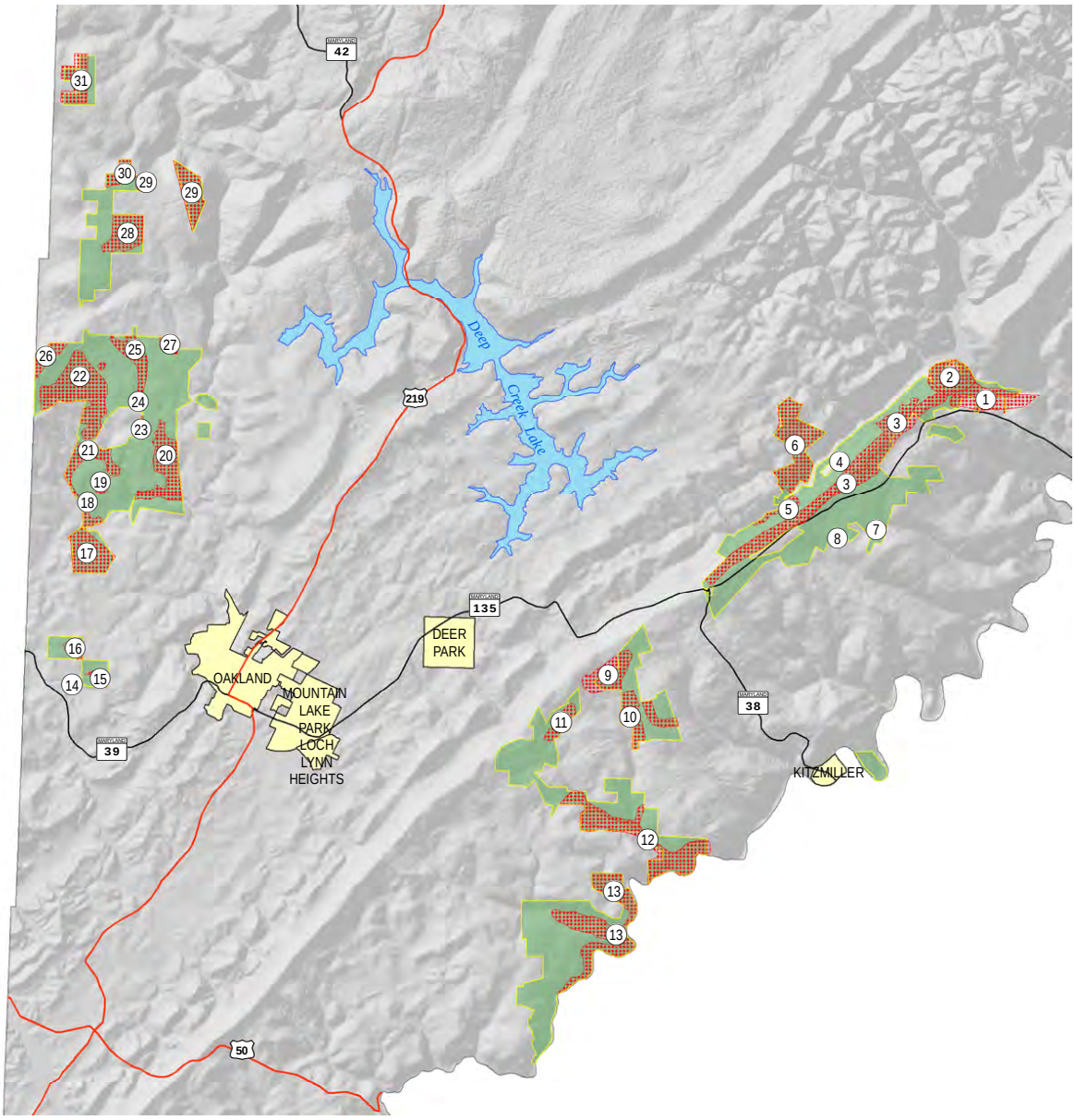
the types and frequencies of management will be markedly different.

Potomac-Garrett State Forest contains 34 identified ESAs that comprise approximately 6,442 acres or about 37% of the entire forest. Some ESA boundaries will expand over time or entirely new ESAs will be delineated, both based on the discovery of new rare resources. Conversely, some ESAs may be removed based on new knowledge or changed legal status of a particular species. Non-overlapping map units where ESAs, FIDS, DFS, or expanded stream buffers took management precedence. ESA boundaries in many cases overlapped other management areas. Timber management is still possible in most ESAs, but in some cases may occur 'one time only' or irregularly timed and only in the context of managing for sensitive resources. We believe implementation of this management regime will achieve the definition of a sustainable forest, providing balanced ecological and economic benefits.

Most of the land designations listed below fall under some type of state protection through legislation. Most of these areas are overlapped by the ESA layer, however some sections are not and as such are listed here as a separate layer. There are three described here: Ecologically Significant Areas; State Designated Wildlands; and Historic and Archaeological Areas. The borders of these layers may overlap one another.

The goal of ESA management is not only the maintenance of existing rare species habitat, but restoration of additional habitat to further enhancing RTE populations and natural communities. In addition, the protection of ecosystem function from a landscape level perspective is also an important objective to pursue. ESAs were classified by major natural community or other landscape category that support RTEs.

Ecologically Significant Areas of Potomac-Garrett State Forest



LEGEND

ESA | State Forest Lands | US Highway | State Highway | Municipalities

ESA NAME

1, Ashton's Woods
2, Crabtree Cave
3, Backbone Mountain Northeast
3, Crabtree Slopes
4, Hitchcock Slope
5, Crabtree Creek Cliffs
6, Maple Lick Run
7, Folly Run
8, Walnut Bottom
9, Eagle Rock Sandstone Glades
10, North Prong Landland Run
11, Upperman Road Bog
12, Lostland Run
13, Crooked Laurel Runs
14, Chisolm Run Swamp
15, North Chisolm Run
16, South Dunkard Lick
17, Herrington Lake South Tributary
18, Herrington Lake Wetlands North
19, Pronghorn Swamp
20, Herrington Run
21, Hutton Switch Bog
22, Murley Run
23, Fork Springs
24, Mechem Bog
25, Toliver Run
26, Cranesville Swamp
27, Muddy Creek/Piney Run
28, West Piney Run/Piney Run Bog
29, East Piney Mountain
30, North Piney Mountain
31, Upper White Rock Run

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7.2 Ecologically Significant Area (ESA) Descriptions

Ashton's Woods/Backbone Mountain North

Description: The dual name for this ESA signifies two distinct features which tend to blend into each other. Ashton's Woods is an area of old growth forest on the north slope of Backbone Mountain. Backbone Mountain North, a little farther west and up slope, represents a site for a very rare small mammal that is State-listed as Endangered. The habitat requirements of this species are quite stringent and the site on this ESA is a fine example of what they prefer. Other areas of potential habitat exist in the direction of Ashton's Woods. These areas could very well harbor colonies of this mammal and this is why the boundaries of these two sites basically merge together.

Prescription: There is private land in the vicinity of the small mammal's habitat. In fact, a portion of the habitat is on private land. This area represents a prime acquisition priority if it should come up for sale. There is unauthorized ATV use on this slope, but it seems to be mostly restricted to one main trail (it has been quite some time since we have monitored the site, however). Ashton's Woods should be visited and evaluated to document the extent of gypsy moth mortality from our latest outbreak.

Crabtree Cave

Description: This ESA represents the protection boundary for one of the most significant caves in Maryland, Crabtree Cave. The cave entrance and immediate property are owned by The Nature Conservancy. Much of the protection zone around the cave is on PGSF. The eastern boundary joins the above ESA. If not for private land to the southwest, it would join into Crabtree Slopes ESA. This northern end of Backbone Mountain offers a number of unique features and supports a large number of special resources. Crabtree Cave harbors a number of rare creatures. Two troglobitic amphipods have been documented. One is State-listed as In Need of Conservation and the other is a species new to science that is currently in the process of being described. In addition, a globally rare isopod, State-listed as Endangered, occurs here. Furthermore, a cave-adapted beetle has been documented here. Beetles of this genus tend to be very restricted and are often endemic to specific areas. The exact species has yet to be determined, but it is expected that it will be new to science. The cave is also an important bat hibernacula. A species of bat State-listed as Endangered uses the cave, and an historic record for a Federally Endangered bat exists. Continued occupation by this species has not been documented, however. Finally, a State Endangered small mammal historically occurred here, but has not been documented in the last several years.

Prescription: Only very recently it has been discovered that the deadly fungal bat disease, white-nosed syndrome, is in Crabtree Cave. Protocols of how to deal with this unfortunate disease are being explored, but mortality rates in any given cave are extraordinarily high, often reaching 99% in certain species. The rapid spread of this disease continues to have profound impacts on the bat fauna of eastern North America, and beyond. These impacts will certainly cause other ecological disruptions. This cave was gated a number of years ago to protect its unique and fragile fauna. Over the years, the gate has been vandalized and repaired a number of times. Apparently, this will be an ongoing management issue for The Nature Conservancy. The bat population has been monitored by professional staff every year for at least

the last 18 years. This led to the discovery of WNS. Monitoring will continue indefinitely.

Crabtree Slopes/Backbone Mountain Northeast

Description: The dual name of this ESA identifies two main areas with somewhat different attributes. However, they do share some features and their boundaries merge into each other. Therefore, it is sensible to consider this as one large natural area. A band of limestone (the same limestone that Crabtree Cave formed in) that occurs near the surface in the Crabtree Slopes area results in some unique attributes for this part of the ESA. There are substantial cliffs present in conjunction with other limestone-influenced plant communities. This is not a common situation in Garrett County and the result is the occurrence of a number of uncommon and rare plants. Six species considered rare in the State have been documented to date. Two of these are State-listed as Endangered and two are State Threatened. For one species, it may be the only remaining extant site in Maryland. Furthermore, a troglobitic amphipod has been documented from the head of a spring emerging on the slope. In addition, Crabtree Slopes features a relatively large stand of old growth forest. Some of the largest trees observed on any western State Forest have been seen here. In contrast to the limestone influence observed on parts of Crabtree Slopes, most of the significant attributes of Backbone Mountain Northeast revolve around outcrops of sandstone. This particular sandstone usually results in plant communities preferring more acidic soils. Several large outcrops occur along the crest of Backbone Mountain in this area, presenting habitats that support a number of special flora and fauna. Four plants considered rare in the State have been documented. Three of these are State-listed as Threatened, and the other is a regional endemic that would be listed as Endangered if it were not for some taxonomic uncertainties. Two mammals State-listed as In Need of Conservation and one listed as Endangered occur within this section of the ESA, as well as two rare breeding birds and a regionally sensitive reptile. Other flora and fauna of interest are expected to occur within this area. In addition, several pockets of old growth forest have been identified within this section of the ESA.

Prescription: The limestone communities of Crabtree Slopes are particularly susceptible to the invasion of non-native weeds. Several troublesome weeds had been identified along an old fire road that dissects the area. Garlic mustard is one of those, and it has the potential to be a problem at Crabtree Slopes. It has been a few years since the invasive plant situation has been monitored. It is recommended that this be analyzed soon. The State Endangered mammal is periodically monitored at particular sites within Backbone Mountain Northeast. They are still present, but the numbers are low compared to historic information. This monitoring will continue. A site for the regionally sensitive reptile has been monitored every two years, and it is recommended that this be continued. The stands of old growth forest should be visited to analyze how they have been affected by the most recent gypsy moth outbreak.

Hitchcock Slope

Description: This site is now included as part of Crabtree Slopes/Backbone Mt. Northeast

Crabtree Cliffs

Description: The habitat on this ESA supports an excellent diversity of herbaceous plant life and features occurrences for three State rare plants. One of these is State-listed as

Endangered. The occurrence for the Endangered plant is one of only three sites known in Maryland, two of which are in Garrett County. The flora is influenced by the band of limestone underlying the site.

Prescription: The site should be monitored at least every three years for the presence of invasive plants. The Endangered plant should be specifically monitored during this effort. Recent acquisition of adjacent private land has bolstered the protection of this ESA.

Maple Lick Run

Description: This ESA is an isolated, road-less block of State Forest. It is one of the larger road-less sections on Potomac State Forest. A significant portion of the ESA is on adjacent private land. This reflects the value of the upper drainage area of Maple Lick Run to the long-term integrity of the watershed, and identifies these lands as future important acquisitions should they ever go up for sale. A significant feature of this area is the presence of several stands of old growth forest. Two main areas have been identified. The varied topography and elevation gives rise to a number of different forest communities or associations. The surrounding landscape consists of forests of varying ages with some agriculture. Therefore, at near 600 acres the State Forest section of this ESA provides a fine core area for forest birds and plants. One State rare plant has been documented to date, but more inventory work would most likely turn up other notable flora. The stream supports a State sensitive fish.

Prescription: More R,T, & E inventory work is warranted on this ESA. The invasive plant issue should be evaluated, as well, but the lack of roads helps curtail this problem. There may be issues along some of the boundaries, however. There are sections of this area that experienced tree mortality from recent gypsy moth infestations. As with a number of ESAs, these places serve as a control for what happens in the aftermath without road building and salvage sales. However, the condition of the old growth stands should be evaluated to determine if any preventative measures should be implemented should the gypsy moth return. Any properties adjacent to the public land that may go up for sale should be considered important acquisitions.

Folly Run

Description: This ESA has been designated to identify and protect the habitat for a State Endangered small mammal. The species was documented here a number of years ago. The rocky habitat also supports an occurrence of a small mammal listed as In Need of Conservation. The discovery and protection of this site is a fine example of the cooperative effort between the State Forest Manager, the Interdisciplinary Team, and the Wildlife & Heritage Service. The general habitat description consists of forested rock bars or boulder ‘fields’ with deep recesses, often with underground flowing water.

Prescription: Maintaining the cool micro-habitat desired by this northern species is the primary management objective. Protecting the ecological integrity of the water flowing within the habitat, and retaining a forested canopy are the two important ingredients for this. A good portion of the headwaters are on State Forest, however, one important section of headwater lies on a private inholding. This parcel represents an important acquisition should it become available. The cool micro-habitat will be enhanced as the forest canopy over the habitat ages.

Walnut Bottom

Description: This ESA is designated for the presence of an excellent vernal pool community. The pool supports breeding populations of two vernal pool obligate amphibians, one of which is uncommon in the State. At least three other amphibians breed here, as well. A thriving and diverse aquatic invertebrate community is also present, including a species of fairy shrimp.

Prescription: The close proximity of this pool to Walnut Bottom Road could present future management issues. Any activity associated with road maintenance or construction such as widening or changing drainage patterns could threaten the ecological integrity of this vernal pool. Notifying the County Roads Dept. may help for limited periods of time, but there will always remain the possibility of a road project being initiated without our knowledge. Trying to keep abreast of such activities is important for the future of this natural community. A specific section of this management plan contains guidelines for the conservation of the amphibian populations in the forested habitat adjacent to a vernal pool.

Eagle Rock Glades

Description: This ESA features several outstanding examples of a natural community type known as a sandstone glade. These open habitats form over large 'sheets' of exposed bedrock and are dominated by ericaceous shrubs, sparse herbaceous cover, and stunted trees. Various lichens and mosses cover significant portions of the community. In this case, the bedrock is sandstone known as the Pottsville formation. Plant communities influenced by this formation typically reflect flora that prefer acidic soils. In addition, these glades offer important habitat for a State sensitive reptile species. It is not easy to envision the original pre-colonial vegetation present on such habitats. Another example of this type in Garrett County has a main component of stunted pitch pine. Eagle Rock glades are devoid of any conifer component. Given what we know of the natural history of this region, a pitch pine component would seem likely as an 'original' member of this natural community. For whatever reason, pitch pine is no longer present at Eagle Rock Glades. A secondary protection boundary for these communities extends onto adjacent private land. Additional field work may identify justification for joining this ESA with North Prong ESA to the south.

Prescription: There is considerable ATV use on adjacent private land and some of this 'spills over' onto State Forest. One negative aspect of this activity is that at least one trail makes the glades more easily accessible then they would normally be given their relatively isolated geographic location. This has created management issues for the sensitive reptile in the past, and may continue to do so. This species has been monitored here at irregular intervals through the years. This activity is important to identify potential management issues and shall continue. Occasional fires would seem to benefit such an open community, but it is not obvious that the area is in desperate need of one. Perhaps future monitoring and study will identify negative issues associated with fire suppression. Adjacent private land would be an important acquisition priority if it should become available.

North Prong Lostland Run

Description: This ESA has been designated to identify and protect the habitat for a State Endangered small mammal. This site represents the first documented occurrence of this

mammal in Maryland, discovered in 1987. The rocky habitat also supports an occurrence of a small mammal listed as In Need of Conservation. The general habitat description consists of forested rock bars or boulder 'fields' with deep recesses, often with underground flowing water. Springs that feed this section of the North Prong of Lostland Run are an important component of the cool micro-habitat required by this species. This section of stream and some of the springs that feed it also support a State sensitive fish species.

Prescription: Maintaining the cool micro-habitat desired by this northern species is the primary management objective. Protecting the ecological integrity of the springs that help define the habitat and retaining a forested canopy are the two important ingredients for this. A small portion of the habitat occurs on adjacent private property. This property represents an important acquisition priority should it become available.

Upperman Road Bog

Description: This ESA consists of forested wetland habitat and an open sphagnum bog. The open wetland habitat lies under a maintained power line right-of-way. Habitats on this ESA support occurrences for several uncommon plants and one rare plant, ranked as S2. This species is also State listed as Threatened. Two rare butterflies have been documented here, as well. Both are ranked as S2 and one is State Threatened and the other is listed as In Need of Conservation. In this particular instance, the power line that crosses the bog has fortuitously created the open habitat preferred by the butterflies and their host plants. The rocky, open power line right-of-way also provides excellent reptile habitat. An important section of this ESA lies on private land. This landowner has entered into a Conservation Easement with the State of Maryland.

Prescription: The past management of the power line right-of-way has led to the conditions that have created habitat for the rare butterflies. Recently, the company charged with power line maintenance contacted the State Forest Manager to solicit comments concerning the management of power line right-of-ways that cross swaths of State Forest. One important aspect of managing special habitats in situations like this is to prohibit broadcast spraying of herbicides, and, instead, recommend spot spraying or cutting of vegetation that may threaten over-head power lines. Having this opportunity to cooperate with the management of such areas should lead to the continued existence of the habitat conditions necessary to support the rare species.

Lostland Run

Description: This ESA features a number of outstanding attributes. A stand of old growth forest occurs along the steep slopes overlooking the Potomac River. Several patches of older trees occur along Lostland Run, as well. The wildflower and other herbaceous plant diversity are quite high due to the underlying geology. This diversity includes a number of uncommon and rare species. One plant in this ESA is State ranked as S1, four are ranked S2, one is ranked S2/S3, and one is ranked S3. Two of these are State listed as Threatened and one is listed as Endangered.

Several uncommon to rare animals have been documented from this ESA, as well. These include one butterfly ranked S1/S2 and proposed to be State listed as Threatened. The Lostland Run area is, perhaps, the best occurrence of this butterfly in Maryland. Other animals include one species of reptile with special conservation needs ranked as S3, two species of mammal both State listed as Endangered, and one mammal State listed as In Need of Conservation.

This ESA also exhibits excellent forest interior bird habitat and offers outstanding scenery.

Prescription: Two major identifiable threats to this ESA are the invasion of several noxious non-native plants and the presence of the hemlock wooly adelgid. The adelgid is most threatening to the hemlocks growing along Lostland Run. Hemlock cover here helps to provide the cooler temperatures required by brook trout and one of the State Endangered mammals. A preemptive management strategy to under-plant sections of the hemlock stand with red spruce seedlings has been initiated.

Private land bordering the State Forest in this area, especially along Lostland Run, should be a prime acquisition target if it becomes available.

Several non-native invasive plants have been identified within this ESA, including garlic mustard and Japanese stilt grass. The soil conditions that support the high diversity of native herbaceous vegetation within sections of this ESA are particularly vulnerable to the invasion of both of these weeds, and others. This is true for the old growth forest which has a parking lot at its base.

Plant communities aren't the only entity impacted by invasive plants. The rare butterfly species known from here lays its eggs on several different species of plants from the mustard family. After hatching, the larvae feed on the plant to complete development. The butterfly is apparently 'fooled' into laying its eggs on the invasive garlic mustard, whereby the larvae fail to develop after eating it. This plant effectively becomes an egg-laying sink for this rare butterfly.

It is well known that a major pathway for invasive plants into any area comes from roads or trails that access the site. In this case, it's Lostland Run Road. Disturbances associated with road maintenance and traffic from recreational users often exacerbates the invasive weed problem. Even with measures such as washing down equipment employed, disturbed ground still seems 'to magically produce' invasives such as garlic mustard. It is vitally important that we do everything possible to keep invasive plants from taking over these unique habitats. Keeping disturbances to a minimum is one way to accomplish this. Active invasive weed control may be necessary.

The level of recreational use is another management aspect of this ESA. Primitive camping, fishing and hunting appear to be the primary recreational pastimes enjoyed here. It is in the best interest of the ecological resources of this ESA to keep this recreational use modest. We strongly suggest keeping the primitive character of the site intact and resist developing facilities that will naturally increase use. As for the rest of the ESA, a passive management strategy is recommended. All of the rare plants identified here will benefit from an aging forest. Indeed, most of them are rare because of the past history of logging and mining. The open habitat preferred by the rare butterfly occurs along the river's edge and, to a lesser extent, along the various roads and trails within the site. The more this road and trailside habitat is taken over by invasive plants, however, the less desirable it will be for the butterfly.

Any future control for the gypsy moth should be carefully considered before any action is taken. The life cycle of the rare butterfly makes it vulnerable to the use any control other than GypCheck.

Laurel Run/Crooked Run

Description: This ESA has a variety of habitats which support a number of rare and

uncommon flora and fauna. There is also a stand of old growth forest, rugged rock outcrops, and splendid scenery along the Potomac River. Eight species of uncommon or rare plants have been documented within the site. One is ranked as S3 while the rest are either S1 or S2. Four of these are State listed as Threatened and one is listed as Endangered. Additionally, the occurrences of several of the rare plants in this ESA are vitally important for that species' continued existence in Maryland. Further inventory would no doubt yield additional interesting flora.

The rare animals within the site include three species of butterfly, one reptile, one breeding bird, and three mammals. One butterfly is State listed as Endangered, another is listed as Threatened, and the other is proposed to be listed as Threatened. The bird is a rare breeder in Maryland. The reptile is a sensitive species which has unique threats to its continued existence. The three mammals documented from this ESA are all State listed. One is listed as Endangered, one is Threatened, and one is listed as In Need of conservation. As with some of the rare plants in this ESA, the sites for at least four of the rare animals represent some of the most important sites for that particular species in the State. Also, the habitat for the sensitive reptile is a unique situation unlike any other in Maryland.

Prescription: A primary management issue over the entire ESA is the presence and continued spread of invasive plants, most notably garlic mustard. Other non-native weeds are present, too, and Japanese stilt-grass is expected to be a problem very soon. Any disturbance in the area, be it road maintenance, timber harvests, recreational use, etc., introduce and spread the weeds. A project to control a garlic mustard infestation along the Wallman Rd./Bradshaw Hollow area has met with mixed results. A nearby important section of this ESA in the Ramsey Trail area was basically free of invasive plants just 10 years ago. A primary goal of the control project was to keep garlic mustard from this area. However, each year it still spread further into Ramsey Trail even with spraying and hand-pulling. Whether the garlic mustard will stay on the trail or enter the old growth forest in the Ramsey area remains to be seen. Completely ridding the area of this pest seems impossible. The discussion in the Lostland Run ESA concerning the association of a rare butterfly and garlic mustard is pertinent to this ESA, as well.

The continued existence of the other rare butterflies depends on the persistence of their caterpillar host plants. In one case, the host plant is a forest tree and should remain a component of the area. The other's host is an herbaceous plant that may be impacted by invasive plants. This situation should be monitored. All three of the rare butterflies found here can be impacted by spraying for gypsy moth control. Any proposal to do this should be carefully considered, and it is recommended that neither dimilin nor Bt be used in specific areas.

Another challenging management issue here involves the sensitive reptile species. It has been persecuted at this site for many years. Some of this harassment has been alleviated in recent years by getting illegal ATV use lessened on a trail that allows access to their habitat. At this point, yearly monitoring is highly recommended to keep abreast of any illegal activity.

The habitat for the Endangered small mammal represents one of the best sites for this species in the State. This animal, as well as many of the other rare species in this ESA, will benefit from a minimal disturbance management policy.

Currently, recreational use of the area is moderate. If this use continues to increase over the years, other management issues may arise for some of the rare species that occur in this ESA.

Upper White Rock Run

Description: This isolated parcel of land (Compartment 49) represents the northernmost section of Garrett State Forest. It lies near the Maryland - West Virginia border. The headwaters of White Rock Run, an important tributary to the designated Wild & Scenic Youghiogheny River, originate within the parcel. It is surrounded by private land and has no deeded access to it. However, we have been granted permission to cross the private land at various times over the last 25 years.

The primary reason this is a valuable piece of public land, despite having no access, is because of the presence of a highly significant occurrence of a rare salamander. It is State listed as Endangered. The specialized habitat of this amphibian can be found at a number of places within the parcel. This ESA is very important to the overall status of this species in Maryland.

Other rare species are also found here. A troglodytic amphipod has been found at a spring head on the parcel. It is State listed as In Need of Conservation. A State Threatened plant also occurs within the ESA.

A small 'sandstone glade' also occurs here. This is recognized as an ecologically significant natural community type. The area has never been inventoried for small mammals, but potential habitat for several uncommon or rare species exists at the site.

Prescription: The rare species of this ESA will not suffer from our inability to access the property. A 'hands off' approach of managing this parcel is well suited to the ecological needs of the rare salamander. An aging forest will enhance their habitat needs. A long-term management goal of this ESA is to let the forest develop into an old growth condition.

An obvious downside to the lack of regular access is the inability to monitor the site. While we are confident that the rare salamander's existence will continue to be viable for a long time to come (unless a range-wide impact occurs), it would certainly be valuable to monitor the site on a regular basis. Perhaps something will change in the future to allow regular access. Certainly, acquiring any available surrounding properties would be important.

Invasive plants are not an issue within this ESA.

East Piney Mountain

Description: This is an isolated parcel of State Forest, shaped like a broad triangle, on the east edge of Piney Mountain in western Garrett County. The north section of the parcel is within the designated Wild & Scenic Corridor of the Youghiogheny River. It borders this corridor on its east side. Access to the parcel is limited and it has been managed as an undisturbed area for a number of years. One interesting and important feature is that it encompasses the entire upper headwater systems of three small tributaries to the Youghiogheny River. Much of the parcel is on fairly level ground, but it is steep and rugged in the north and southeast sections. The wild character of the parcel meshes well with the intentions of the wild and scenic river.

This ESA is also of particular importance to a rare species of salamander, a conservation-sensitive reptile, and a very rare plant. The salamander is State listed as Endangered and is a species of concern in several states within its range. This salamander's habitat is very specific and it occurs within the parcel and immediately adjacent to it. This adjacent site, one of the most important for the species in Maryland, is within the wild and scenic corridor. Recently, two new sites were confirmed on the parcel itself, to the north and the southeast. The sites for this

salamander within the ESA are important to the overall status of this species in Maryland.

Habitat important to the life cycle of the above mentioned reptile occurs within the parcel and immediately adjacent to it, as well. The power line right-of-way that transects the parcel enhances some of this habitat.

A very rare S1 plant occurs in several locations within the site. This taxon has a very small global distribution. It has only been recorded in Garrett County, Maryland and nearby West Virginia. There is some question about this plant being a hybrid between two other species in the same genus. However, research by a graduate student done a number of years ago indicates this is not the case. In reality, it may have arisen from a hybridization event and may now be long enough along on its evolutionary path to be distinct. Because there is this degree of taxonomic uncertainty, this species cannot be listed under Maryland's Endangered Species Law. In any event, it has characteristics that allow it to be identified in the field. Therefore, it is a recognizable taxonomic entity, and, in fact, may be one of the rarest plants in North America.

This site has outstanding potential habitat for several rare small mammal species. Its remote character has discouraged inventory work for these creatures.

Finally, outstanding habitat exists for a State Endangered mammal that occupied the site in the not too distant past. This regionally declining mammal has been extirpated from the site for a number of years.

Prescription: The 'hands-off' approach of managing this parcel is well suited to the ecological needs of the area. An aging forest is precisely the management strategy the rare salamander needs. A long-term management goal of this ESA is to let the forest develop into an old growth condition.

The sites for this salamander have been monitored by the Natural Heritage Program, albeit irregularly, for many years. Recently, the sites were visited several years in a row. This monitoring led to the discovery of new areas of habitat occupied by the species. It is recommended that monitoring by trained personnel should continue indefinitely. Every 5 years may be adequate, but every two to three years would be desired. Monitoring of the reptile and the rare plant could occur at the same time. Clearly, in the case of the rare plant, more serious genetic research is needed. In the meantime, this ESA supports a healthy occurrence which could be studied.

Recreational rock climbing or scrambling should be restricted from occurring here. It would be detrimental to all of the rare species discussed here.

Keeping abreast of what's going on in the surrounding private land is important for this site. For instance, any private land adjacent or near this parcel would be a valuable ecological acquisition. There appears to be ecologically important private land in between the State Forest boundary and the boundary of the Wild & Scenic Corridor, especially to the southeast. In the long run, acquiring or being able to influence the management of these lands is desirable.

Currently, invasive plants are not a management issue here.

North Piney Mountain

Description: This ESA lies on the north end of Piney Mountain and encompasses the most northern section of State Forest in this area. This site contains critical habitat for a State Endangered salamander. This is the same species of salamander that occurs in the East Piney Mountain ESA, which lies a little less than a mile to the east. Additionally, there is a patch of old

forest in the northern section overlooking Salt Block Run that is old enough to nearly qualify as old growth. There is potential habitat for several species of uncommon or rare small mammals here, as well. The State Endangered mammal mentioned as being extirpated in the East Piney Mountain ESA occurred in this ESA, as well.

Prescription: The same management strategy prescribed for the East Piney Mountain ESA applies here. Several sites for the State listed salamander on this ESA have been monitored for many years. One site, in particular, has been monitored very regularly for over 30 years. Some of this site occurs on adjacent private land. If available, land to the east and north of the State Forest boundary represent vitally important acquisition priorities to further enhance the conservation and protection of the rare salamander.

If time and staff would allow, inventory work for various small mammals would be appropriate.

Currently, invasive plants are not a management issue here.

Piney Mountain Bog

Description: The State Forest portion of this ESA is identified to primarily protect the headwaters of a large swamp/bog system occurring to the east, and to protect habitat for a small fossorial snake. This species of snake is quite rare and is listed as Endangered in Maryland. The area also provides excellent habitat for other more common small snake species. The bog/ swamp complex offers regionally significant plant community associations that support unusual flora, and has been a target for acquisition for many years. Two opportunities to acquire it in the past have failed, the most recent of which happened several years ago. It was apparently a case of someone finding out about it and acting on it swiftly before the State could complete its acquisition process.

The bird life of the bog needs further investigation as it provides potential habitat for a number of specialized breeders, including the golden-winged warbler.

Prescription: The Piney Mountain access road bisects some of the drainage to the bog. It is relatively stable at this time, but any road maintenance should be done as sensitively as possible to keep sediment to a minimum. Influencing the management of the power line right-of-way should continue into the future. General broadcast aerial spraying of herbicides should be discouraged. Heavy equipment traversing through the boggy habitat on the right-of-way should be discouraged, as well. Unauthorized ATV use has occurred through wetlands on the right-of-way, too, and should be discouraged as much as possible.

The rare snake has been monitored utilizing ‘sucker boards’ on and off for years, and was recently reconfirmed at the site. This monitoring is advised to continue every 5 years or so.

Invasive plants are currently not an issue within this ESA.

West Piney Mountain

Description: This ESA has been identified because of the occurrence of a rare conifer (S1), one of only two sites for the species in Maryland. Furthermore, the area supports a naturally occurring red spruce (*Picea rubens*) (S3) stand. This 3+ acre red spruce stand has developed because of the presence of two large ‘mother trees’ fortuitously spared during historic logging efforts. The stand has been the subject of a restoration effort by State Forest staff. Another small, discreet group of red spruce occurs on the site, as well.

Prescription: The rare conifer has been monitored over the years and the health of the stand is debatable. Discussion between Natural Heritage and Forest Management staff about the future of the occurrence has occurred in the past. This discussion should probably be revisited to determine what strategy (if any) could be employed to help the stand continue to exist.

The red spruce stand will continue to be monitored and any management strategies deemed necessary to help the stand thrive will be employed.

Invasive plants are currently not an issue here.

Cranesville Swamp

Description: Cranesville Swamp is a large, regionally significant wetland area, much of which is owned by The Nature Conservancy. Sections of State Forest on the west edge of Piney Mountain and Snaggy Mountain drain towards tributaries to this well known natural area. These State Forest lands are identified as being within the ecological boundary of Cranesville Swamp. Some sections are quite steep.

Prescription: The slopes draining towards Cranesville Swamp are recommended to be managed in a sensitive manner. Forest management activities should be restricted from occurring on the slopes to provide as much watershed protection as possible for this regionally significant wetland.

Toliver Bog

Description: This ESA is identified for the protection of the namesake bog and the two main tributaries that feed it. The area represents critical habitat for a rare snake, listed as an Endangered species in Maryland. This snake is known from a handful of sites in Maryland, all of which are in Garrett County. It has a small global range in our state and three others, Pennsylvania, West Virginia, and Virginia.

Another small reptile, a lizard, historically occurred within this ESA, as well. It, too, is listed as Endangered in our State. The last time an individual was observed here was in 1978. Despite many efforts to relocate the species throughout the intervening years, none have been observed since. This lizard is so secretive and elusive that it could very well still exist at the site, albeit in small numbers. In 2012, this species was documented on specialized habitat in the Ridge & Valley Province of Allegany Co., Maryland. It appears that this very rare lizard's historic range was focused around natural openings, be they wet or dry.

Other rare animals documented from this site include an S2 butterfly, listed as In Need of Conservation in Maryland, and a rare subterranean flatworm (S2) found in a spring feeding one of the tributaries of Toliver Run. Two uncommon breeding birds, attracted to the conifer cover of the area, have been documented here, as well. Also, a historic location for a rare frog is very nearby, and at some time in the past it no doubt occurred within this ESA. Currently, it appears that this frog may have become extirpated in our area as no historic sites have been occupied for a number of years. Recent inventory efforts, including searching for new sites, has turned up no individuals.

The plant life of Toliver Bog and the other small bogs within this ESA exhibit a characteristically northern affinity. These wetlands represent 'hotbeds' of biological diversity because of a concentration of uncommon and characteristic flora that do not occur in surrounding habitats. Rare species can be found, too, and three have been documented here. One is State

ranked as an S1 and listed as Endangered and the other two are ranked S2.

Prescription: One of the most important aspects of this ESA is the habitat for the Endangered snake. It prefers open canopied habitat, and is most often found in the vicinity of the bogs, often around the edges. These areas are often not wet enough to prevent woody encroachment. A project to manually cut small trees and shrubs (mainly white pine) was conducted in parts of Toliver Bog a number of years ago. This type of management done periodically will certainly enhance the snake's habitat. Monitoring the snake's habitat has been done every five years or so for over 30 years. It is recommended that this continue.

Recently, a thinning operation was conducted in part of the pine plantation. The trees were quite crowded in this area. It is hoped this will make the remaining conifer cover more desirable to breeding birds that prefer this kind of habitat, including several rare species. It also may provide additional habitat for the rare snake and the rare lizard. Monitoring the thinned area as it ages is highly recommended, especially during periods when breeding birds may be documented.

Mechem Bog

Description: This significant wetland is named after Joe Mechem, a former Potomac-Garrett State Forest Manager, who brought the site to our attention many years ago. It is a small, but ecologically important bog. A primary reason for this is an occurrence of a State Threatened plant. It is a northern bog plant that only occurs in a few of our wetlands. The southern limit of its range is not far south of here in the mountains of West Virginia. This plant is a true indicator of naturally open wetland situations and is a genuine relic of colder times in the past. Most occurrences are isolated and separated by a significant distance. Never-the-less, several sites exhibit occurrences that, at least in the short term, seem to be relatively healthy and stable. Mechem Bog's 'population' is small, but thriving, neither declining nor expanding in the 30 years since we learned of the site. The small opening grades into a shrub swamp and wet woods, and the bog is fed by several springs that have recovered nicely from past activities. Pristine looking springs flow from the bog, as well. These springs are naturally acidic and have been made more so by acid rain, a problem that has plagued the mountains of Garrett County for many years. Monitoring conducted by the Appalachian Laboratory has indicated that this problem has lessened within the last several years, good news for our naturally acidic habitats in western Maryland.

Prescription: The site has been monitored irregularly for 30 years. It has been monitored more regularly in the last ten years. The site should continue to be monitored every 2 years or so. It is quite close to a secondary road, but far enough to not be easily seen from it. This is important, because frequent visitation could damage the rare plant occurrence. If the site was easily visible, curiosity alone would make visitation too frequent. No extra attempt to bring it to the public's attention should occur.

Protecting the water sources of the bog is obviously important. Just in the last few years, Natural Heritage and Forest Service personnel conducted a field visit to the site. The purpose was to discuss the site's conservation in light of a nearby timber harvest proposal. This type of on the ground cooperation is vital to this and many other ESAs.

The delicate balance of hydrology that allows a portion of the site to be open enough for the rare plant is of importance. It is hard to know how open this swamp was in the distant past,

but one can imagine the shrub cover being of lesser extent. In our very short time of knowing the site, succession seems to be occurring very slowly. However, subtle changes could alter this. One of the items to be monitored would be the extent of the shrub cover and if it is changing. It is possible that in the future some manual removal of shrub cover may be necessary to ensure the rare plant's survival.

Salamander Springs

Description: This site consists of a series of springs that exhibit water chemistry that has resisted the acidification that's occurred in many springs in the surrounding landscape. One can only assume that they originate deep within the band of limestone that underlies the area. One spring, in particular, has a high volume of flow, even near the end of the summer. The variety of salamander species, and the high number of individuals of each species, is unlike any other nearby spring studied. While none of the species documented are rare in the State, this assemblage represents a special situation, indeed. It is worthy of special management consideration.

Prescription: This is a site that will benefit from having no disruptive management activity occurring anywhere within the ESA boundary. The site is close to secondary roads. Any nearby road maintenance or construction should be monitored carefully. It would be wise not to draw any attention to the site, as too much visitation could damage the salamander populations.

Bull Glade/ Murley Run

Description: This ESA also includes the Hutton Switch Bog ESA. This ESA is a complex of pristine springs, small streams, significant wetlands and other ecologically important habitats. It is located in the Garrett State Forest not far from the West Virginia border. It makes ecological sense to include a small ESA identified as Hutton Switch Bog within this larger ESA. They border each other and the habitat of Hutton Switch is similar to habitats to the north in Bull Glade/Murley. The abundant water in the area, ending up primarily in Bull Glade Run and Murley Run, represents a significant portion of the headwater drainage system of Herrington Creek, a major tributary to the Youghiogheny River. Snaggy Mountain Road, a north/south running public dirt/gravel road, bisects much of the ESA. In the northern section, Snaggy Mt. Fire Tower Road, a limited access road, dead ends after traversing a mile and a half or so to the west.

The interesting habitats on this site have lead to the discovery of a number of uncommon and rare flora and fauna. Two rare butterflies have been documented from the site, one listed as Threatened in Maryland, and the other listed as In Need of Conservation. Three other animal species, all listed as Endangered in the State, have been documented in the varied habitats of the area. These include a breeding bird, a snake, and small mammal. Another reptile with special conservation needs also has important habitat on the ESA. Additionally, this site, in conjunction with other forested land around it, supports a high diversity of birdlife, a varied amphibian and reptile fauna, and, in general, just supports a lot of different creatures. There is potential for other rare breeding birds to occur here, as well.

A number of significant swamps and bogs occur within this ESA. Most of these are small, but these places always harbor special plant associations, many species being localized to

these habitats. One northern species, with the southern limit of its range very close to here, was recently documented at one of the wetlands. It is listed as Endangered in Maryland. Another rare northern bog plant, the same species found in Mechem Bog, occurs in the Hutton Switch section. It is a State Threatened plant.

The pristine look of many of the small streams here belies the negative impacts that have occurred to them. The impacts of acid rain in this part of Maryland have been as significant as in any state near us. Research conducted by the Appalachian Lab over the last 30+ years has documented this fact. Continued monitoring of this and other atmospheric pollutants by the Lab has shown recent improvement. Most of the springs that make up the headwaters of this entire area originate from sandstone that produces naturally acidic water chemistry, with little buffering capacity. However, prior to human caused air pollution, this natural acidity was well within the tolerable limits of the local aquatic life. Years of acid rain pushed those limits to a detrimental point for many forms of aquatic life living here, as the small streams that once supported brook trout and vibrant frog and salamander communities now do not. The ecological health of this ESA will certainly improve if this form of atmospheric pollution continues a downward trend.

Prescription: There are a few management issues for this ESA. As they flow down stream, many of the water sources of the area converge and cross Snaggy Mountain Road. Road maintenance activities invite negative impacts to the streams. Adherence to the best management practices possible to protect water quality is highly recommended. A recent bridge replacement, which was a fairly complicated project, was done in such a way to protect water quality as well as could be expected. It appears to have had little negative ecological impact. A project to improve the condition and drainage of Snaggy Mt. Fire Tower Rd. may have caused more harm than good, however. The construction associated with this effort has introduced the noxious invasive plant, Japanese stilt grass. This is troubling, and the road improvement hardly seems worth the introduction of this weed.

This same road is at the center of another management issue involving a sensitive reptile that continues to be impacted by human disturbance. Several strategies to lessen the impacts are ongoing. The most effective to date was installing a gate at the beginning of Snaggy Mt. Fire Tower Rd., allowing public vehicle access only during deer firearms season. Easy access is at the heart of the issue for the reptile, and harassment still continues from illegal ATV entry into the area. Aspects of this are challenging, however, since a number of old roads run through the landscape. Though most of these are hardly passable anymore, some of them do allow access from nearby West Virginia. Another strategy involves directing recreational users away from the reptile's habitat. The success of this has yet to be determined, but over a period of time may prove beneficial.

The rare species that exist here should be expected to persist into the foreseeable future. Monitoring of the rare butterflies, the breeding bird and the rare plants should continue at least every few years. The rare small mammal is so secretive and hard to detect that assessing the quality of the habitat is the best way to ensure its continued survival.

Timber harvests have been proposed adjacent to sections of this ESA. Field reconnaissance by Forestry and Natural Heritage staff has resulted in agreed upon protection measures for the aquatic resources. This is an important aspect of the conservation of this ESA and should continue into the future.

Herrington Run

Description: This ESA is a complex of ecologically significant springs, wetlands, and other streamside habitats that support a number of rare plants and two rare troglodytic invertebrates. It is mostly forested, however, there are maintained trails and other managed situations within this ESA. To this point in time, these managed situations seem to have had little impact on the rare species that occur here.

All of the rare species here, both plant and animal, are associated with the springs and other wetland situations. The springs range in pH value and the rare species are found at those that are approaching values near neutral. These water sources appear to begin in rock strata that give them enough buffering capacity to mitigate the effects of acid rain. Two State Threatened plants and one State Endangered plant have been documented. An S3 plant and a yellow form of a common spring wildflower (usually pink) have also been found within the ESA.

One of the invertebrates is quite rare and State listed as Endangered. The other is listed as In Need of Conservation.

The area also supports a number of forest interior breeding birds, including some uncommon ones that are only found on Maryland's Alleghany Plateau.

Prescription: One of the rare plants (and other vegetation) is threatened with over browsing by white-tailed deer. This problem is exasperated by the presence of agricultural land (private) not far to the east of this ESA. A maintained 'wildlife opening' was present within the ESA. Years ago, it was recommended to abandon this opening and let it succeed so as not to unnecessarily attract deer to the area.

Beaver have been present along this tributary to Herrington Run, on and off, for many years. The occurrence of one of the Threatened plants is in a situation that could be inundated by beaver activity. This situation should be monitored indefinitely.

Adequate buffers around all spring heads are necessary when forest management activities are proposed nearby. On the ground reconnaissance to provide this protection has occurred on this ESA and is recommended to continue.

Lower Deep Creek

Description: The majority of this ESA lies within State Park property. However, the extreme southern section of it lies within State Forest. A spring in this area has yielded some very rare invertebrates. Two of the creatures are flatworms and one is an isopod. One of the flatworms is a globally rare invertebrate with a G1/G2 range-wide rank. It is listed as an Endangered species in Maryland. The other flatworm is State ranked as a S2, and the isopod is also an Endangered species in Maryland.

Prescription: Protecting the ecological integrity of the spring-head is of utmost importance.

7.3 Prescribed Burning within ESAs

Some mechanical fire line construction may be necessary within certain ESA in order to conduct prescribed burns within fire safety guidelines and according to state burning regulations. All fire lines that are proposed by Forestry within an ESA will be reviewed by Wildlife & Heritage for

recommendation as to type and location of fire lines. The Wildlife and Heritage Restoration Ecologist must sign off on all burn plans that occur within ESA's. Forestry will contact Wildlife and Heritage within 48 hours preceding a prescribed burn on an ESA.

7.4 Use of Herbicides/Pesticides within ESAs

As a policy, chemicals will not be used in Zones 1, 2 or 3 to control hardwoods; exceptions to the use of chemicals within ESAs will be limited to control and would be allowed after consultation between Wildlife and Heritage and the Forest Manager. This also includes control of invasive animal species, particularly potentially damaging insects, such as the Asian Long-horned Beetle. The expected damage from the pest outbreak to the ESA and surrounding habitat should be greater than the potential negative effects on rare species populations if the areas is cut or sprayed. In the latter case, consultations would also include the MDA Forest Pest Specialist. These would constitute the only potential exceptions to the no-cut policy for riparian and wetland buffers.

7.5 Annual Work Plans

Concerns for ESAs will also be addressed during Annual Work Plan (AWP) reviews by the full ID Team. This will often be done at the time another silviculture operation (thinning or harvest) is planned. During the AWP reviews, all actions necessary to protect, restore or enhance affected ESA's will be considered.

7.6 Wildlands

7.6.1 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, §5-1201).

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 2009, twenty-nine separate Wildlands have been designated on over 43,773 acres of State Parks, State Wildlife Management Areas and State Forests.

Wildlands at Potomac-Garrett State Forest

There are no designated Wildlands on PGSF.

7.7 Historic and Archaeological Areas

This category features areas in which historical or archaeological artifacts or sites are known or suspected to exist. Maryland Historical Trust is the state Agency charged with the statewide inventory of Historic and Archeological sites. Land managers have a tool available to determine if such a site may be affected by future management proposals. MHT uses a '"Presence or Absence blocks" which indicates whether there are known archeological features within a 50 ac. 'grid block' as laid over the state. In many cases these blocks include both private and public land within the 50 ac. block. There are 8 blocks (or portions of them) that are located over the forest. Any work planned for these areas will include MHT in the review of said proposals.

The management goals within this area include protection of the integrity of the site. Education or display of artifacts may or may not be featured within this site or other potential archeological sites as the promotion of access to such sites may not be desirable.

Garrett State Forest

Overall, only a very small portion of the Garrett State Forest has been surveyed for archeological sites. Three small parcels at the southern end of the Garrett State Forest were surveyed by archeologist Joseph M. McNamara in 1978. This was part of an assessment of DNR lands. No archeological sites were located at that time.

As part of a large regional survey of Western Maryland by Dr. Robert Wall in 1981, two small transects intersected Garrett State Forest land. One site, site 18GA217, was recorded during that survey and listed as a prehistoric lithic scatter and two rockshelters.

The Garrett State Forest has the potential to contain many additional prehistoric and historic period sites that have yet to be recorded. Additional archeological survey would be needed to identify those sites.

Survey reports:

<u>Archeological reconnaissance of three separate tracts of land in Garrett State Forest, Garrett Co., Md.</u>
Author: McNamara, Joseph M.
Call Number: GA 5
Location: Main
Publishedr: 1978

<u>Archeological study of the Western Maryland coal region: the prehistoric resources.</u>
Author: Wall, Robert D.
Call Number: GA 9B
Location: Main
Publishedr: 1981

<u>Archeological study of the Western Maryland coal region: the historic resources.</u>
Author: Lacoste and Wall.

Call Number: GA 9C
Location: Main
Publishedr: 1989
Note: the Maryland Coal Region survey produced a two-volume set, one for historic resources and one for prehistoric resources.

Potomac State Forest
The Maryland Coal Region study had a few transects that were located within the Potomac State Forest (Wall, 1981, 1989).
There is one recorded site, 18GA258, reported by H.M. Dorsey, of a location of a prehistoric flake and historic metal button.
The Potomac State Forest has the potential to contain many additional prehistoric and historic period sites that have yet to be recorded. Additional archeological survey would be needed to identify those sites.

*(*Information prepared for DNR Forest Managers in Western Maryland by the Maryland Historical Trust, Maryland Department of Planning, October 18, 2010)*

Chapter 8 - Wildlife Habitat: Protection and Management

8.1 Introduction

The rich diversity of wildlife species located within the Potomac Garrett State Forest requires the use of a wide array of adaptive and proven traditional management techniques. The objective is to utilize appropriate management to address the ecological needs of this diversity of wildlife species and habitat types, including different successional stages of forest, (e.g., distribution, size, composition, and juxtaposition of forest patches), riparian buffers, corridors, and interior forest habitat, as well as young forest and open grassland areas. This approach requires management prescriptions that are anchored in the ecological principle that all of the habitats function in relationship to each other. This is not a definitive prescription, rather an adaptive attempt to best serve the species located on these lands.

8.2 Invertebrates

In general, invertebrates have been poorly inventoried, and therefore, little is known about them on the PGSF. However, several groups have received enough research attention to allow some assessment of the situation in the forest.

Butterflies are one such group. At least 60 species may be found on PGSF, or very close nearby. Approximately 15 of these can be considered uncommon or rare on the forest. Six species documented from, or very near, Potomac-Garrett are officially listed as In Need of Conservation, Threatened or Endangered in Maryland. Like many insects, butterflies are often associated with particular food plants.

Tiger beetles and dragonflies and damselflies are two other invertebrate groups that have had research attention. One tiger beetle listed as Endangered in Maryland has been documented on the Forest. Status evaluations of the dragonflies and damselflies are ongoing. At least six rare species have been found on PGSF. Some of these may become officially State listed in the future.

Another group of invertebrates that has received more study are aquatic, cave-adapted forms. These eyeless and unpigmented creatures are most often found in caves but, occasionally, they are found at the headers of springs that are interconnected with the regional groundwater aquifer. Four species of cave-adapted crustacean, two amphipods and two isopods, have been documented from the PGSF or very close nearby. Two are listed as In Need of Conservation,

one is listed as Endangered and one is a recently described species new to science. This new species will undoubtedly be State listed in the future since it has a very restricted known range. The diversity of other invertebrate groups is expected to be quite high on Potomac-Garrett State Forest, and unusual species may someday be documented from some of the special habitats found here.

8.2.1 Nongame Birds

The variety of habitats supports numerous nongame bird species. Recently 119 species were documented as breeding on the forest and surrounding properties. Many of these species are migratory, breeding on the forest and then migrating south for the winter. Other migratory species utilize Potomac-Garrett State Forest for feeding and nesting during migration, while others winter here, but breed further north. Approximately, 187 nongame bird species may occur on the forest at some time during the year. These species include marsh and wetland birds, raptors and songbirds. At least 16 uncommon or rare breeding birds nest on PGSF or very close nearby.

8.2.2 Marsh and Wetland birds

A number of water associated nongame birds use the wetlands, open waters and stream habitats found within the state forest. These include loons, grebes, herons, sandpipers and gulls. They use the water and wetland habitats as feeding and resting areas during migration. Maintenance of appropriate habitat and good water quality are necessary to support these birds. Management efforts commensurate with watershed protection should adequately address this group's needs.

8.2.3 Raptors

Raptors found on Potomac-Garrett State Forest include hawks, owls and occasionally osprey. The northern raven functionally acts like a bird of prey and is included under this category of nongame birds. Nesting occurs throughout the forest by many of these species. Nest sites are usually in large trees (mature forest size class). Rare breeders include goshawk and possibly saw-whet owl. The saw-whet owl is associated with bogs and swamp habitats. Ravens nest on cliff sites as well as in large trees. During migration, hawks and ravens utilize the updrafts along the ridge tops while moving south. The forest supports populations of wintering raptors.

8.2.4 Songbirds

Numerous songbirds occur in the forest at various times of the year. As expected, the vast majority of species are those associated with forest habitats. All forest types and size classes are utilized by songbirds, though certain species occur only in certain types or size classes. Management strategies are as varied as the number of songbird species found on the forest. Since some of songbirds depend on early successional stages, while others need mature forests, a mix of size classes throughout the entire forest will maintain a wide diversity of species. Potomac-Garrett State Forest is of particular importance to two groups of songbird species, namely forest interior birds and Garrett County endemic breeders.

8.2.5 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, many of these species prefer older forests. 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 tanager, pileated woodpecker, acadian flycatcher and whip-poor-will. Two raptor species, red-shouldered hawks and barred owl, are also considered forest interior breeders. The western Maryland forests are the stronghold of the statewide population. Permanent fragmentation of large, contiguous tracts and the overall loss of forestlands are the most serious problems affecting these species.

8.2.6 Garrett County Endemic Breeders

Garrett County supports a few nongame bird species that breed nowhere else in the state. Most of these species are more common breeders further north and are typically associated with boreal habitats. Remnants of these habitats are found in the Potomac-Garrett State Forest and include bogs, spruce and hemlock forests. The breeding birds of concern are alder flycatcher, olive-sided flycatcher, golden-crowed kinglet, blackburnian warbler, mourning warbler, Canada warbler, dark-eyed junco, purple finch, winter wren, goshawk, red-breasted nuthatch and Nashville warbler.

8.3 Non-Game Small Animals

Thirty-two species of small mammals may inhabit Potomac-Garrett State Forest. These include shrews, moles, bats, woodland mice and voles, chipmunks and flying squirrels (see Appendix A). As a group, habitat requirements and population status of these species are not well known. However, there are several species known to be quite common on the Forest and considerable effort has been made to document some of the rare species that are expected to occur here. Forested rock bars and outcrops and unpolluted first and second order streams are primary habitats for the rarest species documented such as the rock vole, long-tailed shrew and water shrew. Caves and abandoned mine shafts serve as bat hibernacula. Crabtree caves are a significant site. Porcupines have been documented in the state forest. Since they are at the southern periphery of their range here, they are uncommon to rare.

8.4 Reptiles

Eighteen species of reptiles may occur in Potomac-Garrett State Forest. While the population status for some of these secretive creatures is not well understood, it is generally known which species are common and which are not. A State-wide Herp Atlas project that has recently begun will help provide needed information. Reptiles use a variety of habitats throughout the forest. Beaver ponds, wetlands and streams are important for the snapping turtle, painted turtle and some snakes. Openings associated with wetlands, power lines and other disturbances attract a number of different snake species. Rock outcroppings provide suitable habitat for a number of other snakes, including timber rattlesnake. The timber rattlesnake is a species of concern on the Forest and their important habitat features such as over-wintering dens and rookery areas receive special protection. The mountain earth snake which occurs on PGSF is State listed as

Endangered. Downed logs are a favorite haunt of many snakes and lizards. Only two species of lizard occur in Garrett County and both have been documented on PGSF. However, the coal skink, which is listed as State Endangered, has not been observed in over 20 years. More assessment data is needed for reptiles on the forest.

8.5 Amphibians

Twenty-two species of amphibians may occur on Potomac-Garrett State Forest. Amphibians, in general, are associated with moist environments. Vernal pools and wetlands provide ideal breeding habitats for some species. Springs, seeps and first order streams also provide habitat for a number of species. Still others survive in moist forested environments and do not have an aquatic stage. Permanent bodies of water that support fish populations are of less value to most amphibians. Little is known about the population status of some species on the Forest, however, it is generally known which species are common and which are not. Two species listed as State Endangered have been found on the forest, the green salamander and the mountain chorus frog. Green salamander populations are regularly monitored and its status is well documented. The Mountain chorus frog is declining rapidly and may no longer occur in Garrett County. Wehrle's salamander is listed as In Need of Conservation, and the Jefferson salamander is considered uncommon. A State-wide herp atlas project recently begun will help provide addition information about amphibians on the Forest. Protection of non-tidal wetlands, vernal pools and stream corridors is an essential element for maintaining these species in the forest. Woodland salamanders, including the green salamander, thrive best under old growth forest conditions.

8.6 Forest Game Birds and Mammals

Forest game birds and mammals include the following species: ruffed grouse, wild turkey, black bear, white-tailed deer, fox squirrels, gray squirrels and red squirrels as well as 13 species of furbearers. Due to the fact that 99% of the Potomac-Garrett State Forest is classified as forestland, these species are common residents of the forest ecosystem. The following is a brief status report for each individual species.

8.6.1 White-tailed 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 principal spring and summer foods. Their home range seldom exceeds 300 acres where food, cover and water are interspersed (U.S. Dept. of Agriculture, 1974). During severe winter conditions, deer concentrate in "deer yards." These areas have been identified on the Potomac-Garrett State Forest as "special habitats." Deer populations are stable, and within carrying capacity, on Potomac-Garrett State Forest and adjacent private properties. The present effects of the gypsy moth may continue to increase deer habitat by producing cover and browse. However, the loss of oak sprouting and acorn mast may have negative effects on deer, and other species populations over the long term.

Potomac-Garrett State Forest continues to be a favorite destination for deer hunters. In the 2009-10 hunting season, 271 deer were reported harvested from Potomac-Garrett State Forest.

This is almost 5% of the total countywide reported harvest. The harvest numbers continue to remain steady over the last several years.

8.6.2 Ruffed Grouse

This game bird prospers in the early stages of forest succession, but uses mature stands as well. Grouse use fruit, seed, catkins, buds and green parts of over 300 plants for food. Broods require insects from late May through July. Thickets, vine tangles and dense shrub growth provide reproductive or drumming habitat and for escape cover. Nesting cover is usually open understories near drumming logs and openings or old logging roads that serve as brood range. Home range is 40-50 acres (U.S. Department of Agriculture, 1974). Ruffed grouse populations generally benefit from most silvicultural practices that encourage early successional stage forest habitat. They particularly benefit from regeneration harvests in even-aged stands. As with the white-tailed deer, the present effects of gypsy moth could have a positive impact on grouse habitats. Populations tend to be less cyclic in the Appalachian Region, which includes Potomac-Garrett State Forest. Loss of habitat to maturing forest has likely resulted in the decreased population and hunting success in western Maryland over the last few decades. Reproductive success has also been poor due to very wet springs that lead to high poult mortality. Overall, ruffed grouse populations remain stable on Potomac-Garrett State Forest.

Potomac-Garrett State Forest continues to be a primary destination for grouse hunters in Maryland. Garrett County has maintained the best populations of grouse in the state. The continued harvest of timber provides the necessary regeneration for good grouse reproductive habitat. The high stem density that occurs 10-15 years after a regeneration harvest provides optimum habitat for grouse. This combined with grape thickets and good mast production found on PGSF provides the cover and winter food that keeps grouse populations strong and provides a popular hunting destination for grouse enthusiasts throughout the tri-state area.

8.6.3 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 primary food source of the gray squirrel is nuts - acorns, hickory nuts, beechnuts, walnuts, and hazelnuts (Herritt, 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 85% of the Potomac-Garrett State Forest is comprised of immature to mature 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.

Conversion of the tree species complex on Potomac-Garrett State Forest through harvest regeneration that favors maple and cherry over oak or loss of oak species through gypsy moth defoliation will result in poorer gray squirrel habitat over time. Gray squirrels are heavily influenced by the amount and diversity of acorns that are produced in the forest.

8.6.4 Fox Squirrel

Like the gray squirrel, the fox squirrel resides in deciduous forests characterized by an abundance of seed-producing trees. The habitat preference of the fox squirrel and the gray squirrel is common in heavy forests with a well-developed understory, whereas the fox squirrel prefers open woods or forest edges with a poorly developed understory. Small woodlots with park-like conditions adjacent to cultivated fields or orchards are favored habitats for the fox squirrel (Nerritt, 1987). The fox squirrel is uncommon on the Potomac-Garrett State Forest due to the lack of preferred habitats that exist there. Increased and timely intermediate tree harvests could improve and expand fox squirrel habitat.

8.6.5 Red Squirrel

Although the red squirrel reaches maximum abundance in mature, closed-canopy, coniferous forests of white pine and hemlock, it can also be found in mixed forests and pure deciduous woodlots. In mixed forests such as exist on Potomac-Garrett State Forest, both the red and gray squirrel may co-exist, but in this situation, the red squirrel tends to be restricted to coniferous growth, while gray squirrels select deciduous areas in the same forest (Merritt, 1987). Due to the scattered stands of hemlock and pine plantations that exist on the Potomac-Garrett State Forest, the red squirrel is probably locally common within these conifer stands.

8.6.6 Black Bear

Although black bears were common throughout Garrett County in colonial times, they have existed in very low population numbers throughout most of the present century. In May and June 2005, DNR conducted western Maryland's most recent black bear population survey. A DNA-based mark-recapture study was conducted across Garrett and Allegany counties. A similar study had been conducted in 2000. The results of the DNA analysis were entered into Program MARK which yielded a population estimate of 362 adult and sub-adult bears across the study area. The 95% CI ranged between 242 and 482 animals. Currently, Maryland has a resident, breeding black bear population in Garrett, Allegany, Washington, and Frederick counties.

The prevailing characteristic of black bear habitat is forest cover interspersed with Small clearings and early stages of forest succession (U.S. Department of Interior, 1987). Mixed stands of conifers and hardwoods supporting a dense, brushy understory in close proximity to wetlands represent optimal black bear habitat. The bear selects prime habitats on the basis of availability of food and den sites and inaccessibility to humans. Except for humans and their dogs, the black bear has few enemies (Merritt, 1987).

Black bears are habitat generalists and will generally benefit from most common silvicultural practices. Bears are considered common throughout all of Garrett County and utilize all areas of Potomac-Garrett State Forest. The extent and age of the forestland, the preponderance of wetland and the occurrence of dense rhododendron thickets such as is found on Potomac-Garrett State Forest provides the best black bear habitat of any state owned land in Maryland. A major management consideration is that black bears have large home ranges as compared to many wildlife species that spend their entire lives within the boundaries of the forest. Male black bears commonly range over 50 square miles. It will be difficult to manage for black bears on the

Potomac-Garrett State Forest without considering the impact of adjacent private land habitats.

8.6.7 Wild Turkey

Good turkey habitat contains mature stands 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 diets consist 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).

Potomac-Garrett State Forest offers good wild turkey habitat. Probably the greatest limiting factor is that only 1% of the forest is classified as openland. Few acres of the Potomac-Garrett State Forest is maintained in permanent wildlife openings. Additional acres of utility rights-of-way provide marginal turkey brood habitat. Of course some of this lack of openland area is compensated for by nearby openings on private lands. A cursory GIS exercise shows that there is at least some limited potential for brood habitat within the annual range of turkeys throughout the forest. The large wildland areas are most lacking in available brood habitat. Converting reclaimed log landings to permanent herbaceous cover would improve brood habitat for turkeys in many areas of the State Forest.

If large scale hardwood mortality occurs due to gypsy moth defoliation, this will have a negative effect on the wild turkey population; as would any habitat change that would reduce mast production. The long-term decline in oak species regeneration following harvest or gypsy moth defoliation will have a negative effect of turkey populations. Any management toward maintaining healthy oak stands will benefit wild turkeys.

8.7 Upland Game Birds and Mammals

For the purpose of the Potomac-Garrett State Forest planning effort, the following wildlife species will be classified as upland game: mourning dove, American woodcock, eastern cottontail, New England cottontail and snowshoe hare.

8.7.1 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. They are less numerous in dense forests with poorly- developed ground covers of herbaceous plants and in very open grassland (Merritt, 1987). The eastern cottontail is not a common wildlife species to be found throughout Potomac-Garrett State Forest because 85% of the forest is 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. Areas with severe gypsy moth mortality may provide a short term increase in eastern cottontail populations. The eastern cottontail was a more sought after game species a few decades ago when habitats were more suitable and populations were higher.

8.7.2 New England Cottontail

The New England cottontail prefers dense forests, as compared with the eastern cottontail. The plant communities in which it resides vary from coniferous to deciduous forests with lush herbaceous ground cover. It generally inhabits forests at high elevations (Merritt, 1987). Chapman et. al., 1973, reported that New England cottontail is not common to Maryland and their status is not clearly known. Chapman found no location of New England cottontail in either Allegany or Washington County. However, in Garrett County, a small population was found in Savage River State Forest. This site was characterized as a northern hardwood forest, but contained large tracts of conifers, rhododendron and mountain laurel.

Very little is known about the New England cottontail and virtually nothing has been developed in the way of management criteria (Chapman, et. al., 1978). Though not documented in Potomac-Garrett State Forest, there is potential that it occurs here, though rarely.

8.7.3 Snowshoe Hare

The snowshoe hare is indigenous to boreal forests throughout North America. In Pennsylvania, it is most common in mountainous sections in the northern part of the state where it inhabits high ridges marked by mountain laurel and rhododendron. Although suitable habitats are present in the Appalachian Plateau of southwestern Pennsylvania, the snowshoe hare is rare there (Merritt, 1987). There is historical data for snowshoe hare in Garrett County and Potomac-Garrett State Forest, and a small remnant population may exist. There is no current documentation or survey data to indicate a surviving population, though some attempt at reintroduction was made in the 1970's. The snowshoe hare is still listed as a game species in Maryland with a closed season.

8.7.4 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 midwestMidwest 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 Allegheny Mountain regions of Maryland including Potomac-Garrett 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). A habitat does exist for American woodcock in Potomac-Garrett State Forest, but it is only a small percentage of the total forest, since 85% of the forest is at the immature to mature age class. Any silvicultural efforts creating early successional stage habitats near wetlands or moist soil and flood plain areas would be of benefit to woodcock populations.

As part of the Appalachian Mountain Woodcock Initiative (AMWI), there will be a concentrated effort to improve habitat for the American woodcock in Potomac-Garrett State Forest. Specific plans and area will be determined following a GIS exercise to determine best potential areas for

implementing habitat alterations to benefit American woodcock. The strategy will be to incorporate Best Management Practices as outlined by AMWI. Areas of Potomac-Garrett State Forest may serve as public demonstration and education areas for showcasing woodcock management BMP's.

8.7.5 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. 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 Potomac-Garrett State Forest. Low populations may exist adjacent to openlandopen land habitats or near private agricultural lands adjacent to the forest.

8.8 Waterfowl

Aquatic habitats located within and surrounding Potomac-Garrett State Forest support several species of waterfowl. Open water areas include the many creeks and beaver ponds as well as several swamps. Waterfowl use these habitats for 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 protected shorelines using cattails, grassy areas and fallen logs for cover. Mallards are highly adaptive feeders that 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 Potomac-Garrett State Forest (Win. 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.

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

Current management of waterfowl in the Potomac-Garrett 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.

8.9 Aquatic Furbearers

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

8.9.1 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 modern wildlife management and its own prolific breeding habits, the beaver has successfully repopulated much of its former range.

Beavers are found throughout Western Maryland and are highly concentrated in sections of Potomac-Garrett 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 plentiful throughout Potomac-Garrett State Forest. Regulated trapping and mandatory tagging provide useful data on beaver harvests and subsequent populations.

8.9.2 Muskrat

Muskrats live on or near still or slow moving water of ponds, marshes, streams, rivers and to a lesser extent, the faster mountain streams. They build lodges of vegetation or burrow into stream banks and dams. Both lodges and burrows have underwater entrances. Muskrats 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 sub-optimal and subsequent population levels range from low to moderate.

8.9.3 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 stream banks of rivers and dive to locate aquatic animals. Prey includePrey includes 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 Potomac-Garrett. Studies indicate an individual mink requires approximately three miles of stream on the riverbank.

8.9.4 River Otter

The river otter is an elusive aquatic member of the weasel family. They are semi-aquatic and utilize most healthy wetland systems, ranging from trout streams to beaver ponds to marshes. River otter feed predominantly on fish, but will also consume crustaceans, mollusks, amphibians,

reptiles and other small animals when locally abundant. Otters were once found in watersheds across the State. At present, breeding populations are limited to Maryland's Eastern Shore. The presence of river otters in Garrett and Allegany counties is the result of a reintroduction program that took place throughout the 1990s. During that time, otters had been re-introduced to one location in Garrett County near Potomac-Garrett State Forest. Potomac-Garrett State Forest contains watersheds that are contain extremely valuable otter habitat. River otters are now considered rather common throughout Garrett County and the Potomac-Garrett State Forest.

8.10 Upland Furbearers

8.10.1 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 Potomac-Garrett 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 or rock outcroppings are utilized by raccoons.

8.10.2 Spotted Skunk

Garrett County is near the northeastern limit of the spotted skunk in North American and so this skunk is sighted occasionally in Maryland. The eastern spotted skunk resides in oak forests mixed with hickory, locust and pine marked by dense tangles of wild grape. Although it has not been documented to date, this habitat type exists in Potomac-Garrett State Forest and this species may occur there.

8.10.3 Red Fox

The red fox is associated with brushy early successional areas such as old fields, pasture borders and rolling farmland, usually close to water. Some of these habitat types occur on private in-holdings (powerlinepower line, gas wells, etc.) in Potomac-Garrett State Forest and a few are found on the forest. Due to the limited acreage of preferred habitat, the red fox is present, though not abundant.

8.10.4 Gray Fox

The gray fox is closely affiliated with hardwood forest typified by rock terrain and 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. As most of Potomac-Garrett State Forest provides this type of habitat, it can probably be assumed that the gray fox is generally common and well distributed throughout the forest.

8.10.5 Fisher

The fisher is associated with large tracts of mixed hardwood and coniferous forest, usually in isolated mountain regions. It dens in hollow trees or logs, in abandoned animal dens or under large boulders. Fisher populations have been growing throughout the county as well as

Potomac-Garrett State Forest. Fishers were relocated in both neighboring West Virginia and Pennsylvania and have expanded throughout Garrett County from these relocations. The fisher population has grown and the bag limit was raised to 2 per season. Trappers from throughout the state travel to Garrett County and Potomac-Garrett State Forest for an opportunity to catch fishers. Maintaining a variety of habitat types within a forest ecosystem will ensure quality habitat for fishers.

8.10.6 Long-tailed Weasel

The long-tailed weasel lives in a diversity of habitats ranging from mature forests to marshes and farmlands. It is highly carnivorous and shows a preference for sSmall animals, which make up 95% of its diet. Although population status has not been determined, wildlife biologists believe it to be common and well-distributed throughout Potomac-Garrett State Forest.

8.10.7 Bobcat

Optimal bobcat habitat is woodland interrupted by brushy thickets, old fields and rocky outcrops. Isolation from human activity and availability of prey and den sites are key factors determining habitat selection. A bobcat population study conducted in 1986-87 by the DNR indicated that this feline will use all habitat types in Potomac-Garrett State Forest. Sightings have been documented throughout forest.

Feldhamer et al. (1984) stated that although there is no question that the density of bobcats in Maryland is significantly reduced from colonial days, there probably are more individuals in Maryland than commonly believed. The Wildlife and Heritage Service is currently participating in a research project with Frostburg State University to better understand the population and range of bobcats in Maryland.

8.11 Management Objectives and Strategies

The DNR commonly considers and manages wildlife in broad categories based on the habitats that they prefer. Game species as mentioned include forest game such as white-tailed deer, black bears, gray and fox squirrels, ruffed grouse and wild turkeys and upland species such as eastern cottontail, American woodcock and morning dove, as well as wetland species such as aquatic furbearers and waterfowl. Habitats for these groups of species can be managed to provide all the requirements of the group. Though some species have very specific habitat requirements, many of the species will use similar habitat components that are beneficial for the group. The objectives and strategies listed will provide both the specific and general habitat requirements of the species within the groups.

8.11.1 Forest Game Species

<u>Objective:</u> Create and maintain 20% of manageable area in early successional forest habitat.

Strategies:

- Regularly use silvicultural forest management practices, either commercial or non-commercial, to maintain early succession forest habitat.
- Target regeneration of aspen stands and maintain them in the sapling stage by cutting and regenerating pole size trees to promote root sprouts.
- Focus early succession habitat maintenance along edges of fields, permanent wildlife openings, power line rights-of-way, and road edges.

Objective: Maintain a structurally diverse forest that provides habitat for a variety of wildlife species.

Strategies:

- Use Best Management Practices to maintain forest cover and protect soils from erosion on steeper slopes.

- Use BMP's and appropriate silviculture techniques to maintain various age classes. of forest habitat from seedling-sapling to older forest.

Objective: To manage older forest habitat for long term wildlife food production and promote acorns and other hard mast production.

Strategies:

- Complete comprehensive and detailed forest inventory and maintain a significant oak component throughout the forest.
- Conduct timber harvest and site preparation to focus on improving the oak component and ensuring oak regeneration in future stands.
- Conduct crop tree management to improve oak survival and improve hard and soft mast production throughout. This will also improve understory regeneration, cover, and vertical structure beneficial for a variety of forest wildlife species.

Objective: Maintain and protect the spring seeps, drainages and water quality for invertebrates as well as to provide winter habitat for turkeys and other species that will benefit from the springs in the area.

Strategies:

- Delineate and maintain adequate buffers along all springs and drainages to protect their ecological integrity.
- Utilize Best Management Practices for forest harvest operations.
- Seek opportunities to acquire property, easements, or work with landowners and municipalities to prevent watershed degradation.
- Monitor water quality conditions, invertebrate populations, and threats and adjust plans as necessary.

8.11.2 Upland Habitat

Objective: Create and maintain upland and early successional habitat.

Strategies:

- Maintain the open herbaceous cover and crops beneficial to wildlife. A variety of crops should be used to benefit different species of wildlife at different times of the year. Perennial grass and clover plantings should be a priority to provide soil stabilization, forage, and game bird brood habitats. Plantings should include annual grains that will remain available in winter and stand up under snow.
- Throughout spring and summer, mow and maintain strips of herbaceous cover at less than a 6-8 inch height. Mowing will begin prior to nesting season and be maintained throughout summer to provide breeding habitat for Eastern cottontails.
- Maintain warm season grasses for Eastern cottontail nesting and escape cover and wildlife habitat demonstration.
- Continually monitor and maintain early succession edge habitat around field edges.
- Maintain and expand aspen and hawthorn thickets by releasing and regenerating as necessary.
- Regularly use forest management practices, either commercial or non-commercial, to maintain early succession forest habitat at field edges.
- Complete routine annual assessments of plantings and available cover crops and adjust annual work plans accordingly.
- Monitor and coordinate habitat programs with the Appalachian Mountain Woodcock Initiative.
- Consider management actions to enhance habitat for nesting Golden-winged Warbler.

Objective: Maintain upland field edge habitat and orchards.

Strategies:

- Release and prune apple trees to encourage fruit production.
- Maintain “soft” field edges by cutting back field edges 50-75 feet.
- Continue to rotationally plant and mow herbaceous openings.
- Evaluate plantings and edge effects and adjust plans as necessary.
- Consider management actions to enhance habitat for nesting Golden-winged Warbler.

8.11.3 Recreation Objective

Objective: Provide quality access for wildlife dependant recreation, particularly deer firearm season.

Strategies:

- Conduct regular maintenance to roadways, parking areas, and signboards.
- Seek critical maintenance funding when available.
- Coordinate with Engineering and Construction for road maintenance specifications.
- Limit motorized access to the period of highest user demand.

8.12 Rare Threatened and Endangered Wildlife Species

According to the Maryland DNR, Wildlife and Heritage Service the following is a summary of current and historical rare, threatened and endangered animal species found on Potomac-Garrett State Forest within Garrett County.

Animals:

Planarians:	
A Planarian, *Procotyla typhlops*	E
Crustaceans:	
An Isopod, *Caecidotea alleghenyensis*	E
Allegheny Cave Amphipod, *Stygobromus allegheniensis*	I
Franz's Cave Amphipod, *Stygobromus franzi*	I
Insects (Coleoptera):	
Appalachian Tiger Beetle, *Cicindela ancocisconensis*	E
Insects (Lepidoptera):	
Pepper-and-salt Skipper, *Amblyscirtes hegon*	I
Harris' Checkerspot, *Chlosyne harrissii*	T
Early Hairstreak, *Erora laeta*	E
Atlantis Fritillary, *Speyeria atlantis*	T
Amphibians:	
Green Salamander, *Aneides aeneus*	E
Wehrle's Salamander, *Plethodon wehrlei*	I
Mountain Chorus Frog, *Pseudacris brachyphona*	E
Reptiles:	
Northern Coal Skink, *Eumeces anthracinus*	E

Mountain Earthsnake, *Virginia valeriae pulchra*	E
Birds:	
Northern Goshawk, *Accipiter gentilis*	E
Blackburnian Warbler, *Dendroica fusca*	T
Alder Flycatcher, *Empidonax alnorum*	I
Nashville Warbler, *Vermivora ruficapilla*	I
Mammals:	
Porcupine, *Erethizon dorsatum*	I
Bobcat, *Lynx rufus*	I
Southern Rock Vole, *Microtus chrotorrhinus carolinensis*	E
Least Weasel, *Mustela nivalis*	I
Allegheny Woodrat, *Neotoma magister*	E
Long-tailed Shrew, *Sorex dispar*	I
Smoky Shrew, *Sorex fumeus*	I
Southern Water Shrew, *Sorex palustris punctulatus*	E
Appalachian Cottontail, *Sylvilagus obscurus*	I

I = In Need of Conservation (designation for animals only)
T = Threatened
E = Endangered

Please Note: There are a number of rare animals tracked by the Maryland Natural Heritage Program that are not officially State listed that occur on PGSF.

8.13 Fishery Assessment

The fishery resource of the Potomac-Garrett State Forests can be divided into three general categories:

- Wild reproducing populations of brook and brown trout that provide a year-round recreational fishery. These species are also important indicators of water quality.

- Stocked adult hatchery brown and rainbow trout that provide a seasonal recreational fishery; and stocked fingerling brown trout that support a "put and grow" trout fishery.

- Non-game fish species that are not sought by anglers but are important indicators of water quality.

8.13.1 Wild Brook Trout and Brown Trout General Statewide Trout Fishing Regulations

Native brook trout are the premiere game fish found in the PGSF. A two-fish daily creel limit is in effect on wild trout streams; however harvest of this species is not encouraged. Their distribution and population numbers are intensively researched by the Inland Fisheries Service. In general, trout densities are directly related to habitat quality. Low numbers or absence of wild trout tends to reflect the marginal quality of habitat in a particular stream. The following criteria are important to good trout habitat:

- cold water temperatures (maximum < 68° F).

- minimal sediment loading to protect incubating trout eggs and the benthic macroinvertebrate community by maintaining vegetated banks free from livestock grazing, protected buffer zones, and by implementing rigorous sediment controls on all road construction and maintenance, agricultural activities, and timber harvest operations.

- stream pH > 6.0. Low pH in Garrett County can usually be attributed to acid mine drainage and from atmospheric deposition (acid rain).

The wild trout fishery in the following streams are regulated under statewide general trout fishing management: two-trout daily creel limit, no minimum size restriction, and no bait or tackle restrictions (MD DNR Sportfishing Guide 2010).

Bradshaw Hollow Run
Brook trout are present in low numbers near the mouth; however a stream blockage at a culvert crossing on PGSF road limits upstream habitation.

Laurel Run, including Trout Run and Riley Spring Run
No trout were present in Laurel Run or Trout Run in 1973 as acid mine drainage (AMD) affected the watershed. After AMD reclamation projects were completed, brook trout re-colonized the stream system from unaffected unnamed tributary streams. A small population of brown trout exists in Laurel Run, the result of fingerling brown trout stockings by the Nemacolin Chapter of Trout Unlimited during the late 1980's. Brown trout are not native to Maryland, and the Inland Fisheries Service has made a policy to not stock brown trout in streams where viable populations of brook trout exist. A 2003 survey showed that brook trout populations are found in Laurel Run and its two tributaries, Trout Run and Riley Spring Run.

Crooked Run
A reproducing brook trout population exists in this stream.

Lostland Run, including North and South Prong
The Lostland Run watershed was polluted by AMD and devoid of trout and other associated coldwater fish species as recently as 1979. By 1983 brook trout re-colonized the North and South Prongs of Lostland Run. The Maryland Department of Environment's Bureau of Mines has operated a limestone doser on the South Prong of Lostland Run since 1992 to treat AMD in

the watershed. Viable brook trout populations are now found in all three stream reaches.

Elklick Run
A tributary to Jennings Randolph Lake, the upper portion of the watershed is located on the PGSF. A baseline biological study was conducted in 1996 to document stream conditions as part of an AMD restoration plan. Brook trout were present in low numbers near the mouth upstream to a natural fish blockage. The four upstream stations were fishless due to the effects of AMD.

Folly Run
A high-density brook trout population exists throughout the stream. The headwater area is located within the PGSF while the lower portion of the stream is within the MD DNR Fisheries Management Area property.

Laurel Run (downstream of Jennings Randolph Lake)
This stream supports a reproducing brook trout population. Hatchery-origin brown and rainbow trout were present in the stream from North Branch Potomac River stockings during 2001.

Brook Trout Zero Creel Limit
MD DNR Inland Fisheries Service implemented a Brook Trout Zero Creel Limit Fishing Area that includes a year-round catch-and-release for brook trout; two-fish per day creel limit for brown and rainbow trout; artificial lures only regulation for the upper Savage River watershed, effective January 1, 2007. ***Crabtree Creek*** within the PGSF is managed as part of the Brook Trout Zero Creel Limit Fishing Area as discussed in Chapter 910.

8.13.2 Stocked Trout Recreational Fishery

Delayed Harvest Trout Fishing Area
The diversity and abundance of fish in the North Branch Potomac River (NBPR) upstream of Jennings Randolph Lake (JRL) has increased dramatically since limestone doser technology was implemented in the watershed beginning in 1993. Stockings of adult hatchery rainbow trout began in 1994, immediately creating the first recreational fishing opportunity in the upper NBPR in many decades. The eight-mile portion of the ***North Branch Potomac River bordering the Potomac State Forest is managed as a Delayed Harvest Trout Management Area,*** and receives spring and fall stockings totaling about 6,000 adult rainbow trout. Regulations include a catch and return season from October 1 through June 15 with the use of artificial lures and flies only. From June 16 through September 30, the daily creel limit is five trout per day, no minimum size restriction, and no bait restrictions. Temperature in the river during mid-summer limits trout survival, thus harvest is allowed during this time period to gain maximum use of the stocked trout. This special trout fishing area has become one of Maryland's more popular fishing destinations due to its exceptional scenic value and sense of remoteness

Put and Take Trout Fishing Areas
Streams managed as recreational Put and Take Trout Fishing Areas generally cannot support trout due to a limiting factor such as high summer in-stream temperatures. However, during the

cool spring months, the stocking of adult trout can provide a high-use recreational trout fishery. A five-fish daily creel limit with no bait restrictions is in effect for these streams and stream closures may apply to allow for trout stocking. ***Herrington Creek*** is stocked annually with about 480 catchable-size brown and rainbow trout, and ***Muddy Creek*** receives about 1,920 brown and rainbow trout. Muddy Creek is also stocked with about 2,000 fingerling brown trout each fall as part of a trout fishery restoration plan that is discussed in Chapter 10.

8.13.3 Non-Game Fish Species

Fish species diversity is an excellent means of monitoring water quality in the Potomac-Garrett State Forests. A list of common and scientific names of fish species collected in PGSF waters are presented in Table 8.1. Twenty three fish species have been documented in streams and rivers within the PGSF, which drains into the Potomac River Basin and the Youghiogheny River Basin. Bull Glade Run and Murley Run are acidified due to acid deposition and do not support fish populations.

Table 8.13 1. List of Common and Scientific Names of Fish Found Within the Potomac-Garrett State Forest Waterbodies of the Youghiogheny and Potomac River Watersheds.

Common Name	**Scientific Name**
Central stoneroller	*Campostoma anomalum*
Golden shiner	*Notemigonus crysoleucas*
Blacknose dace	*Rhinichthys atratulus*
Longnose dace	*Rhinichthys cataractae*
Creek chub	*Semotilus atromaculatus*
River chub	*Nocomis micropogon*
White sucker	*Catostomus commersoni*
Rainbow trout	*Oncorhynchus mykiss*
Brook trout	*Salvelinus fontinalis*
Brown trout	*Salmo trutta*
Potomac sculpin	*Cottus girardi*
Blue Ridge sculpin	*Cottus caeruleomentum*
Mottled sculpin	*Cottus bairdi*
Brown bullhead	*Ameiurus nebulosus*
Rock bass	*Ambloplites rupestris*
Green sunfish	*Lepomis cyanellus*
Pumpkinseed	*Lepomis gibbosus*
Bluegill	*Lepomis macrochirus*
Black crappie	*Pomoxis nigromaculatus*
Smallmouth bass	*Micropterus dolomieu*
Largemouth bass	*Micropterus salmoides*
Fantail darter	*Etheostoma flabellare*
Chain pickerel	*Esox niger*

Total Species = 23	

Chapter 9 - Public Use & Education

9.1 Background

Potomac-Garrett State Forest is an integral component of a larger greenway system that connects other public and private forest, state and local county parks and state wildlife management areas. These sites, in addition to their natural, cultural and historic values, provide a variety of recreational opportunities. Decisions affecting public uses (recreational opportunities) on Potomac-Garrett State Forest are integrated into management decisions that are consistent with the following resource goal as stated in chapter 1: *"Provide opportunities for the enjoyment of the natural resources on the Forest by making appropriate areas available for resource-based, low impact recreational activities and environmental education programs that are consistent with the resource values of the Forest."*

9.2 Current and Future Public Uses

The demand both nationwide and locally indicate that outdoor recreational activities such as camping, hiking, horseback riding, wildlife viewing, hunting, fishing, off-road vehicle? use, canoeing and kayaking continue to be popular. The public's pursuit of these activities continues to play a major role in Maryland's economic growth and tourism industry. Therefore, all future public use proposals will be evaluated based on the resource goal stated above to determine their compatibility with:

- The implementation of sustainable forest management;
- The conservation of wildlife;
- The conservation of plant and animal habitats and other sensitive areas;
- The maintenance of water quality;
- And the protection of cultural resources.

The primary types of public use to be encouraged on the Potomac-Garrett State Forest include activities such as camping, hiking, hunting, fishing, birding, horseback riding, nature/wildlife observation, environmental education, trapping and access for canoeing and kayaking. In select cases, minimal development may be undertaken to provide and maintain off-road vehicle trails, mountain bike trails, hiking trails and disabled hunter access trails.

9.2.1 Camping

Primitive camping is a significant recreational use of the state forest, with a magoritymajority of our users choosing to camp and then pursue a many of the other outdoor recreation options offered at the forest; hunting, fishing, hiking, bird watching, etc. The forest offers 50 primitive roadside campsites distributed in five of the management complexes, including the Wallaman, Laurel Run, Lost Land Run, Piney Mtn. and Snaggy Mtn. areas of the forest. Campsites include

a picnic table, fire ring, and lantern post. Each of the five areas include a number of individual campsites designed to accommodate up to 2 camping units and 8 guests; there is one group camping site, a trail shelter campsite, and a sanitary vault toilet facility.
Back country camping is available by permit, allowing for backpack camping into undeveloped areas of the forest.

Developed campsites are monitored for site degradation through soil compaction, erosion, and vegetation impacts. Limits of acceptable change are determined and sites are closed or 'rested' as needed.

9.2.2 Hunting

Wildlife populations must be managed to ensure a healthy forest. Therefore, public hunting opportunities will be provided to limit population growth of game species and ensure the protection of the forest and other habitat areas. This plan attempts to identify the proper combination of hunting as well as other appropriate recreational use. The forest is open to hunting and fishing in season. The important forest game birds and mammals include the following species: wild turkey, white-tailed deer, and gray squirrels. Due to the fact that 96% of the forest is classified as forestland, this group of wildlife species is common throughout the forest. Trapping on portions of the PGSF for furbearers is permitted through the issuance of a trapping permit.

Upland game birds and mammals are not as common on the forest, but do provide for hunting opportunities. Low populations of eastern cottontail rabbit, mourning dove, and American woodcock can be found in recently cutover areas, open land habitats that exist on the forest or near private agricultural lands adjacent to the forest.

Aquatic habitats located within and surrounding the forest support several species of waterfowl. Wood ducks and mallards are the most common species.

Hunting with rifles, handguns, shotguns, bows and muzzleloaders are permitted in all designated areas in accordance with State and Federal laws. Possession or use of weapons is prohibited in State Forests outside of regular open hunting season. All game birds and game mammals may be hunted. Game shooting stands are limited to those of a temporary nature, which must be removed or dismantled at the end of each day. The hunting season in State Forests conforms to standard hunting seasons adopted by State and Federal regulations

9.2.3 Target Shooting

Target shooting is prohibited, except at designated shooting ranges; PGSF presently offers a 30 target 3-D Archery Range located behind the Forest Headquarters. For a modest fee, the range offers hunters and competitive shooters an opportunity to hone their shooting skills in a safe and controlled natural setting.

As hunting is one of the primary recreational uses of the forest, there has long been a demand for

a safe area for hunters to sight in their rifles and/or to practice shooting skills. This demand has led visitors to set up impromptu ranges in various locations throughout the forest, often with little regard for resources beyond immediate view. Visitors have been routinely directed to use the well developed and safe range facilities at the Savage River State Forest. Demand from the hunting community and at the recommendation of the State Forest Citizen Advisory BoardCommittee, a Firearms Shooting Range has been proposed for the Snaggy Mtn. Complex. Range design and development will be pursued as resources are made available.

9.2.4 Hiking, Biking Horseback Riding, Nature Observation and Off Road Vehicles

Although hunting is the most popular activity there is an extensive forest road and trail system on the Potomac-Garrett State Forest that offers ample opportunities for hiking, biking, horseback riding and nature observation. These activities will be encouraged on all complexes provided there are no other resource or user conflicts. Foot traffic is welcome on all areas of the state forest unless posted otherwise. (For example, safety zones posted around archery range.) All other means of travel are restricted to designated, developed and maintained trails and roads designed to accommodate recreational use, while limiting natural resource impacts.

9.2.5 Potomac-Garrett State Forest Trail / Road System

The Potomac-Garrett State Forest has a diverse network of some 59 miles of multi-use trails and roads. Permitted use on any given trail is dependent upon trail location and site suitability. All new trail system proposals as well as maintenance work will be submitted and reviewed through the Annual Work Plan process.

The following list is an inventory of existing trails that may be hiked, biked, or backpacked within Potomac-Garrett State Forest; including a brief description of each trail, length, degree of difficulty, and brief bit of info about the trail. (The trails that may be utilized by ORV or snowmobiles have a special statement in each description.)

Snaggy Mtn. Complex

Snaggy Mtn. Road/ORV Trail 3.2 miles
Improved gravel road which provides vehicle access to campsites and day use areas.

Watchable Wildlife Trail .25 miles
Foot traffic only.

Snaggy Mtn. Ski Trails 6.7 miles
Groomed skiing surface when snow is present, and in the off season, these trails are great for other non-motorized use.

Snaggy Mtn. Snowmobile Trail 8.5 miles (includes the 3.2 miles of Snaggy Mtn. ORV Trail)
A network of unimproved forest roads. When snow is not present, the trail is great

for non-motorized activities.

Herrington Creek Handicapped Hunter Access Road .5 mile
Improved gravel road open to vehicle traffic, with a permit, during the hunting season. Non-motorized use welcome year round.

Maple Glade Handicapped Hunter Access Road .25 mile
Improved gravel road open to vehicle traffic, with a permit, during the hunting season. Non-motorized use welcome year round.

Maple Glade Road 1.9 miles
Improved gravel road that provides access to Swallow Falls State Park.

Maple Glade Fishermen's Access Trail 0.5 miles

5-1/2 Mile Hiking Trail 5.5 miles
Unsurfaced trail, width varies from single track, to two track, un-groomed skiing during the winter. Non-motorized use only

Toliver Trail .7 mile
Unimproved forest access road.

Maryland Bicentennial Oak Trail .3 mile
Unsurfaced forest road, non-motorized use only.

Wilderness Ranch Access Trail 1.8 miles
Unsurfaced forest road, non-motorized use only

<u>Wallman / Laurel Run Complex</u>

Wallman Road/ORV Trail 3.9 miles
Improved gravel road which provides vehicle access to campsites, day use areas, and fishing areas.

Laurel Run Road/ ORV Trail 2.4 miles
Improved gravel road which provides vehicle access to campsites, day use, and fishing areas.

Laurel Run Road/Wallman Road Snowmobile Trail System 10.2 miles
Includes:
Wallman Road 3.9 miles
See above description

Laurel Run Road 2.9 miles
See above description

Loop Road 2.6 miles
Partially improved forest access road. When snow is not present non-motorized use welcome.

Bradshaw Hollow Road 0.8 miles
Unimproved forest access road. When snow is not present, non-motorized use welcome.

Loop Road Handicapped Hunter Access Road 1.1 miles
Improved gravel road open to vehicle traffic, with a permit, during the hunting season. Non-motorized use welcome year round.

Lostland Run Complex

Lostland Run Road / Trail 3.0 miles
Improved gravel road which provides vehicle access to campsites, day use, and fishing areas.

Lostland Run Hiking Trail 3.5 miles
Single track trail, foot traffic only.

CCC Fish Rearing Ponds Trail .5 mile
Single track, non-motorized use only.

Overlook Trail .25 mile
Semi-improved forest access road, non-motorized use only.

Potomac Cliffs Trail .25 mile
Single track, foot traffic only.

Eagle Scout Trail .25 mile
Interpretive trail, non-motorized use only.

Eagle Rock Handicapped Hunter Access Trail .25 mile
Improved gravel road open to vehicle traffic, with a permit, during the hunting season. Non-motorized use welcome year round.

North Hill Complex

North Hill Road/Trail 2 miles

Semi-improved dirt/gravel road, open during the hunting seasons to vehicle traffic, non-motorized use welcome year round.

Backbone Mtn. Complex

Burkholder Road/ORV Trail 2.7 miles
Improved gravel road.

Backbone Mtn. Snowmobile Trail System 4 miles
A network of unimproved forest roads. When snow is not present, the trail is great for non-motorized activities. This system also includes a portion of the Burkholder ORV Trail.

Burkholder Road Snowmobile Trail 2.7 miles
Improved gravel road.

Backbone Mtn. Handicapped Hunter Access Road .75 miles
Improved gravel road open to vehicle traffic, with a permit, during the hunting season. Non-motorized use welcome year round.

Piney Mtn. Complex

Piney Mtn. Road/ORV Trail 1.7 miles
Improved gravel road which provides vehicle access to campsites and day use areas.

Piney Mtn. Snowmobile Trail 2.5 miles
Unimproved forest road, a portion of a powerline right of way, and also includes the entire Piney Mtn. Road/Trail. When snow is not present, non–motorized use welcome.

Piney Mtn. Handicapped Hunter Access Road .5 mile
Improved gravel road open to vehicle traffic, with a permit, during the hunting season. Non-motorized use welcome year round.

Hutton Complex

Kindness Demonstration Area Handicapped Hunter Access Road 1.2 miles
Improved gravel road open to vehicle traffic, with a permit, during the hunting season. Non-motorized use welcome year round.

9.2.6 Potomac-Garrett State Forest Off Road Vehicle (ORV)Trail

The ORV trails on State Forest property were established in 1976 under MD Annotated Code

5-209 and DNR Regulation 08.01.03. The initial establishment and location of these trails (in the 1970's) met the criteria of the regulation as known by local field staff at that time.

Over recent years, the importance and management of certain natural communities on our State Forest have become more clearly defined on the landscape. The Department is mandated under both the ORV regulation and the Annotated Code to protect any known "unique" natural areas. Title 5-209 states: *no off-road vehicle may be permitted where its operation will damage the wildland character of the property,*

> Regulation 08.01.03.10.C, states:
> *(1) The Department shall locate ORV trails to minimize:*
> *(b) Damage to soil, watershed, vegetation, or other resources;*
> *(2) The Department may not locate ORV trails in:*
> *(e) Areas possessing unique natural, wildlife, historic, or recreational values as determined by the Department.*

The ORV trail system on PGSF includes a total of 27.9 miles of roads and trails, all of which are open to snowmobile use. Of the 27.9 miles of ORV/ Snowmobile Trails, 13.9 miles are located on hardened gravel roads and are open to rubber tired ATV/ORV use.

<u>Snowmobile Trails on PGSF:</u>

Snaggy Mtn. Snowmobile Trail 8.5 miles
Laurel Run Road/Wallman Road Snowmobile Trail System 10.2 miles
Backbone Mtn. Snowmobile Trail System 4 miles
Burkholder Road Snowmobile Trail 2.7 miles
Piney Mtn. Snowmobile Trail 2.5 miles

<u>ORV Trails Open to ATV Use:</u>

Snaggy Mtn. Road/ORV Trail 3.2 miles
Wallman Road/ORV Trail 3.9 miles
Laurel Run Road/ORV Trail 2.4 miles
Burkholder Road/ORV Trail 2.7 miles
Piney Mtn. Road/ORV Trail 1.7 miles

9.2.7 Water Access for Canoeing, Kayaking

The North Branch of the Potomac River and its tributaries offers limited opportunities for canoeing, kayaking and fishing. The Forest tracts at Lostland Run, Laurel Run and Wallman on the Potomac River offer access/take out points. The North Branch of the Potomac River offers Class 3-4 boating for the experienced canoeist or kayaker. Improvement of these areas or development of additional water access opportunities will be made on an as needed basis, and

would be reviewed during the Annual Work Plan process.

9.2.8 Fishing Opportunities at PGSF

The fishery resource of the Potomac-Garrett State Forests can be divided into three general categories:

- Wild reproducing populations of brook and brown trout that provide a year-round recreational fishery. These species are also important indicators of water quality.

- Stocked adult hatchery brown and rainbow trout that provide a seasonal recreational fishery; and stocked fingerling brown trout that support a "put and grow" trout fishery.

- Non-game fish species that are not sought by anglers but are important indicators of water quality.

Wild Brook Trout and Brown Trout General Statewide Trout Fishing Regulations

Native brook trout are the premiere game fish found in the PGSF. A two-fish daily creel limit is in effect on wild trout streams; however harvest of this species is not encouraged. Their distribution and population numbers are intensively researched by the Inland Fisheries Service. In general, trout densities are directly related to habitat quality. Low numbers or absence of wild trout tends to reflect the marginal quality of habitat in a particular stream. The following criteria are important to good trout habitat.

- cold water temperatures (maximum < 68° F)
- minimal sediment loading to protect incubating trout eggs and the benthic macroinvertebrate community by maintaining vegetated banks free from livestock grazing, protected buffer zones, and by implementing rigorous sediment controls on all road construction and maintenance, agricultural activities, and timber harvest operations.
- stream pH > 6.0. Low pH in Garrett County can usually be attributed to acid mine drainage and from atmospheric deposition (acid rain).

The wild trout fishery in the following streams are regulated under statewide general trout fishing management: two-trout daily creel limit, no minimum size restriction, and no bait or tackle restrictions (MD DNR Sportfishing Guide 2010).

Bradshaw Hollow Run

Brook trout are present in low numbers near the mouth; however a stream blockage at a culvert crossing on PGSF road limits upstream habitation.

Laurel Run, including Trout Run and Riley Spring Run

No trout were present in Laurel Run or Trout Run in 1973 as acid mine drainage (AMD) affected the watershed. After AMD reclamation projects were completed, brook trout re-colonized the stream system from unaffected unnamed tributary streams. A small population of brown trout exists in Laurel Run, the result of fingerling brown trout stockings by the Nemacolin Chapter of

Trout Unlimited during the late 1980's. Brown trout are not native to Maryland, and the Inland Fisheries Service has made a policy to not stock brown trout in streams where viable populations of brook trout exist. A 2003 survey showed that brook trout populations are found in Laurel Run and its two tributaries, Trout Run and Riley Spring Run.

Crooked Run
A reproducing brook trout population exists in this stream.

Lostland Run, including North and South Prong
The Lostland Run watershed was polluted by AMD and devoid of trout and other associated coldwater fish species as recently as 1979. By 1983 brook trout re-colonized the North and South Prongs of Lostland Run. The Maryland Department of Environment's Bureau of Mines has operated a limestone doser on the South Prong of Lostland Run since 1992 to treat AMD in the watershed. Viable brook trout populations are now found in all three stream reaches.

Elklick Run
A tributary to Jennings Randolph Lake, the upper portion of the watershed is located on the PGSF. A baseline biological study was conducted in 1996 to document stream conditions as part of an AMD restoration plan. Brook trout were present in low numbers near the mouth upstream to a natural fish blockage. The four upstream stations were fishless due to the effects of AMD.

Folly Run
A high-density brook trout population exists throughout the stream. The headwater area is located within the PGSF while the lower portion of the stream is within the MD DNR Fisheries Management Area property.

Laurel Run (downstream of Jennings Randolph Lake)
This stream supports a reproducing brook trout population. Hatchery-origin brown and rainbow trout were present in the stream from North Branch Potomac River stockings during 2001.

Brook Trout Zero Creel Limit
MD DNR Inland Fisheries Service implemented a Brook Trout Zero Creel Limit Fishing Area that includes a year-round catch-and-release for brook trout; two-fish per day creel limit for brown and rainbow trout; artificial lures only regulation for the upper Savage River watershed, effective January 1, 2007. ***Crabtree Creek*** within the PGSF is managed as part of the Brook Trout Zero Creel Limit Fishing Area as discussed in Chapter 10

STOCKED TROUT RECREATIONAL FISHERY

Delayed Harvest Trout Fishing Area
The diversity and abundance of fish in the North Branch Potomac River (NBPR) upstream of Jennings Randolph Lake (JRL) has increased dramatically since limestone doser technology was implemented in the watershed beginning in 1993. Stockings of adult hatchery rainbow trout began in 1994, immediately creating the first recreational fishing opportunity in the upper NBPR

in many decades. The eight-mile portion of the ***North Branch Potomac River bordering the Potomac State Forest is managed as a Delayed Harvest Trout Management Area,*** and receives spring and fall stockings totaling about 6,000 adult rainbow trout. Regulations include a catch and return season from October 1 through June 15 with the use of artificial lures and flies only. From June 16 through September 30, the daily creel limit is five trout per day, no minimum size restriction, and no bait restrictions. Temperature in the river during mid-summer limits trout survival, thus harvest is allowed during this time period to gain maximum use of the stocked trout. This special trout fishing area has become one of Maryland's more popular fishing destinations due to its exceptional scenic value and sense of remoteness.

Put and Take Trout Fishing Areas

Streams managed as recreational Put and Take Trout Fishing Areas generally cannot support trout due to a limiting factor such as high summer in-stream temperatures. However, during the cool spring months, the stocking of adult trout can provide a high-use recreational trout fishery. A five-fish daily creel limit with no bait restrictions is in effect for these streams and stream closures may apply to allow for trout stocking. ***Herrington Creek*** is stocked annually with about 480 catchable-size brown and rainbow trout, and ***Muddy Creek*** receives about 1,920 brown and rainbow trout. Muddy Creek is also stocked with about 2,000 fingerling brown trout each fall as part of a trout fishery restoration plan that is discussed in Chapter 10.

9.3 Education and Public Outreach

The Department's goal for Potomac-Garrett State Forest is that it will be a national model of sustainable forest management, in addition to increasing the public's awareness concerning the importance of sustainable forest management and its connection to the health of the Chesapeake Bay. The Forest is seen as a "living laboratory" or "outdoor classroom" where resource professionals and the public can learn. Therefore, education and the development of forest management demonstration areas is very important. This goal will be achieved by:

- The continued use and promotion of the "Kindness Forestry Demonstration Area";
- The continuation and constant update of the Potomac-Garrett State Forest website;
- Development of brochures and other written material about the Forest;
- And, the continued provision of tours and other public forums for educating the public about the Forest.

9.3.1 Potomac-Garrett State Forest Website

The website (http://www.dnr.state.md.us/publiclands/eastern/Potomac-garrettforest.asp) has been and will continue to be an invaluable mechanism for communicating with the public. It has been used to share general information and annual work plan (AWP) projects. However, its future value is dependent on the Department's ability to continually update the information.

9.3.2 Educational Material

The Department will consider the placement of interpretive markers or informational kiosks at the public use areas experiencing the highest visitation. These kiosks would include a map and

information on the Forest and sustainable forest management. One example of this approach is found on the Garrett State Forest's "Kindness Demonstration Area" where a mile long trail offers a self-guided tour with wayside exhibits interpreting numerous forestry and wildlife management practices seen along the trail.

Presently USDA-Forest Service has been working with staff in developing demo sites for use in "Silva-Oak" management training workshops. The first workshop was held in 2010 with plans to return with this program every other year. As appropriate, some of these demonstration sites will include interpretive signage to further educate forest visitors as to the methods and practices seen at given strategic locations.

9.3.3 Tours and Forums

The Department should sponsor forest management field days that educate the public in the values of sustainable forest management and working landscapes. These field days could be targeted to the public that are using the forest as a way for them to be educated and understand the Department's approach to forest management and the relationship of their use to this management. The Department will continue to sponsor cooperative research projects as part of the implementation of the Monitoring Plan (See Chapter 10). Possible partners could include universities such as Garrett College and Frostburg University and West Virginia University, private non-profit organizations like the Chesapeake Bay Foundation and local community service organizations. In addition, the Department should involve the, local school groups, scouting organizations and local environmental groups in the implementation of projects identified in the Annual Work Plan (AWP).

9.4 Implementation

9.4 Implementation

As with the other management activities, recreational and educational activities will be included as proposals within the Annual Work Plan (AWP). These activities will be reviewed by the Potomac-Garrett State Forest interdisciplinary team and once reviewed and approved will be implemented as part of the AWP process. Public use activities will also be monitored to ensure there is not conflict with the other management goals or degradation of the sensitive resources found on the forest. Limits of Acceptable Change procedures and protocols will be used to monitor these public use activities (See Chapter 10 Monitoring Plan).

Chapter 10 - Monitoring Plan

10.1 Introduction

The primary goal of the Potomac-Garrett State Forest Project is to provide sustainable natural resources, from water, fisheries and wildlife habitat to timber, education and recreation contributing to the local environment and economy. The Potomac-Garrett State Forest and all of Maryland's state forests are being managed for sustainable forestry using similar strategies and combined efforts. Concepts of sustainability are based on the international standards of sustainable forestry represented by the Montreal Process Criteria and Indicators? . http://www.rinya.maff.go.jp/mpci/whatis__e.html . MD DNR participates in the National Roundtable for Sustainable Forests (what is this?) to further improve coordination and use of sustainable forestry practices http://www.sustainableforests.net/ . Critical sustainability standards for this Forest includes no soil deterioration or nutrient loss, no decline in water quality from activities, no loss or decline of species, the protection of special areas, an acceptable flow of jobs and revenue, and stakeholder satisfaction with results.

Monitoring is crucial to the ability of the Potomac-Garrett State Forest (PGSF) to supply its intended sustained yield of a variety of forest resource benefits. At a minimum, the monitoring activities must meet current requirements for certification and reporting. Monitoring is necessary to document sustainable practices, provide information to adapt management, and carry out elements required for certification as a sustainable forest by the Sustainable Forestry Initiative (SFI) and Forest Stewardship Council (FSC). The FSC specifically identifies monitoring and assessment as one of its 10ten Principles (Appendix B), and monitoring data are needed to meet a number of SFI Core Indicators. Evaluation of the range of elements being sustained relies on an interdisciplinary plan that monitors a wide range of aquatic and terrestrial features. A monitoring project on this scale provides opportunities for scientific study, collaboration, and external funding. It also provides challenges, such as the need for an efficient, coordinating structure for the monitoring program and how to overcome limits to the involvement of current staff in the project. This critical component of the Potomac-Garrett State Forest Plan will not be successful unless support continues to be adequate, whether financed by Forest income or other sources.

On Potomac-Garrett State Forest we have begun to implement stand level data for the entire forest. The last Continuous Forest Inventory (CFI) was completed in 2002.

10.2 Monitoring Plan

The monitoring plan supports the needs of the Potomac-Garrett State Forest Project using a multi-tiered approach:

- Tier I: a landscape-scale inventory
- Tier II: a stand/complex-level inventory, and
- Tier III: project-specific assessment and research.

In order to more efficiently use resources, data collection is coordinated as much as possible among the different units' staff and with similarly managed land holdings like Chesapeake Forest. The exact number of points to be sampled will depend on the number of points falling within multiple strata, and potentially on the cost/effort for sampling. Power analysis and community dynamics models will be used to help determine the appropriate number of samples to allow trends in population changes to be detected. At the beginning of each section, the SFI Objectives and FSC Principles that are addressed by these elements of the monitoring plan are listed with text descriptions supplied in Appendix B & C.

Data obtained from the monitoring will be used to update the Potomac-Garrett State Forest Geographic Information System, and spatially integrated with the base ownership layer. DNR units and personnel have been assigned to manage the layers of information based on data source and unit expertise, including Forest Service, Wildlife & Heritage Service, Land Acquisition & Planning Ecosystem Restoration Services, and Information Technology. New data is added to the GIS system through the data manager assigned for the respective layers.

10.3 Tier I: Landscape-scale, Long-term Monitoring

10.3.1 Objectives

The focus of Tier I monitoring is overall biodiversity and ecosystem health. It provides the basic inventory data for forest management, sensitive resources, and water quality over terrestrial and hydrogeomorphic regions. Tier I monitoring provides the information base for Sustainable Forestry Initiative certification Objectives 1, 3, 4, 5, and 6, and for Forest Stewardship Council certification Principles 5, 6, 7, 8, 9, 10 (Objectives and Principles listed in Appendix B & C). The CFI data was completed in 2002. Stand level data collection was begun in the fall of 2009. Data layers inventoried include:

1) Forest overstory condition, including stand inventory, tree growth rates, and regeneration status, yielding information needed to determine sustainable levels of harvesting;
2) Forest understory condition, including layers, species, diversity, and presence of invasive species;
3) Wildlife and habitat information, habitat features like snags, woody debris, stand size class, percent canopy, vertical diversity, and suitability for endangered species; and
4) Water quality surveys of nutrient status, macroinvertebrate populations, and aquatic habitat condition that supplement the Maryland Biological Stream Survey data, supplying water quality status and aquatic invertebrate species presence and diversity.

The inventory sampling approach assures representation of sensitive resource areas like forest interior habitat, ecologically significant areas, and riparian areas. Special area boundaries including sensitive species protection and restoration areas and cultural resources such as ruins,

graveyards, research plots, or wells will be added to the GIS system as encountered or sought out. Inventories are scheduled for update every 10 years.

The definition of sustainability given above for the publicly owned Potomac-Garrett State Forest included stakeholder satisfaction with results. Existing processes, including public meetings on annual work plans, interdisciplinary team for management review, and the Citizens Advisory Board, all provide outlets for expression of stakeholder views. Information is provided on the DNR website, http://www.dnr.state.md.us/publiclands/eastern/potomac-garrettforest.asp, including the current management plan and annual work plans. These information sources will be used at a minimum to estimate stakeholder satisfaction. Independent survey of known stakeholders may be undertaken if outside funding and partners are secured.

10.3.2 Methods Overview

Strata for sampling were chosen for major factors of interest and to control for known variation. Stream and water quality sampling are organized around geomorphic region and the stream network, while terrestrial sampling uses strata based on forest type and habitat for sensitive resources (Table 10.1). Geomorphic regions split out areas based on underlying geology and topographic characteristics, which usually control major differences in stream chemistry (e.g., acid or alkaline, base levels of nutrients). The stream network is stratified on position relative to State ownership, and will correspond partially to stream order; streams originating entirely in State land are likely to be smaller (first, second, or third order), while streams passing through or bordering State lands are likely to be larger (third order or higher). Terrestrial strata focus on major stand types and areas with rare species and natural communities, most of which are already defined and available in digital form, since these two criteria have the greatest effect on management actions undertaken. The information base for the sampling is the Potomac-Garrett State Forest GIS system.

Table 10.3.2.1: Strata for Long-term Monitoring on PGSF

Table 1: Categories of Interest for Analysis of Long-term Monitoring on PGSF

Stream and Water Quality Sampling		Terrestrial Vegetation and Wildlife Habitats	
Geomorphic Region	Stream Location	Ecological Community Groups	Sensitive Resources
Surficial Confined	Originates in GRSF	Mesic Forests	Forest Interior Dwelling Species (FIDS) Core
Fine-grained Lowland	Passes through GRSF	Dry-Mesic Forests and Woodlands	Old Growth Forest
Well-drained Upland	Borders GRSF	Dry Forests and Woodlands	Ecologically Significant Areas & Wildlands
Poorly Drained Upland		Glades, Barrens and Rock Outcrops	Riparian Areas

Poorly Drained Lowland			Wetlands

10.3.3 Terrestrial Vegetation and Species Sampling

Vegetation structure and composition will be quantified using methods similar to those of the Continuous Forest Inventory, based on USDA Forest Service inventory sampling and analysis methods. Plots randomly sampled from a grid overlaying the management unit. In addition, percent ground cover, canopy cover, vertical layer presence and height, tree regeneration, coarse woody debris, depth of organic layer, forest health indicators, and data for invasive species, shrubs, and herbaceous plants will be collected. Data summaries for forest overstory include tree volume, basal area, density, and growth rates. All permanent sample points are expected to be sampled at least once every 10 years. In order to ensure that there are adequate samples to examine trends in the data, a minimum of 20 plots were assured for the less common strata like Ecologically Significant Areas.

To gather detailed data on bird and reptile/amphibian abundance and habitat features, a subset of sensitive resource plots will be selected here using multiplefor additional data collection sounds like a lot of empty promises here using multiple visits from spring to late summer to adequately sample seasonally available populations. Calculations for wildlife information will include diversity indices, relative frequency, and relative abundance. Multivariate analyses are used to determine relationships between stand types, age classes, and stand history and observed population characteristics. Vegetation information from the detailed wildlife habitat subset of plots may be analyzed using detrended correspondence analysis techniques to identify community types and other associations.

Living organisms will be monitored with emphasis on sensitive species or indicators of ecosystem functions, including forest interior dwelling and other birds, reptiles, and amphibians. Standard methods include constrained time searches, pitfall traps, and call counts, tailored to the habits of target species.

10.3.4 Stream and Water Quality Sampling, Procedures, and Progress

For aquatic samples, points are chosen using stratified random sampling from mapped (“blue-line”) stream sections that are 150 m in length. Streams must traverse a minimum of 1000 feet on a Potomac-Garrett State Forest parcel. These stream sampling points are re-randomized for each sampling event (at least every 5 years) in order to more accurately capture the general condition of the aquatic resources.

Water quality monitoring will use procedures outlined in Boward and Friedman (2000) or current Maryland Biological Stream Survey sampling methods. Water samples are collected during base flow at all sites with water, standing or free flowing in a defined channel, avoiding the 24-hour period following a minimum of 0.5” of rain. Sampling includes flow (L/s), water temperature (^{o}C), dissolved oxygen (mg/L), pH, and conductivity measurements at each site using field instruments (e.g., Hydrolab Surveyor II). Grab samples of whole water are collected just below

the water surface at mid-stream and filtered in the field (0.45: pore size Gelman GF/C filter). To allow for analysis of nitrogen species, the samples are stored on ice and frozen the day of collection for later lab analysis. Analysis includes dissolved inorganic nitrogen (mg N/L of NO^3, NO^2, NH^4) and dissolved inorganic phosphorus (mg P/L PO^4). All analyses are conducted in accordance with US EPA protocols.

Aquatic benthic macroinvertebrates are collected using methods developed for mid-Atlantic coastal plain streams that are compatible with and comparable to Maryland Biological Stream Survey (MBSS) sampling protocols (Kayzak, 2001). Samples are collected only from free-flowing streams, avoiding inaccuracies associated with evaluating standing pools. Sample processing is done according to MBSS guidelines (Boward and Friedman, 2000). Habitat assessments based on US EPA methods for low gradient streams (Barbour et al., 1999) are completed at all macroinvertebrate stations. Summary measures include the Benthic Macroinvertebrate Index of Biotic Integrity, Habitat score, and percent of suitable habitat.

10.4 Tier II: Stand/Complex-level Medium-term Monitoring

10.4.1 Objectives

This level of monitoring is used to give more specific information on:

1) Occurrence and management needs for rare, threatened, or endangered species, or natural communities;
2) Areas where invasive species threaten populations of rare species;
3) Stands or complexes where more information is needed to support high production of wood fiber or other marketable product; or
4) Other species or areas of interest that occurs across several stands.

Emphasis will be placed on sites that need to be protected, enhanced, or restored to maintain healthy native communities. Factors assessed at this scale include water quality and sensitive resources, including species presence, richness, and diversity. In areas identified for high production of wood fiber or other marketable forest products, more frequent and more intensive forest stand data may be needed to inform management options. These monitoring activities will occur more frequently and in focused areas compared to Tier I monitoring. Tier II monitoring supplies information needed to carry out or document SFI Objectives 1, 3, 4, 6, and 8, and FSC Principles 5, 6, 7, 8, 9, 10.

Forest communities of interest on the Potomac-Garrett State Forest include Hemlock and Red Spruce. Overstory and regeneration will be monitored to determine that these valuable, threatened and less common communities are being maintained in the current stands or other areas with suitable habitat. Monitoring of regeneration is designed to allow diagnosis of threats to maintaining these conifer forest communities, and to allow management actions to be taken to increase abundance prior to loss of parent trees. Other natural communities of interest with monitoring needs related to management and protection include: old growth and nearly old growth forests, and other High Conservation Value Forests.

Monitoring of health and condition with regard to forest insects and diseases is presently done through a partnership with Maryland Department of Agriculture who has state wide responsibility for forest pest and disease control and monitoring.

10.4.2 Methods Overview

Sample points for sensitive resources will be selected using random sampling or, when necessary, stratified random sampling. Cluster sampling may be used for rare plants. For forest stand condition, systematic grid sampling will be used for greatest efficiency, avoiding lining up the grid with obvious landscape patterns (streams or ridges) to preclude bias in sampling. Data collection will occur more frequently than in Tier I monitoring, with the timing dependent on the organisms/habitat features to be monitored. This monitoring may be ongoing or of limited duration.

Standard methods available in Federal or State manuals or published peer-reviewed research will be used to collect data for:

- Water quality indicators such as stream nutrient export, wetland condition, fish and aquatic macroinvertebrate assemblages;
- Forest stand condition indicators such as vegetation structure and composition, invasive species, natural plant communities, insect and disease impacts, fuel loading, and stand density;
- Rare, threatened, and endangered species presence, diversity, and abundance; and
- Presence of invasive species that threaten the survival of rare, threatened, or endangered species;
- Natural community diversity metrics;
- Other indicators of ecosystem recovery and function.

Impacts from trails including both hiking and All-Terrain Vehicle (ATV) routes, can be monitored in specific areas of concern using standard limits of acceptable change (LAC) procedures (Stankey et al., 1985; McCool and Cole, 1998) and procedures developed specifically to assess trail impacts (Marion and Leung, 2001). *get copies of these 3 papers Methods to monitor populations of rare, threatened, and endangered species in Ecologically Significant Areas and other areas of interest will depend on the organisms of interest. Protocols will generally follow standardized methods presented in Tier I. Power analyses will be used to help determine the appropriate number of samples to allow a trend to be detected. Unique natural communities will be monitored using standard plot methods for community classification. Forest stand information may include data for stand-level growth and yield modeling, soil sampling, and overstory and understory composition.

10.4.3 Invasive Species

Information on general occurrence of invasive plants will be captured in the Tier I inventory, and updated on the same cycle as that inventory. More intensive monitoring and control will be targeted to those areas where they might compromise the health and survival of rare, threatened, or endangered species or natural communities. Invasive species control plans will be developed in conjunction with rare species protection and restoration plans. Control plans will include

actions to prevent or minimize re-infestation of problem species, such as when management operations are in adjacent areas. Control options will be tailored to the situation and species, and may include physical, chemical, or biological controls. The spread of invasive plant species will also be minimized as much as possible through Best Management Practices for timber harvest and other management activities.

Problematic invasive species are sometimes identified in routine field operations, outside of rare species habitat. In these cases, staff will determine the potential to interfere with the survival, health, or regeneration of native forest stands. Where the invasive species is a significant detriment, a management strategy for control will be developed and included in the annual work plan review. Chemical control is anticipated in many settings because of the general effectiveness and cost-efficiency, although any effective option including physical or biological control will be considered. Species that have potential to interfere greatly with forest health and regeneration include multi-flora rose, mile-a-minute, and Japanese stiltgrass among others.

10.5 Tier III: Management Activity-based Short-term Monitoring

10.5.1 Objectives

Monitoring at the Tier III level measures responses to management activities at a finer scale, including silvicultural treatments, restoration projects, and public uses that may affect a portion of a stand or the whole stand. This level of monitoring includes updates of stand-level information to reflect recent management actions and some focused scientific studies, with monitoring occurring on both control and experimental areas before and after the manipulation. Measurement and monitoring of soil quality, water quality, and species presence, richness, and diversity allow us to monitor these indicators of sustainability from the Sustainable Forest Management Plan for the Potomac-Garrett State Forest Project over the long term. Tier III monitoring is needed to document compliance with SFI Objectives 1, 2, 3, 4, and 6 and FSC Principles 5, 6, 7, 8, 9, and 10 (Appendix B & C).

10.5.2 Methods Overview

Sample plots are chosen randomly or systematically within appropriate control (reference) and experimental areas (areas to be manipulated). Where possible, at least 3 replicates are sampled for each type, with more than one sample taken in each plot. Potential experimental area treatments include prescribed burns, herbicide applications, harvest systems and practices, watershed restoration and improvement projects, and ESA restoration activities. Measurements of stand health, biodiversity, productivity, soil fertility, water quality, and species-specific responses are most appropriate for this level of monitoring.

10.6 Procedures by Forest Management Actions

Harvesting (For SFI Objectives 2, 3, 4, 5, 6)

All thinning and regeneration harvest operations are checked for compliance with Best

Management Practices (BMP). Harvest Site Review checklist items include, Haul Roads\skid trails & Landings, Merchandizing & Selection, Streamside Management Zones (SMZ) & Stream Crossings, BMP's, and Aesthetics.

The harvest area selection process occurs through Interdisciplinary Team review, based on an Annual Work Plan recommended activity list generated by the forest manager. Stands are selected based on age, stocking levels, species composition and condition of stand. Consideration is given to size of the area to be harvested and in the case of regeneration proposals, seedling/sapling stage, as well as proximity to other stands. Currently, most silvicultural prescriptions have been for final harvest. However, a transition to use of more intensive regeneration methods involving treatments to assure regeneration and assure retention of mixed oak component in the forest are being utilized. Silvicultural prescriptions may be modified based on the following:

- Presence of rare species, and Forest Interior Dwelling Species, Wetlands of Special State Concern, Threatened and Endangered species (State and Federal) (existing database and some field checks);
- Stream buffers (later identified and flagged in the field);
- Cultural sites (e.g., graveyards, ruins);
- Presence or absence of advanced regeneration (i.e., whether suitable for natural regeneration, planting, or direct seeding).

10.6.1 Site Preparation

Natural regeneration is considered as the first option, so advanced regeneration is evaluated (plot counts to estimate seedlings/acre, with attention to distribution over harvest area). Site preparation methods considered by the Interdisciplinary Team for the Annual Work Plan review include but are not limited to prescribed burning, herbicide application, and mechanical treatment.

10.6.2 Prescribed Burning

Prescribed burning is recommended for site preparation to control understory vegetation and encourage regeneration of native fire-adapted plants. Procedures for establishing the prescription for a burn include evaluating the site for fuel load, ability to carry a burn, locations of fire breaks, and potential hazards of smoke to surrounding locations (e.g., well-traveled roads, confined livestock, neighbors). Prescribed burn plans are prepared by MD DNR fire staff, using guidance from "A Guide to Prescribed Fire in Southern Forests" (1989, USDA FS National Wildfire Coordinating Group publication PMS 431-2). MD DNR fire personnel evaluate all sites after burning to determine if the burn met the stated objectives. MD DNR Wildlife and Heritage staff specialists evaluate selected sites with high potential for rare species for presence and abundance of target species following burn treatment. On the Potomac-Garrett State Forest, understory burning to enhance mixed oak regeneration is planned. Regeneration monitoring will be used to evaluate the level of success of this practice and identify factors to improve regeneration.

10.6.3 Herbicide Application

The use of herbicides has been minimal on Potomac-Garrett State Forest, but there are instances where their use is appropriate to effectively shape the stand to its desired condition for forest

products and/or habitat with minimal impact to soils. Most notably in controlling invasive ferns that impede natural regeneration, as well as understory control of developed woody understory plants that impede oak regeneration. Herbicides are applied according to label restrictions, with spray buffers around flowing streams or open water. Application is expected to be carried out most commonly by ground based equipment; (Utility vehicle or skidder/tractor mounted rigs) with backpack application used where spot spraying is the only need. Management on Potomac-Garrett State Forest in many areas seeks to establish a mixed stand that includes a significant oak component valuable for virtually all forest wildlife species. While maple is a native species, the lack of wildfire has allowed its density and frequency to greatly increase at the expense of other hardwoods, and they lack the mast that is a winter staple for wildlife. Monitoring of regeneration density and type will allow evaluation of current practices in developing the desired mix of stand types.

10.6.4 Mechanical Treatment

Mechanical site preparation is rarely used in Potomac-Garrett State Forest, but when used, it usually involves heavy equipment such as a bulldozer, which may be augmented by lighter equipment such as chain saws or brush saws. A drum chopper may be used to condense slash and allow the site to be burned and planted. Riparian buffers are flagged in the field to assure that machinery does not affect water bodies and no delivery routes for sediment are established during the operation. Excessive rutting and soil compaction are avoided as required in Maryland Forest Harvesting BMPs, and are monitored through the use of the Harvest Site Review form.

10.6.5 Intermediate Operations

Commercial and pre-commercial thinning is planned for the Potomac-Garrett State Forest. The same procedures as outlined for harvesting are followed, regarding site review, modification of operation for rare or sensitive species, and BMP compliance. Fertilization is not typically practiced, but soil tests for nitrogen, phosphorus, and pH before and after application will be used if application is needed.

10.6.6 Special Area Projects for Water Quality

Some additional restoration projects may be undertaken for water quality and wildlife objectives. Watershed improvement projects will be chosen in locations where slowing water could improve nutrient and sediment levels in water leaving Potomac-Garrett State Forest. Projects require at least two critical elements: 1) waterway and topography where water can be slowed and backed up to increase residence time without adversely affecting neighboring lands, and 2) source of nutrients or sediment, such as from agricultural lands (rates from forest lands are already low). Monitoring includes pre-project baseline information and post-project assessment of water quality and vegetation.

10.6.7 Special Area Projects for Wildlife & Heritage

Habitat Improvement Projects are chosen in areas with great potential to support rare species or natural community types. MD Wildlife and Heritage Service is developing management plans for selected areas, and restoration projects will be implemented as part of the annual work plan.

Projects include clearing trees in areas where rare species depend on more open conditions, disturbance to mimic natural process, prescribed burning and restoring hydrology where past drainage has reduced extent of wetland habitat. Presence and extent of rare species or appropriate indicators will be recorded before and after projects.

Portions of Potomac-Garrett State Forest lands are being surveyed annually for bird presence through statewide and regional count programs. These bird counts are added to other regional and national data. A detailed study of bird use, including forest interior dwelling species, was completed in the early 1990's by principal investigators at Frostburg State University, and found extensive use even in some pine-dominated regions. Follow-up study of this result is anticipated in partnership with Frostburg State or another university.

10.6.8 Public Use and Recreational Activity

Hunting is permitted on Potomac-Garrett State Forest lands. For lands open to public hunting, monitoring consists of periodic roadside vehicle counts during hunting season.
The annual harvest report includes estimates for harvest by species: white-tailed deer, sika deer, turkey, dove, quail, squirrel and rabbit. Public use data will be collected via checklist surveys permit applications, and other quantitative methods comparable to those used by the USDA Forest Service, US Fish and Wildlife National Refuge System, and Maryland DNR Wildlife and Heritage Service.

Visitor use is monitored by periodic roadside visitor counts as well as through the use of mechanical vehicle counters located at the five Complexes that contain developed camping areas. Trail registries are located at trail heads of the Lostland Run Hiking Trial and the 5 ½ Mile Hiking Trial.

Ongoing survey efforts such as the national surveys for fishing and hunting and county recreational surveys will be used as additional information sources and for context to allow comparisons of patterns of use on Potomac-Garrett State Forest. Other methods such as online user forms and honor system use survey boxes will be used as time, resources, and departmental approval permit. As stated earlier, impacts to use areas may be monitored using limits of acceptable change (LAC) protocols, provided funding is available (Stankey et al., 1985; McCool and Cole, 1998).

Chapter 11 - Annual Work Plan Process

11.1 Annual Work Plan

The Annual Work Plan (AWP) will be the controlling document to assure that the Land Manager is effectively carrying out the sustainable management plan for the land, and that the Department is fully informed and supportive of the management actions planned and taken. The Potomac Garrett State Forest Manager is responsible for preparation of the Annual Work Plan.

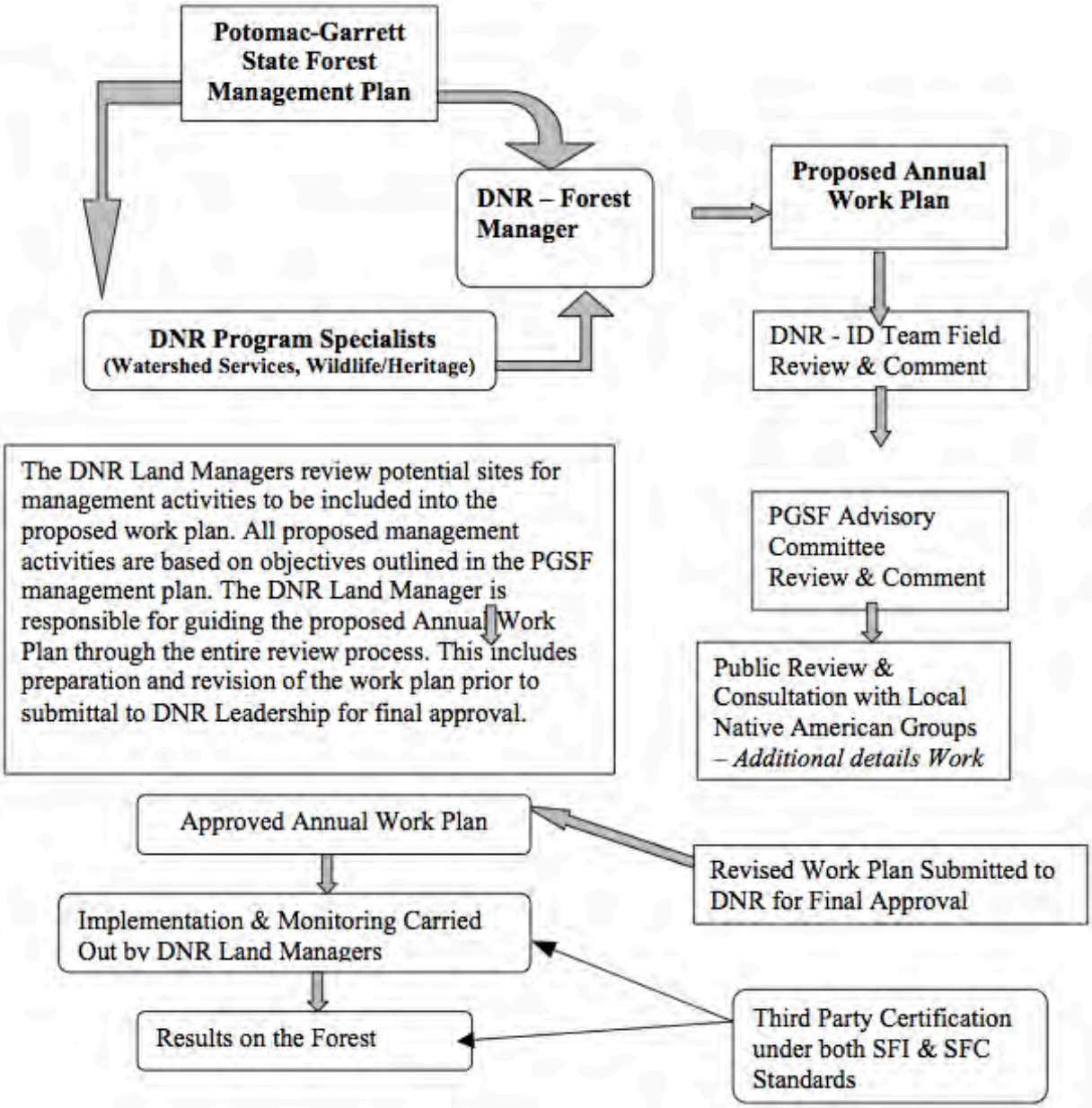

Figure 11.1: Annual Work Plan Development Process

The concept of an annual work plan that establishes the land management program for an entire year is an important key to successful implementation of sustainable forest management on Potomac-Garrett State Forest. It will be the responsibility of the DNR State Forest Manager to oversee day to day operations on Potomac-Garrett State Forest and the implementation of each Annual Work Plan. The amount of work that needs to be done, means that the State Land Manager must be able to plan and schedule work well ahead of time, arrange for sub-contractors, and be ready to move rapidly when weather and soil conditions are favorable. This will be accomplished through a well defined and detailed annual work plan that will outline forest management and restoration projects over a year in advance of the actual work.

Figure 11.1 shows how achieving desirable on-the-ground results, which are the key outcomes of the annual work plans, requires the cooperation of a variety of players. Several parties are involved in the process all with key roles, but the persons central to all implementation, monitoring and reporting are the Land Managers. In this process, the lines of responsibility essential for success are clearly defined. The Land Managers are responsible for implementing the Annual Work Plan in a manner that is both environmentally and fiscally responsible.

Once implementation is underway, the ongoing process of carrying out forest management activities will result in changes in on-the-land conditions, as well as new information gathered. The on-ground results will be verified by a third party certification process, which will be conducted every 3-5 years. Certification is done to compare the achieved results with the planned outcomes of the management prescriptions contained in this plan and the Annual Work Plans. The independent third party auditors will report their findings to the Land Managers. Where field or operational deficiencies are noted, it will be the responsibility of the Land Managers to correct them. Any deficiencies identified in the management plan or its goals, will be addressed by Maryland DNR. The audit report, and any subsequent actions taken, will be available to the public.

Implementing the Potomac-Garrett State Forest plan involves adaptive management, where research and monitoring are given a high priority, and new information is constantly gathered to feed back into the basic data management system and all future plans. The Land Managers are responsible for reporting key findings as well as maintaining a constantly-updated data management system that is always available for making forecasts, guiding management decisions, and providing a current information base that can support plan reviews or amendments in the future.

11.2 Annual Work Plan Time Table

Annual Work Plan (AWP) development along with the necessary environmental and regulatory reviews will strive to adhere to the following process/time lines:

1. The DNR Land Managers begin fieldwork to review sites to be included in the next annual work plan from November through March.
2. The DNR Land Manager drafts a proposed work plan and sends it for ID Team review by July 1.
3. The DNR – ID Team reviews the proposed plan, a field review of proposed activities in the work plan is scheduled and comments returned to the DNR Land Manager at least two weeks before the scheduled ID Team field review.
4. The DNR Forest Manager presents the proposed work plan to the Potomac Garrett State Forest Citizens Advisory Committee for comment and review by December 1.
5. This above process includes consultation/review with local Native American Groups and the Maryland Commission on Indian Affairs concerning potential sites of special cultural, ecological, economic, or religious significance.
6. The DNR Forest Manager reacts to needed changes and submits a revised plan to DNR Headquarters by January 1.
7. The final step is the AWP will be posted on the DNR webpage for a 30-day public comment period, to be completed no later than March 1.
8. The DNR Headquarters obtains final official approval of the Annual Work Plan, as revised, by June 1.
9. The Land Managers begin implementing the approved Work Plan July 1.
10. Independent Third-Party Auditing for forest certification begins after the year ends and is repeated every 3-5 years, depending on certification requirements.

11.3 Contents of the Annual Work Plan

Forest Overview

Includes an over site of the forest; history, size, location, special features, etc.

AWP Summary

Includes number of sales, total harvest acres, acres by harvest method, estimated harvest volume and other important features for the work to be performed during the next year.

Maintenance Projects

Includes boundary maintenance, road maintenance, building maintenance and other such projects.

Recreation Projects

Includes projects such as campsite improvements, hunting programs, special recreational activities, ATV and hiking trail maintenance, trail grants, signage, and other projects specific to benefiting recreational users of the forest.

Special Projects

Includes activities to gain or maintain third party forest certification, GIS databases, and other such activities.

Silvicultural Projects

Includes forest harvesting, prescribed fire programs, fertilization, reforestation, and other such projects. This section must include the following:

Final Silvicultural Activities:

1. Site Map
2. Silvicultural Prescription
3. Stand Data

Review Process:

1. Review Summary
2. Interdisciplinary Team Comments (collective)
3. Advisory Committee Comments
4. Public Comments

Watershed Improvement Projects

Includes special projects to enhance water quality, wetland restoration, and other such activities.

Ecosystem Restoration Projects

Includes projects to manage exotic invasive species, efforts to restore shale barrens or other natural habitats, and other such activities aimed at improving ecosytems.

Monitoring Projects

Includes CFI forest inventories, and other inventory projects being conducted on the forest, watershed monitoring, and other such projects.

Budget

The Annual Work Plan will contain a proposed budget for the year, including revenue and cost estimates for all proposed activities. The Land Managers will be responsible for overseeing all activities to insure the desired environmental and silvicultural result, while maintaining cost effectiveness and targeted economic returns.

Chapter 12 - Operational Management

12.1 Introduction

This section of the plan is designed to cover the annual cost and revenues associated with the operational management of Potomac-Garrett State Forest (PGSF). It is the Department's intent that all revenues generated from PGSF will be used to pay for the management and operation of the Forest. The numbers expressed in this section are only estimates and averages of annual expenses and revenues. These numbers will fluctuate each year based on management prescriptions, economic conditions and public use of the forest.

The following information is a breakdown of Funding Sources and Operational costs associated with PGSF. These figures are only estimates that are based on projected revenues and operational expenses. Yearly changes in timber markets and weather conditions can severely affect revenues. Operational expenses will vary from year to year.

12.2 Funding Sources

Estimated - $547,347

General Fund: $269,234

State Forests in Maryland are funded from several sources. The first is the **General Fund**. This is money generated from taxes. It is used in state forests primarily to fund classified (permanent) employee salaries and benefits.

Special Fund: $251,113

The second source is the **Special Fund**. This is money generated from revenue. The State Forests generate revenue through the collection of service fees, as well as the sale of timber and forest products as detailed within the annual work plan and deposited in the Department of Natural Resources Forest or Park Reserve Fund. These funds must be appropriated by the General Assembly through the annual budgeting process before being spent. It is used in state forests to fund operational costs. The State Forest budget is prepared approximately one year before the beginning of the fiscal year in which it will be spent. The budget then goes through the legislative approval/review process along with all other state operating budgets. Once adopted, the budget goes into effect the first day of the fiscal year (July 1st). The Special Fund

contribution of revenue generated by PGSF for FY-10 is expected to be $114,524 of the $231,113.

ORV Fund: $17,000

In addition, PGSF is included in the Maryland Forest Service's Off Road Vehicle (ORV) Budget. This separate budget is based on **revenue generated from ORV permit sales** statewide and is allocated back to the state forests through the budgeting process. ORV funds are a restricted special fund and can only be spent for ORV Trail related expenditures.

Recreational Trail Grant: $30,000

Another source of funding at PGSF is **Recreational Trail Grants**. These grants are competitive and are generally limited to $30,000 per year per grant. The source of this funding is the Federal Department of Transportation administered through the Maryland Department of Transportation, State Highway Administration. These funds are designated reimbursable funds and are applied to various trail related projects as detailed in specific grant requests.

12.3 Operational Cost

Estimated Annual Expenses - $567,347

Operational expenses are those costs paid directly out of the PGSF operational budget by the State Forest Manager and vary based on approval of operational budgets. The Forest Manager prepares a proposed operational budget for the forest based on instructions provided approximately one year in advance of the fiscal year. The FY-2010 budget proposal was prepared in July of 2009.

Classified Salaries, Wages and Benefits: $269,234

This cost is associated with General Funds which are state tax revenues provided annually. These funds are used to pay PGSF Maryland Classified Employee salaries responsible for the management, operations and maintenance of the state forest.

Contractual Staffing: $94,090

This cost is associated with contractual personnel hired to assist the classified staff in conducting work outlined in the annual work plan, managing the daily activities on the forest, including boundary line work, maintenance of trails, forest roads, maintaining primitive campsites, a public shooting range, overlooks, wildlife habitat areas, and implementing all maintenance, recreational, silviculture, and ecosystem restoration projects.

Land Management and Operation Cost: $86,023

This includes expenses for office and field equipment, vehicles, gravel, signs, boundary paint, roadwork contracts and construction, trash removal from illegal dumping, boundary line work & surveying, tree planting, site preparation, control of invasive species, non-commercial thinning and other forest management practices. These costs vary greatly from year to year based on the activities identified in the Annual Work Plan.

Forest Certification, Inventory & Monitoring Program : $20,000

This estimate reflects the annual cost of various on-going inventory and research projects on the forest. Expenses are directly tied to Forest Certification. The purpose of forest monitoring is to accurately evaluate forest health and the effects of specific management activities. Resource managers will use the information to make informed future management decisions (i.e. adaptive management). Cost would cover both forest resource and sensitive habitat inventories and monitoring the effects of various restoration projects.

Expenses for forest certification will vary from year to year and will be at their highest at the initial certification and then every five years when the re-certification is done. Routine audits are used to verify compliance with the various certification programs. The goal is to certify Potomac-Garrett State Forest under both the Sustainable Forest Initiative (SFI) and the Forest Stewardship Council (SFC). Each certifying agency takes a slightly different look at what is needed for sustainable forest management. Expenses will include fees for audits and annual monitoring programs for compliance with the certification requirements.

Future plans include hiring additional staffing to cover wildlife management activities, restoration projects, recreation management, monitoring, and additional forestry related activities outlined in this Sustainable Resource Management Plan for Potomac-Garrett State Forest.

County Payments: $51,000

These are revenue payments to local county governments which will vary every year. Payments are made on an annual basis to Garrett County based on 25% of the gross revenue generated from PGSF. These payments come out of revenue generated from timber sales and recreation. These payments are used to help the counties offset the loss in property tax revenues which are not paid on State-owned lands.

ORV Funds: $17,000

ORV funds are a restricted special fund and can only be spent for ORV Trail related expenditures.

Recreational Trail Grants: $30,000

These grant secured funds are designated for trail improvements under guidelines set out by the Federal Department of Transportation administered through the Maryland Department of Transportation, State Highway Administration. These funds are designated reimbursable funds and are applied to various trail related projects as detailed in specific grant requests.

12.4 Summary

This is the general breakdown on Revenues and Operational Costs associated with the Potomac-Garrett State Forest. As described, these figures will vary from year to year. A more detailed picture on revenues and operational cost will be reviewed quarterly as the actual picture develops within implementation of the Annual Work Plan and as operating budgets are approved.

Appendix A - Citizens Advisory Committee

The stakeholder group that offers an advice and expertise from a local forest-users perspective is the Forest Advisory Committee (FAC). This group is appointed by the DNR secretary and is composed of eleven diverse groups of resource perspectives.

Groups represented on the FAC include:

- Recreation (e.g. hiking, horseback riding, bird watching, etc.)
- Sportsman (e.g. fishing, hunting)
- Wildlife Interest (e.g. Audubon, National Wildlife Federation, TNC, Ducks Unlimited, etc.)
- Conservation Interest (e.g. TNC, Trout Unlimited, National Turkey Federation, USFWS, etc.)
- Forest Industry (e.g. mill representative or logger)
- Socioeconomic Interest (e.g. local business or community/governmental representative)
- Forest Conservation District Board Member (e.g. Representative from County Board in the area of State Forest)

Appendix B - Forest Stewardship Council

FSC – US Forest Management Standard (v1.0)
(w/o FF Indicators and Guidance)

Recommended by FSC-US Board, May 25, 2010
Approved by FSC-IC, July 8, 2010

Principle #1: Compliance with laws and FSC Principles
Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory, and comply with all FSC Principles and Criteria.

Principle #2: Tenure and use rights and responsibilities
Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established.

Principle #3: Indigenous peoples' rights
The legal and customary rights of indigenous peoples to own, use and manage their lands, territories, and resources shall be recognized and respected.

Principle #4: Community relations and worker's rights
Forest management operations shall maintain or enhance the long-term social and economic well-being of forest workers and local communities.

Principle #5: Benefits from the forest
Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.

Principle #6: Environmental impact
Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest.

Principle #7: Management plan
A management plan -- appropriate to the scale and intensity of the operations -- shall be written, implemented, and kept up to date. The long term objectives of management, and the means of achieving them, shall be clearly stated.

Principle #8: Monitoring and assessment
Monitoring shall be conducted -- appropriate to the scale and intensity of forest management -- to assess the condition of the forest, yields of forest products, chain of custody, management activities and their social and environmental impacts.

Principle #9: Maintenance of high conservation value forests
Management activities in high conservation value forests shall maintain or enhance the attributes which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.

Principle #10: Plantations
Plantations shall be planned and managed in accordance with Principles and Criteria 1 - 9, and Principle 10 and its Criteria. While plantations can provide an array of social and economic benefits, and can contribute to satisfying the world's needs for forest products, they should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.

For additional information go to the Forest Stewardship Council homepage at: **http://www.fsc.org/en/**

Appendix C - Sustainable Forestry Initiative

SFI 2015-2019 Forest Management Standard Principles

SFI Program Participants believe forest landowners have an important stewardship responsibility and a commitment to society, and they recognize the importance of maintaining viable commercial, family forest and *conservation* forestland bases. They support *sustainable forestry* practices on forestland they manage, and promote them on other lands. They support efforts to protect private property rights, and to help all private landowners manage their forestland sustainably. In keeping with this responsibility, *SFI Program Participants* shall have a written *policy* (or *policies*) to implement and achieve the following *principles*:

1. Sustainable Forestry

To practice *sustainable forestry* to meet the needs of the present without compromising the ability of future generations to meet their own needs by practicing a land stewardship ethic that integrates *reforestation* and the managing, growing, nurturing and harvesting of trees for useful products and *ecosystem services* such as the *conservation* of soil, air and water quality, carbon, *biological diversity, wildlife* and *aquatic habitats,* recreation and aesthetics.

2. Forest Productivity and Health

To provide for regeneration after harvest and maintain the productive capacity of the forestland base, and to protect and maintain *long-term* forest and soil *productivity.* In addition, to protect forests from economically or environmentally undesirable levels of wildfire, pests, diseases, *invasive exotic plants and animals,* and other damaging agents and thus maintain and improve *long-term forest health* and *productivity.*

3. Protection of Water Resources

To protect water bodies and *riparian areas*, and to conform with forestry *best management practices* to protect water quality.

4. Protection of Biological Diversity

To manage forests in ways that protect and promote *biological diversity*, including animal and plant species, *wildlife habitats*, and ecological or natural community types.

5. Aesthetics and Recreation

To manage the visual impacts of forest operations, and to provide recreational opportunities for the public.

6. Protection of Special Sites

To manage lands that are ecologically, geologically or *culturally important* in a manner that takes into account their unique qualities.

7. Responsible Fiber Sourcing Practices in North America

To use and promote among other forest landowners *sustainable forestry* practices that are both scientifically credible and economically, environmentally and socially responsible.

8. Legal Compliance

To comply with applicable federal, provincial, state and local *forestry* and related environmental laws, statutes and regulations.

9. Research

To support advances in sustainable forest management through *forestry* research, science and technology.

10. Training and Education

To improve the practice of *sustainable forestry* through training and education *programs.*

11. Community Involvement and Social Responsibility

To broaden the practice of *sustainable forestry* on all lands through community involvement, socially responsible practices, and through recognition and respect of *Indigenous Peoples*' rights and *traditional*
forest-related knowledge.

12. Transparency

To broaden the understanding of forest certification to the *SFI 2015-2019 Forest Management Standard* by documenting certification audits and making the findings publicly available.

13. Continual Improvement

To continually improve the practice of forest management, and to monitor, measure and report performance in achieving the commitment to *sustainable forestry.*

SFI 2015-2019 Forest Management Standard objectives

A Summary of the SFI 2015-2019 Forest Management Standard Objectives follows:

Objective 1. Forest Management Planning

To ensure forest management plans include long-term sustainable harvest levels and measures to avoid forest conversion.

Objective 2. Forest Health and Productivity

To ensure long-term forest productivity, carbon storage and conservation of forest resources through prompt reforestation, afforestation, minimized chemical use, soil conservation, and protecting forests from damaging agents.

Objective 3. Protection and Maintenance of Water Resources

To protect the water quality of rivers, streams, lakes, wetlands and other water bodies through meeting or exceeding best management practices.

Objective 4. Conservation of Biological Diversity

To manage the quality and distribution of wildlife habitats and contribute to the conservation of biological diversity by developing and implementing stand- and landscape-level measures that promote a diversity of types of habitat and successional stages, and the conservation of forest plants and animals, including aquatic species, as well as threatened and endangered species, Forests with Exceptional Conservation Value, old-growth forests and ecologically important sites.

Objective 5. Management of Visual Quality and Recreational Benefits

To manage the visual impact of forest operations and provide recreational opportunities for the public.

Objective 6. Protection of Special Sites

To manage lands that are geologically or culturally important in a manner that takes into account their unique qualities.

Objective 7. Efficient Use of Fiber Resources

To minimize waste and ensure the efficient use of fiber resources.

Objective 8. Recognize and Respect Indigenous Peoples' Rights

To recognize and respect Indigenous Peoples' rights and traditional knowledge.

Objective 9. Legal and Regulatory Compliance

To comply with applicable federal, provincial, state, and local laws and regulations.

Objective 10. Forestry Research, Science and Technology

To invest in forestry research, science and technology, upon which sustainable forest management decisions are based and broaden the awareness of climate change impacts

on forests, wildlife and biological diversity.

Objective 11. Training and Education

To improve the implementation of sustainable forestry practices through appropriate training and education programs.

Objective 12. Community Involvement and Landowner Outreach

To broaden the practice of sustainable forestry through public outreach, education, and involvement, and to support the efforts of SFI Implementation Committees.

Objective 13. Public Land Management Responsibilities

To participate and implement sustainable forest management on public lands.

Objective 14. Communications and Public Reporting

To increase transparency and to annually report progress on conformance with the SFI Forest Management Standard.

Objective 15. Management Review and Continual Improvement

To promote continual improvement in the practice of sustainable forestry by conducting a management review and monitoring performance.

For additional information on the Sustainable Forestry Initiative go to the homepage at: http://www.sfiprogram.org/index.cfm

SFI 2015-2019 Forest Management Standard Objectives

A Summary of the SFI 2015-2019 Forest Management Standard Objectives follows:

Objective 1. Forest Management Planning

To ensure forest management plans include long-term sustainable harvest levels and measures to avoid forest conversion.

Objective 2. Forest Health and Productivity

To ensure long-term forest productivity, carbon storage and conservation of forest resources through prompt reforestation, afforestation, minimized chemical use, soil conservation, and protecting forests from damaging agents.

Objective 3. Protection and Maintenance of Water Resources

To protect the water quality of rivers, streams, lakes, wetlands and other water bodies through meeting or exceeding best management practices.

Objective 4. Conservation of Biological Diversity

To manage the quality and distribution of wildlife habitats and contribute to the conservation of biological diversity by developing and implementing stand- and landscape-level measures that promote a diversity of types of habitat and successional stages, and the conservation of forest plants and animals, including aquatic species, as well as threatened and endangered species, Forests with Exceptional Conservation Value, old-growth forests and ecologically important sites.

Objective 5. Management of Visual Quality and Recreational Benefits

To manage the visual impact of forest operations and provide recreational opportunities for the public.

Objective 6. Protection of Special Sites

To manage lands that are geologically or culturally important in a manner that takes into account their unique qualities.

Objective 7. Efficient Use of Fiber Resources

To minimize waste and ensure the efficient use of fiber resources.

Objective 8. Recognize and Respect Indigenous Peoples' Rights

To recognize and respect Indigenous Peoples' rights and traditional knowledge.

Objective 9. Legal and Regulatory Compliance

To comply with applicable federal, provincial, state, and local laws and regulations.

Objective 10. Forestry Research, Science and Technology

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Appendix D - Soils Management Groups

Potomac Garrett State Forest Soils Management Groups

SMG1 = Very Poorly Drained to Poorly Drained Mapping Units with Moderate Limitations Affecting Construction of Haul Roads and Log Landings

BrA, Brinkerton and Andover Silt Loams, 0 to 3 percent slopes, 25Acres, <1% of total
BrB, Brinkerton and Andover Silt Loams, 3 to 8 percent slopes, 16 Acres, <1% of total
Ls, Lickdale very stony silt loam, 116 Acres, <1% of total
Acreage total of 157 Acres, <1% of Total Area

SMG2 = Very Poorly Drained to Poorly Drained Mapping Units with Severe Limitations Affecting Construction of Haul Roads and Log Landings

Ao, Alluvial Land, Very Stony 236 Acres, 1% of total
At, Atkins Silt Loam, .04 Acres, <1% of total
BsC, Brinkerton and Andover Very Stony Silt Loams, 0 to 15 percent slopes, 882 Acres, 5% of total
Lc, Lickdale Silt Loam, 85 Acres, <1% of total area
NoB, Nolo Silt Loam, 0 – 8 percent slopes, .2 Acres, <1% of totals acres
Acreage total of 1203..06 Acres, 6 % of Total Area

SMG3 = Somewhat Poorly Drained to Moderately Well Drained Mapping Units with Moderate Limitations Affecting Construction of Haul Roads and Log Landings

CoB, Cavode silt loam, 0 to 8 percent slopes, 2 Acres, <1% of total
CtB, Cookport channery loam, 0 to 8 percent slopes, 38 Acres, <1% of total
CtC2, Cookport channery loam, 8 to 15 percent slopes, moderately eroded, .5 Acres, <1% of total
CuD, Cookport and Ernest very stony silt loams, 8 to 25 percent slopes, 831 Acres, 5% of total
ErB, Ernest silt loam, 3 to 8 percent slopes, 34 Acres, <1% of total
ErC2, Ernest silt loam, 8 to 15 percent slopes, moderately eroded, 1 Acres, <1% of total
Acreage total of 163 Acres, <1% of Total Area

SMG4 = Somewhat Poorly Drained to Moderately Well Drained Mapping Units with Severe Limitations Affecting Construction of Haul Roads and Log

Landings

AgC, Albrights Very Stony Silt Loam, 0 to 15 percent slopes, 10 Acres, <1% of total
CuB, Cookport and Ernest very stony silt loams, 0 to 8 percent slopes, 1976 Acres, 11% of total
Acreage total of 1986 Acres, 11% of Total Area

SMG5 = Well Drained Mapping Units with Slight to Moderate Limitations Affecting Construction of Haul Roads and Log Landings

CnC2, Calvin, Ungers, and Lehew channery loams, 10 to 20 percent slopes, 185 Acres,1% of total
CnD2, Calvin, Ungers, and Lehew channery loams, 20 to 35percent slopes, 11 Acres, 0% of total
CrB, Clymer channery loam, 0 to 10 percent slopes, 4 Acres, <0% of total
DbB, Dekalb channery loam, 0 to 10 percent slopes, 40 Acres,0% of total
DbC2, Dekalb channery loam, 10 to 20 percent slopes, moderately eroded, 23 Acres, <1% of total
DbD2, Dekalb channery loam, 20 to 35 percent slopes, moderately eroded, 4 Acres, <1% of total
DgD, Dekalb and Gilpin very stony loams, 15 to 25 percent slopes, 3612 Acres,20% of total
DlD, Dekalb and Leetonia very stony sandy loams, 15 to 25 percent slopes, 1481 Acres,8% of total
GnB2, Gilpin channery silt loam, 0 to 10 percent slopes, 171 Acres, <1% of total
GnC2, Gilpin channery silt loam, 10 to 20 percent slopes, 129 Acres,<1% of total
GnD2, Gilpin channery silt loam, 20 to 35 percent slopes,30 Acres, <1% of total
LaD, Laidig very stony loam, 8 to 25 percent slopes,144 Acres, <1% of total
UcB, Ungers, Calvin, and Lehew channery loams, 0 to 10 percent slopes, 45 Acres, <1% of total
VsF, Very stony land, steep,55 Acres, <1% of total
Ps, Pope Silt Loam, 2 Acres, <1% of total
Acreage total of5936 Acres, 32% of Total Area

SMG6 = Well Drained Mapping Units with Severe Limitations Affecting Construction of Haul Roads and Log Landings

ClE, Calvin and Lehew channery loams, 35 to 50 percent slopes, 16 Acres, <1% of total
DcC, Dekalb-Calvin-Lehew very stony loams, 0 to 15 percent slopes, moderately eroded, 38 Acres, <1% of total
DcD, Dekalb-Calvin-Lehew very stony loams, 15 to 25 percent slopes, moderately eroded, 491 Acres, 3% of total
DgC, Dekalb and Gilpin very stony loams, 0 to 15 percent slopes, 2133 Acres,12% of total
DlC, Dekalb and Leetonia very stony sandy loams, 0 to 15 percent slopes, 1798 Acres,10% of total
LaB, Laidig very stony loam, 0 to 8 percent slopes, 13 Acres, <1% of total
VsD, Very stony land, rolling, 635Acres,3% of total
Acreage total of5124 Acres, 29% of Total Area

SMG7 = Soil Mapping Units that are Variable and have no Defined Drainage Class with Moderate Limitations Affecting Construction of Haul Roads and

Log Landings

St, Strip Mines and Dumps,41 Acres, <1% of total

Acreage total of 41 Acres, <1% of Total Area

SMG8 = Soil Mapping Units that are Variable and have no Defined Drainage Class with Severe Limitations Affecting Construction of Haul Roads and Log Landings

SrF, Stony Land, Steep, 3334 Acres, 19% of total

Sw, Swamp, 2 Acres, <1% of total

W, Water, 66 Acres,< 1% of total

Acreage total of 3402 Acres, 19% of Total Area

Soils Inventory Report for Potomac Garrett State Forest

Map Unit Symbol	Acres	Percent
AgC	10	0%
Ao	236	1%
At	.04	0%
BrA	25	0%
BrB	16	0%
BsC	882	5%
ClE	16	0%
CnC2	185	1%
CnD2	11	0%
CoB	2	0%
CrB	4	0%
CtB	38	0%
CtC2	.5	0%
CuB	1976	11%
CuD	831	5%
DbB	40	0%
DbC2	23	0%
DbD2	4	0%
DcC	38	0%
DcD	491	3%
DgC	2133	12%
DgD	3612	20%
DlC	1798	10%
DlD	1481	8%
ErB	34	0%
ErC2	1	0%
GnB2	171	0%
GnC2	129	0%
GnD2	30	0%
LaB	13	0%
LaD	144	0%
Lc	85	0%
Ls	116	0%
NoB	.2	0%

Ps	2	0%
SrF	3334	19%
St	41	0%
Sw	2	0%
UcB	45	0%
VsD	626	3%
VsF	55	0%
W	66	0%
Total:	18,766	

Appendix E - Current and Historical Rare, Threatened and Endangered Species of Garrett Count MD

April 2010
Maryland Department of Natural Resources
Wildlife and Heritage Service

Scientific Name	Common Name	Global Rank	State Rank	Federal Status
Animals				
Accipiter gentilis	Northern Goshawk	G5	S1B	E
Accipiter striatus	Sharp-shinned Hawk	G5	S1S2B	
Aegolius acadicus	Northern Saw-whet Owl	G5	S1B	
Aeshna canadensis	Canada Darner	G5	S2	
Aeshna tuberculifera	Black-tipped Darner	G4	S2	
Aimophila aestivalis	Bachman's Sparrow	G3	SHB	X
Amblyscirtes hegon	Pepper and Salt Skipper	G4	S2	I
Ammodramus henslowii	Henslow's Sparrow	G4	S1S2B	T
Aneides aeneus	Green Salamander	G3G4	S2	E
Apalone spinifera	Eastern Spiny Softshell	G5	S1	I
Apamea mixta	A Noctuid Moth	GU	S1	
Arrhopalites sp. 1	Crabtree Cave Springtail	GNR	SU	
Bartramia longicauda	Upland Sandpiper	G5	S1B	E
Boyeria grafiana	Ocellated Darner	G5	S1	
Caecidotea franzi	Franz's Cave Isopod	G2G4	S1	E
Caecidotea sp. 1	An Isopod	G1	S1	
Caecidotea sp. 5	John Friend Cave Isopod	GNR	S1	
Caecidotea sp. 6	An Isopod	GNR	S2	
Callophrys irus	Frosted Elfin	G3	S1	E
Calopteryx amata	Superb Jewelwing	G4	S1S2	T
Catostomus catostomus	Longnose Sucker	G5	SH	X
Chlosyne harrisii	Harris's Checkerspot	G4	S2	T
Cicindela patruela	Green-patterned Tiger Beetle	G3	S1	E
Circus cyaneus	Northern Harrier	G5	S2B	
Cistothorus platensis	Sedge Wren	G5	S1B	E
Clinostomus elongatus	Redside Dace	G3G4	SX?	
Colias interior	Pink-edged Sulphur	G5	S1	
Contopus cooperi	Olive-sided Flycatcher	G4	SHB	E
Cordulegaster obliqua	Arrowhead Spiketail	G4	S2	
Cryptobranchus alleganiensis	Eastern Hellbender	G3G4	S1	E

Dactylocythere scotos	An Entocytherid Ostracod	GNR	S1	
Dendroica fusca	Blackburnian Warbler	G5	S1S2B	T
Discus catskillensis	Angular Disc	G5	S1	
Empidonax alnorum	Alder Flycatcher	G5	S2B	I
Enallagma annexum	Northern Bluet	G5	S1	
Enallagma antennatum	Rainbow Bluet	G5	S1	
Erethizon dorsatum	Porcupine	G5	S1S2	I
Erora laeta	Early Hairstreak	GU	S1	E
Euchloe olympia	Olympia Marble	G4G5	S2	I
Eumeces anthracinus	Northern Coal Skink	G5	S1	E
Euphyes bimacula	Two-spotted Skipper	G4	S1	E
Fontigens bottimeri	Appalachian Spring Snail	G2	S2	
Gomphus rogersi	Sable Clubtail	G4	S2	I
Haliaeetus leucocephalus	Bald Eagle	G5	S3B	

Appendix F - SFI Management Review & Continual Improvement

Effective: July 19, 2005
Operation Order 2005-601 Annapolis, Maryland

Policy for Management Review & Continual Improvement

Objective
This order establishes the Maryland Department of Natural Resources Forest Service policy for a management review system to examine findings and progress in implementing the Sustainable Forest Initiative (SFI) Standard on those lands subject to the Standard, to make appropriate improvements in programs, and to inform employees of changes.

Overview
The Sustainable Forest Initiative Standard Objective 13 requires landowners with lands subject to the Standard to promote continual improvement in the practice of sustainable forestry and monitor, measure, and report performance in achieving the commitment to sustainable forestry.

Therefore:

1. Biannual reports will be filed by the State Forest manager (with input by the management contractor, if applicable) to the State Forester on progress of meeting SFI requirements, status of Corrective Action Requests (CAR), and suggested opportunities for continual improvement. The first report will be due within 60 days after the Sustainable Forest Initiative annual audit and the second report about six months after that.
2. A summary of the biannual reports will be posted on the DNR Forest Service website and optionally other appropriate public outlets.
3. A meeting will be held annually to report on the progress of meeting SFI requirements, CAR status, opportunities for continual improvement on meeting SFI requirements and for the adjustment and establishment of new SFI implementation goals. This will require attendance by the forest manager, management contractor (if applicable), State Forester and appropriate staff. This meeting should be in conjunction with the release of the second report and coordinated by State Forest manager, contractor (if applicable) and State Forester.
4. This policy shall be included as a requirement in the agreement with any forest management contractors with DNR Forest Service the requirement to fulfill the above written policy conditions.

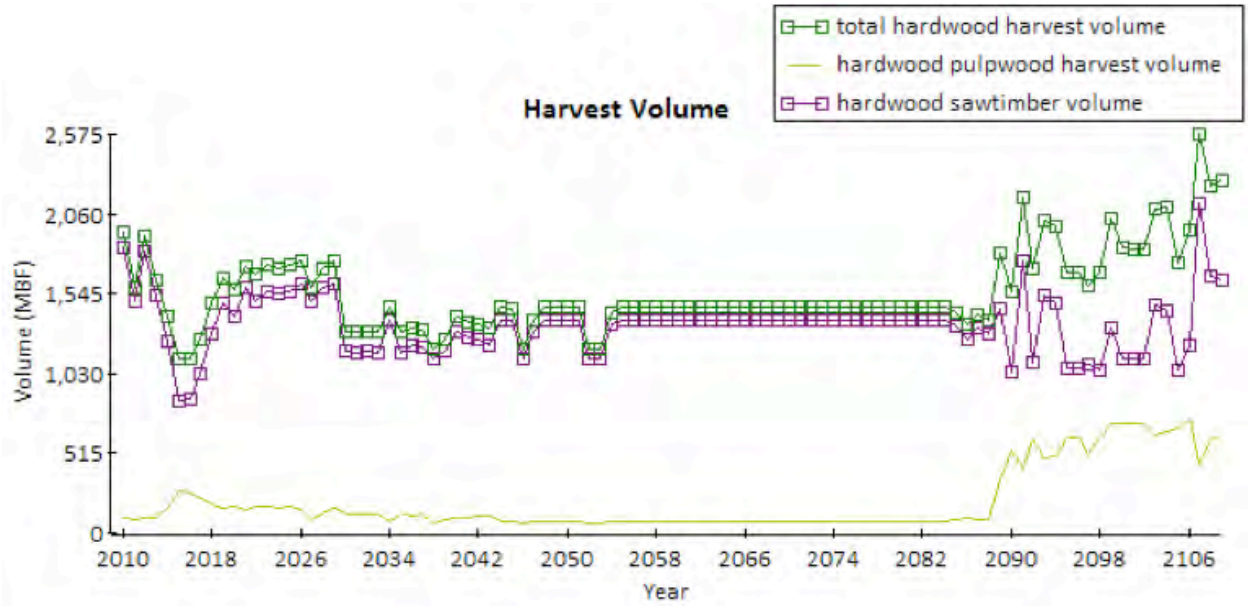
Appendix G - Modeling Long-Term Sustainability

Criteria used in this 100 year model run:

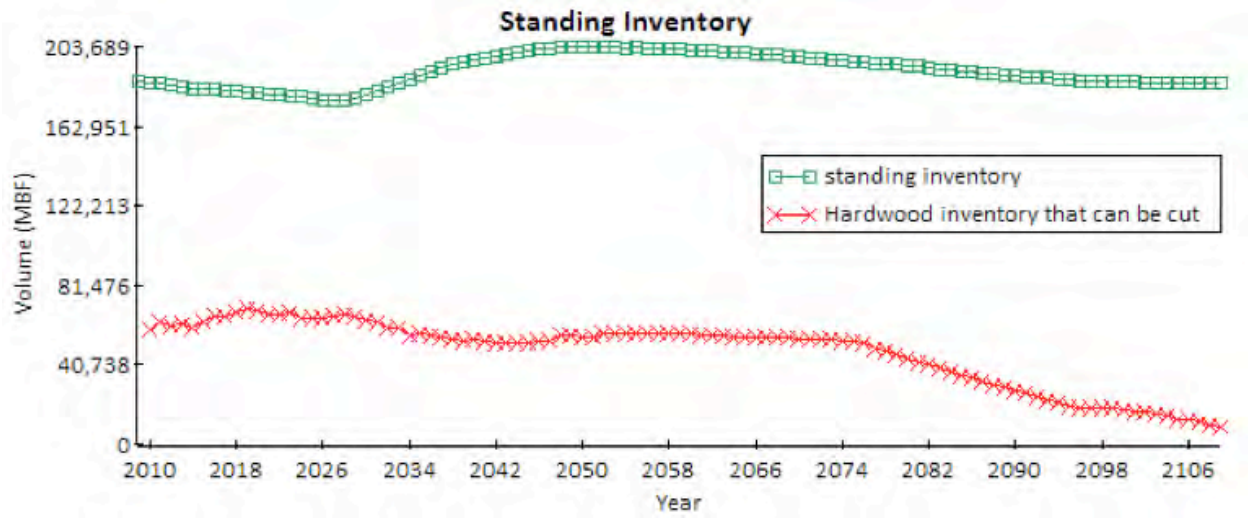
- Maximum age
    - Mixed Oak - 250
    - Northern Hardwood - 250
    - Cove Hardwood - 200
    - Hemlock – 300
    - Plantations - 150
    - Red Maple - 150
    - All other types - 250
- Yields/returns derived from year 2000 CFI data
- Harvests
    - Thinning
        - Mixed Oak – Age 30-65, no activity after thinning for 20 years
        - Northern Hardwood – Age 30-65, no activity after thinning for 20 years
    - Variable Retention Harvest
        - Mixed Oak – Age 80-125 (with thinning)
        - Northern Hardwood – Age 80-125 (with thinning)
        - Mixed Oak and Northern Hardwood – Age 80-135 (without thinning)
- Death
    - All stands reset to age zero with the same cover type
- Model maximizes total dollar return over entire model run
- Constraints
    - Total harvest area cannot exceed 500 acres per year
    - Total Thin area cannot exceed 200 acres per year
    - Total Variable Retention area cannot exceed 500 acres per year
    - Even flow constraints
        - Total volume harvested cannot change from the maximum by more than 40%
        - No restriction on total thin area change
        - Total variable retention level cannot change more than 25% from max

- Total standing inventory cannot change by more than 25% from the max

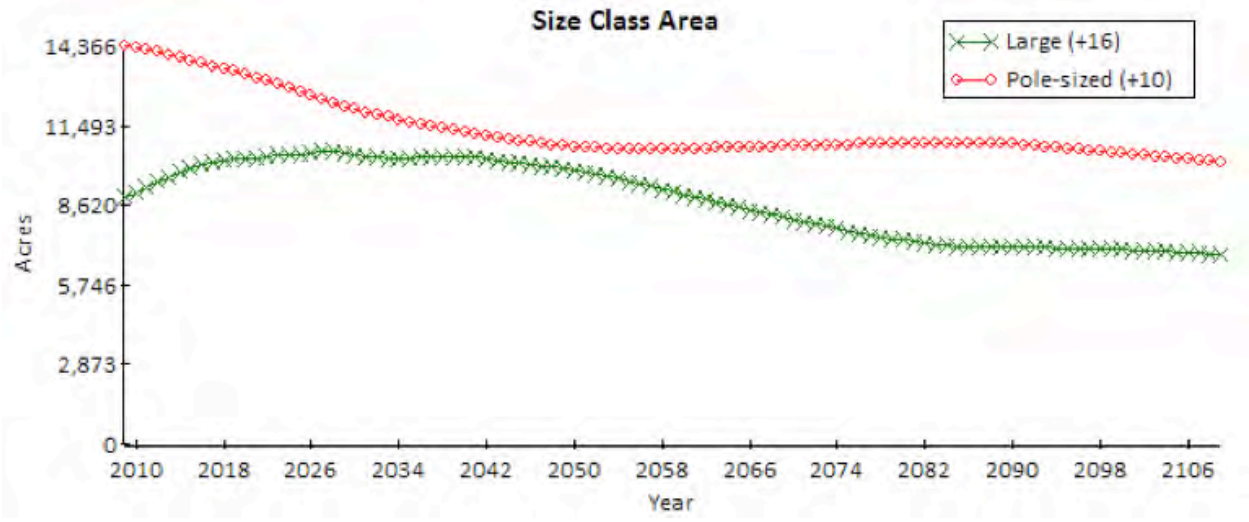
The following forest modeling graphs are derived from the current database for Potomac-Garrett State Forest as of March 2011. The forest modeling projections below are estimates on what can be expected to occur over a 100 year time frame.



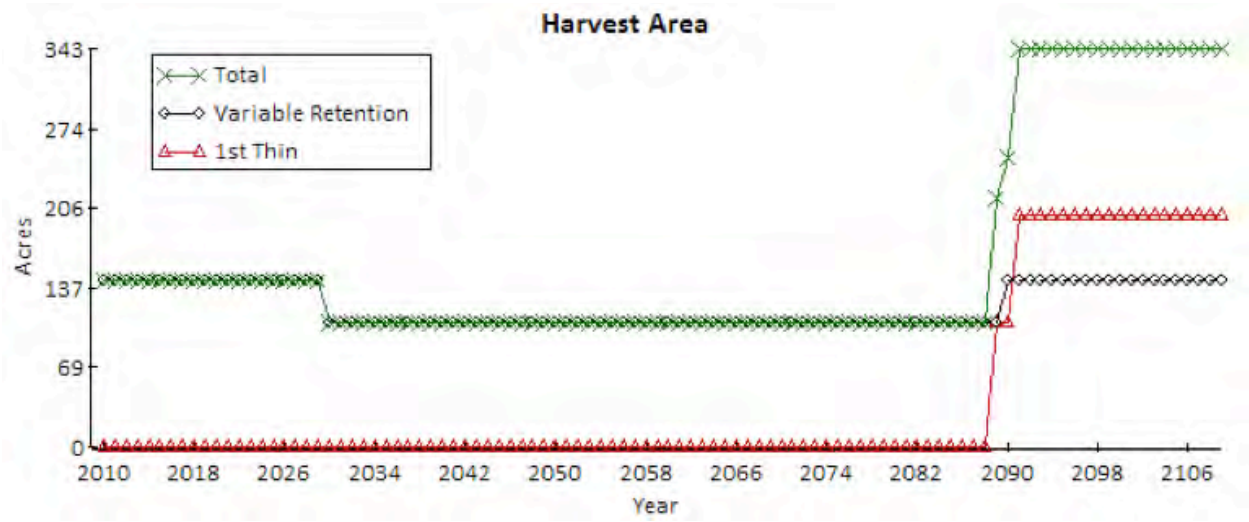
J1: Estimated Harvest Volume on PGSF Based on a 100-Year Projection



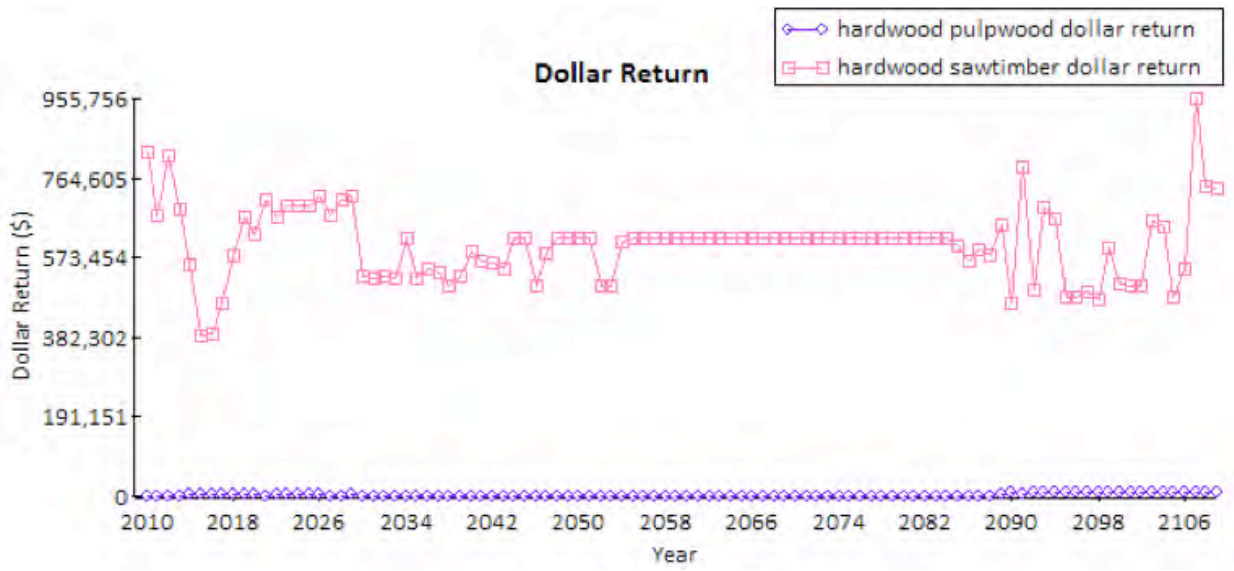
J2: Standing Inventory on PGSF Based on a 100-Year Projection



J3: Size Class Area in Acres on PGSF on a 100-Year Projection



J4: Estimated Available Harvest Acres for Various Harvest Methods Over a 100 -Year Period



J5: Estimated Revenue Projections From Various Harvest Types Over a 100-Year Period

Forest Resource Planning

The annual growth rate* on the entire forest is 3,300,000 Bd. Ft. (3.3 mmBF). Of this 3.3mmBF, 2.1mmBF are growing within the General Management Zone; that area as set out in the "1993 - Ten Year Resource Management Plan" as being generally available for timber management.

Forest wide, the average annual harvest rate since 2000 is 677,184 Bd.Ft., approximately 20% of the average annual growth across the entire forest, or 32% of the volume growing within the General Management Zone.

The annual harvest rates since 2000 are as follows:

2001	828,472	Bd.Ft
2002	875,177	Bd.Ft.
2003	738,097	Bd.Ft.
2004	973,262	Bd.Ft.
2005	925,113	Bd.Ft.
2006	731,568	Bd.Ft.
2007	487,027	Bd.Ft.
2008	793,002	Bd.Ft.
2009	251,990	Bd.Ft.
2010	168,131	Bd.Ft.

* Growth figures derived from the Potomac-Garrett State Forest -Continuous Forest Inventory (CFI) completed in 2000.

Appendix H - Glossary

BIOLOGICAL DIVERSITY - The variety of life forms in a given area. Diversity can be categorized in terms of the number of species, the variety in the area's plant and animal communities, the genetic variability of the animals, or a combination of these elements.

BUFFER STRIP - A narrow zone or strip of land, trees, or vegetation bordering an area. Common examples include visual buffers, which screen the view along roads, and streamside buffers, which are used to protect water quality. Buffers may also be used to prevent the spread of forest pests.

DOMINANT [CO-DOMINANT]: The overstory life form or species in a plant community which contributes the most cover or basal area to the community, compared to other life form or species.

ECOLOGICAL TYPE (Habitat Type): A category of land having a unique combination of potential natural community; soil, landscape features, climate, and differing from other ecological types in its ability to produce vegetation and respond to management. Classes of ecological types include all sites that have this

ECOSYSTEM/COVER TYPE: The native vegetation ecological community considered together with non-living factors of the environment as a unit and, the general cover type occupying the greatest percent of the stand location. Based on tree or plant species forming a plurality of the stocking within the stand. May be observed in the field or computed from plot measurements.

INTERIOR FOREST: Habitat necessary for insulation from edge effects (e.g., noise, wind, sun, predation) which occurs within the interior of a patch.

LANDSCAPE LEVEL PLANNING: Planning of the distribution patterns of communities and ecosystems, the processes that affect those patterns, and changes in pattern and process over time.

LAND USE CLASS: The predominant purpose for which an area is employed. Classes include Agricultural Land, Forest land, Rangeland, Wetland, Urban/suburban, and Utility/Transportation Corridors (Roads, Railroads, and Utility Corridors).

OLD GROWTH ECOSYSTEM FUNCTIONALITY: The ability of an ecosystem to produce the attributes and perform the continued operation of the plant and animal communities in an area together with the non-living physical environment that supports them. Functional Old Growth Ecosystems have physically defined boundaries, but they are also dynamic: their boundaries and constituents can change over time. They can import and export materials and energy and thus can interact with and influence other ecosystems. They can also vary widely in size.

Extended Rotation: Forest stands for which the harvest age is increased beyond the optimum economic harvest age [e.g., increasing the harvest age of an oak stand from 80-100 years (i.e., the "normal" economic harvest age for oak on most sites) to 150 or more years] to provide larger trees, wildlife habitat, and other non-timber values.

OLD GROWTH NETWORK / MANAGEMENT COMPLEX: interrelated areas of Old Growth that import and export materials and energy and interact with and influence each other as ecosystems.

SHADE-INTOLERANT TREES - Trees that cannot thrive in the shade of larger trees.

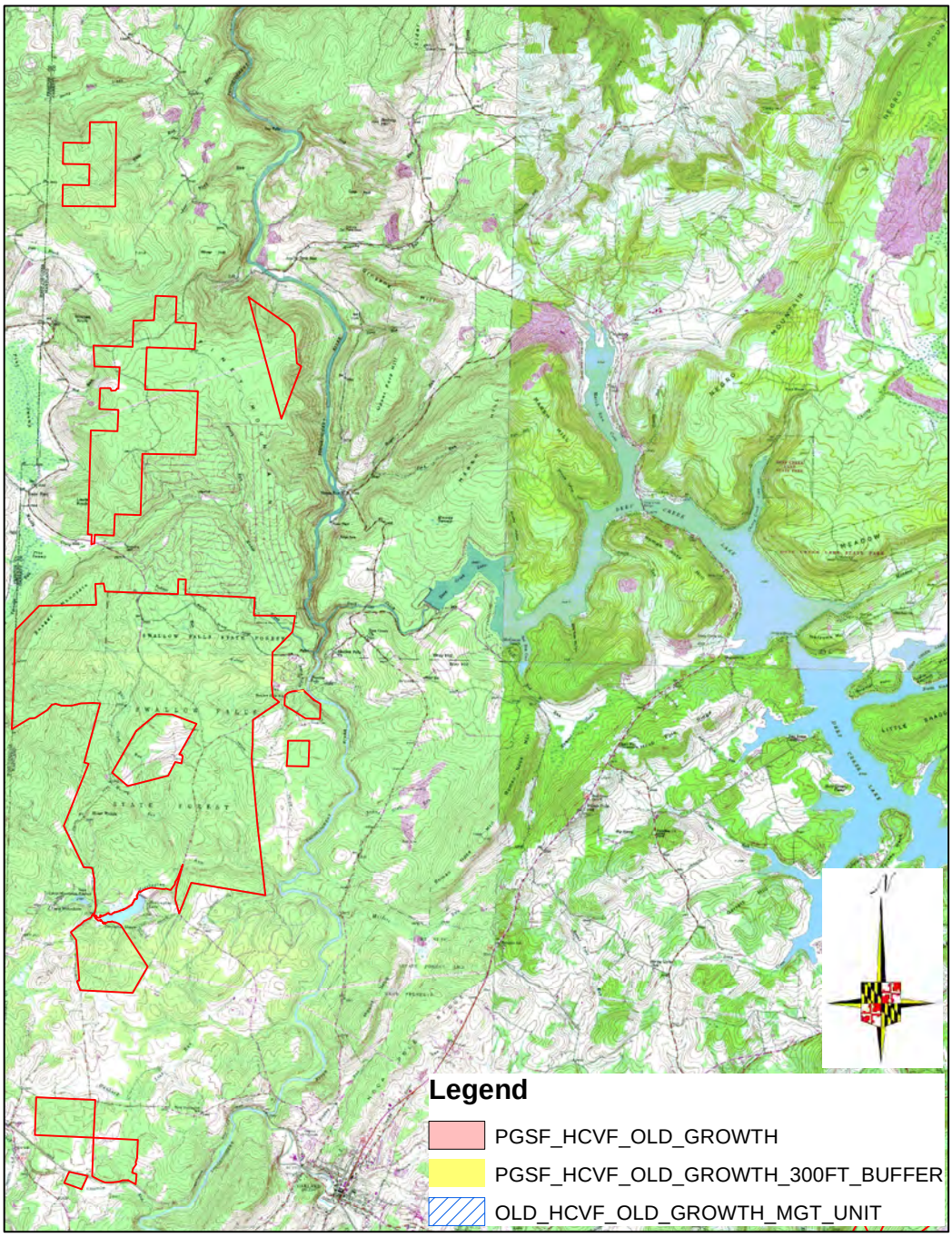
STAND AGE: The mean age of the dominant and co-dominant trees in the stand.

STAND CONDITION: A classification of forest stands based upon the age of maturity and structure of the overstory and understory.

- Old-Growth Stands: Ecosystems distinguished by old trees and related structural attributes. Old growth encompasses the later stages of stand development which typically differ from earlier stages in a variety of characteristics that may include tree size, accumulations of large dead woody material, number of canopy layers, species composition, and ecosystem function. The age at which old growth develops and the specific structural attributes that characterize old growth will vary widely according to forest type, climate, site conditions and disturbance regime. For example, old growth in fire-dependent forest types may not differ from younger forests in the number of canopy layers or accumulation of down woody material. However, old growth is typically distinguished from younger growth by several of the following structural attributes:
    - Large trees for species and site.
    - Wide variation in tree sizes and spacing.
    - Accumulations of large-size dead standing and fallen trees that are high relative to earlier stages.
    - Decadence in the form of broken or deformed tops or bole and root decay.
    - Multiple canopy layers.
    - Canopy gaps and understory patchiness.
- Young-Growth Stand: Any forested stand not meeting the definition of old growth.

STRUCTURAL COMPLEXITY ENHANCEMENT: Silvicultural practices that promote old-growth structural characteristics such as multi-layered canopies, elevated large snag and downed log densities, variable horizontal density, and a greater proportion of tree basal area in large diameter classes.

Appendix I - Maps



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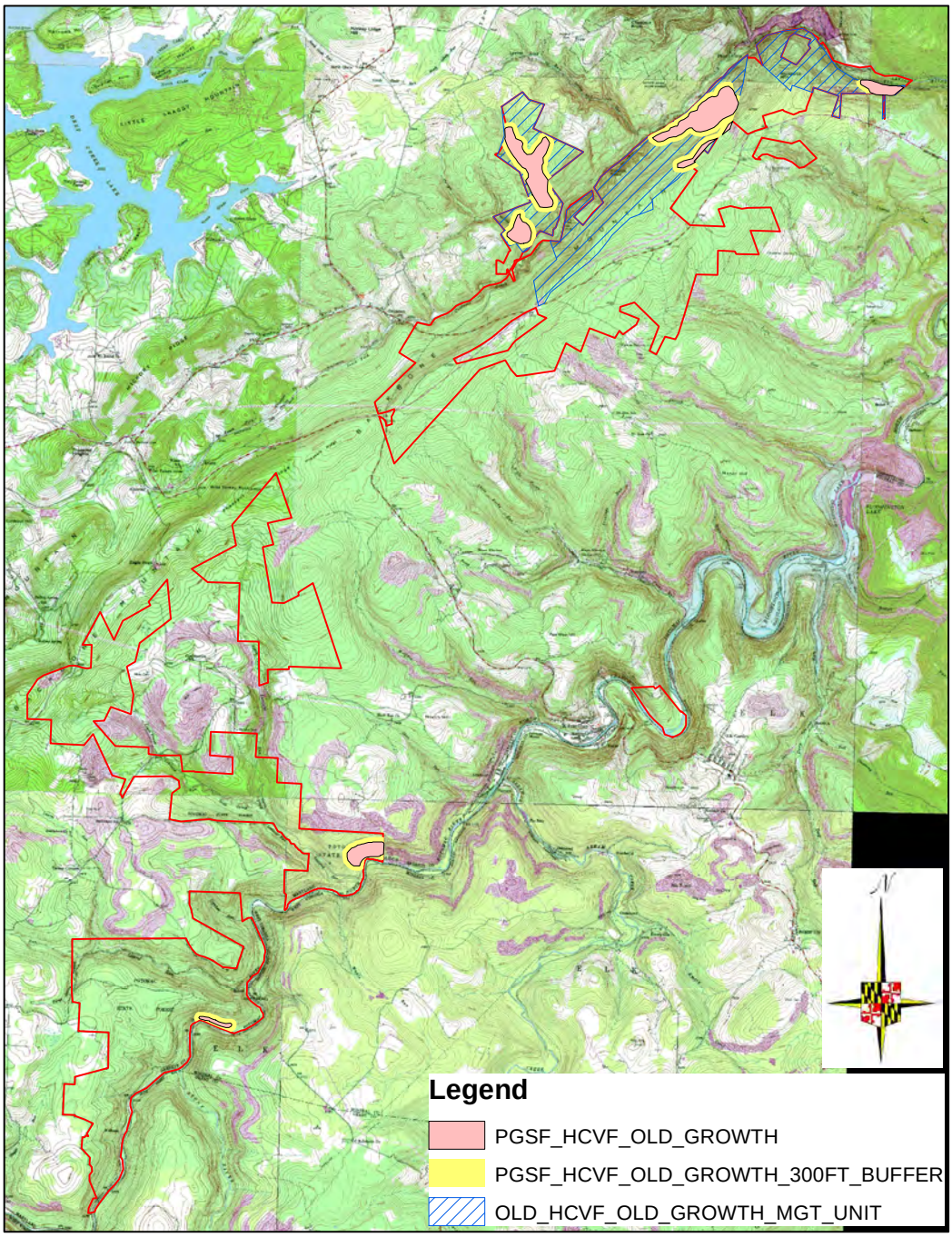
Old Growth and OGMA Map Garrett State Forest



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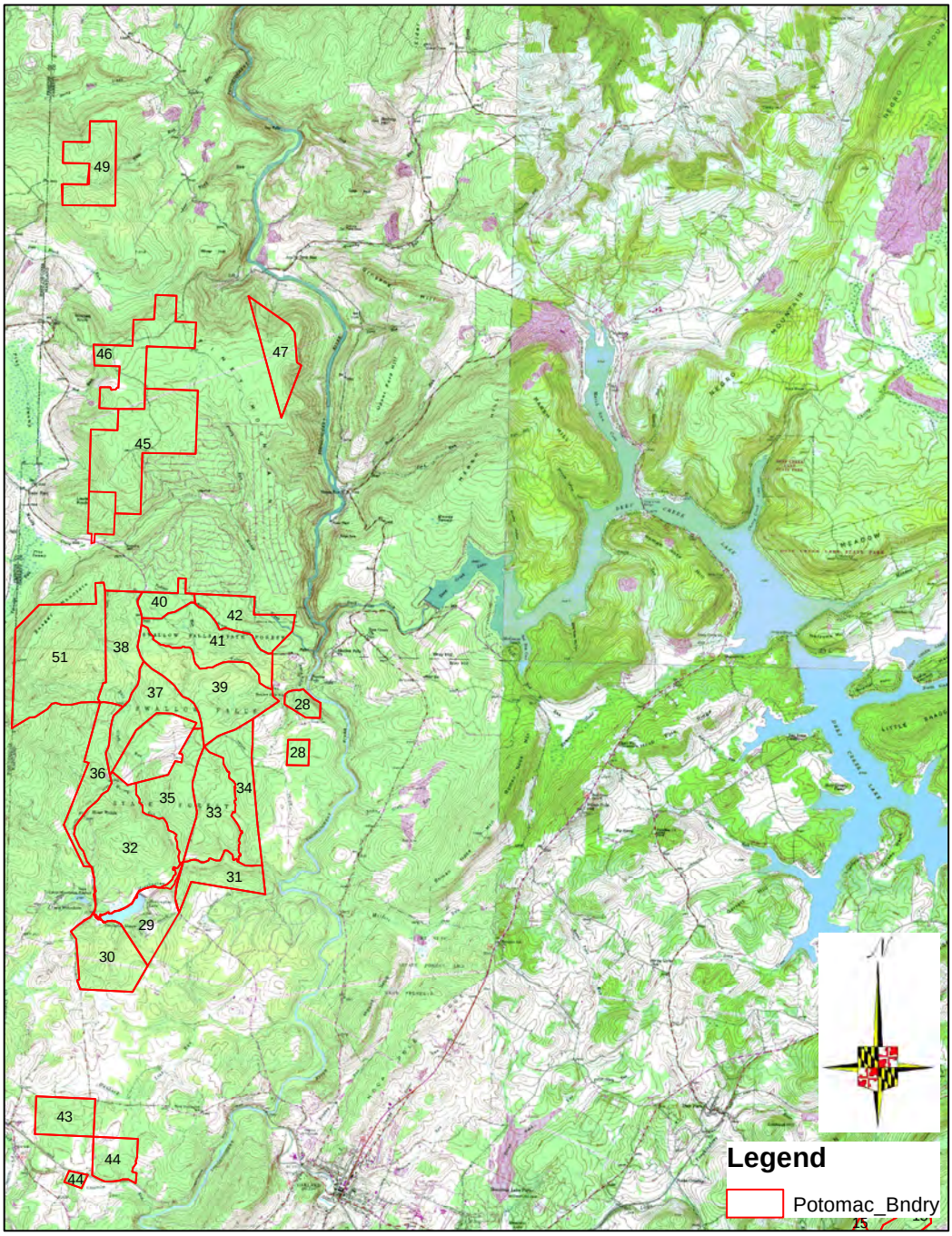
Old Growth and OGMA Map Potomac State Forest



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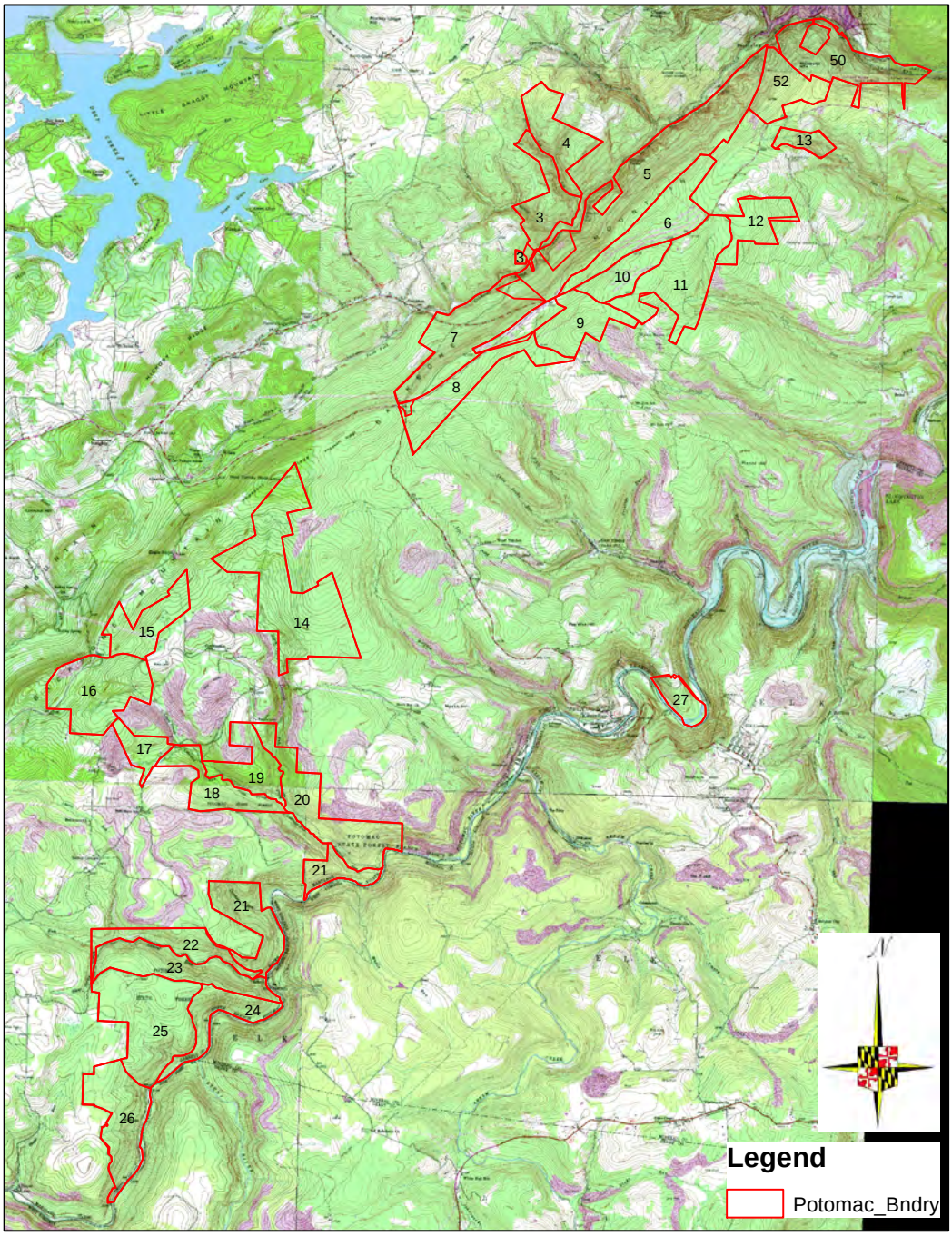
Compartment Map Garrett State Forest



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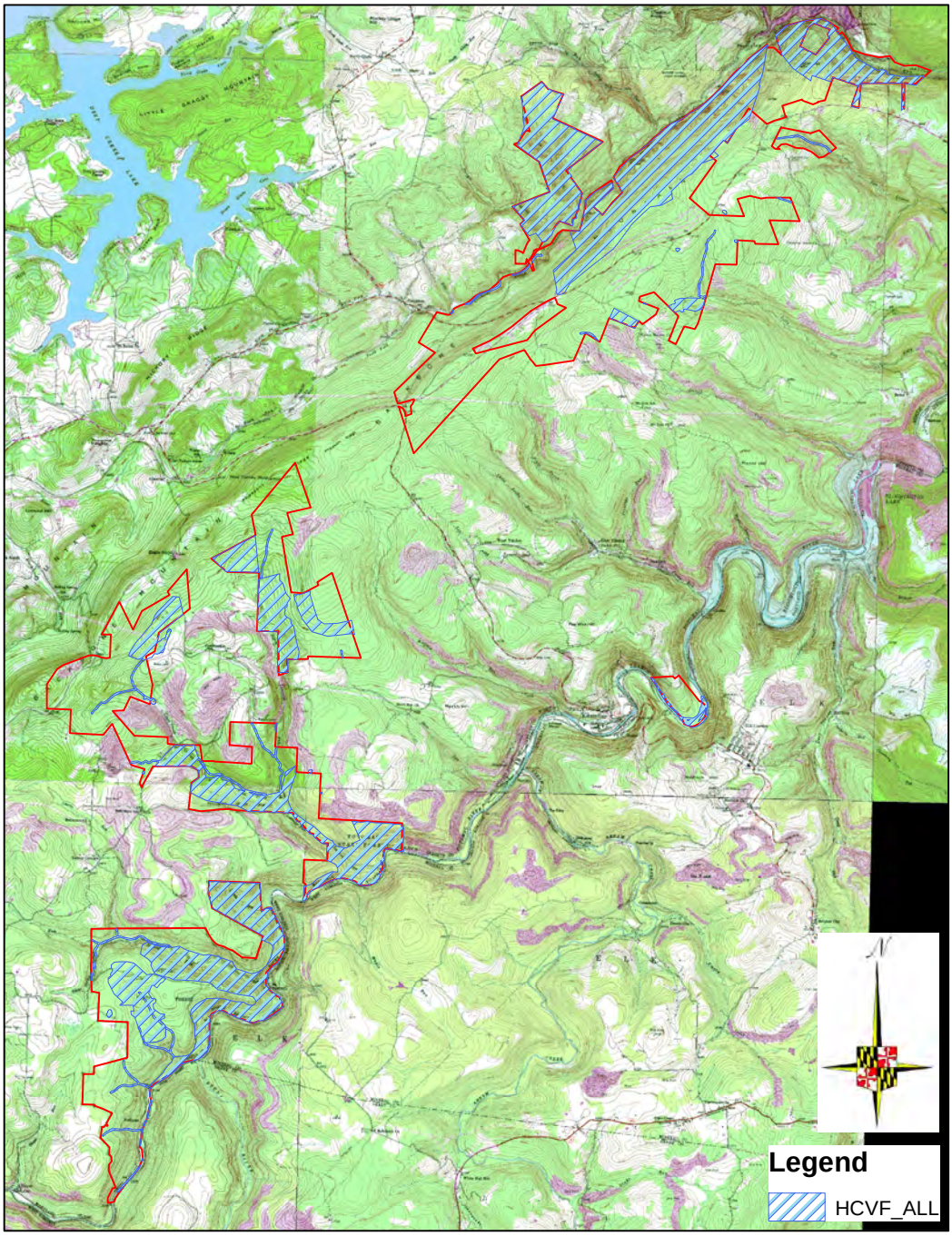
Compartment Map Potomac State Forest



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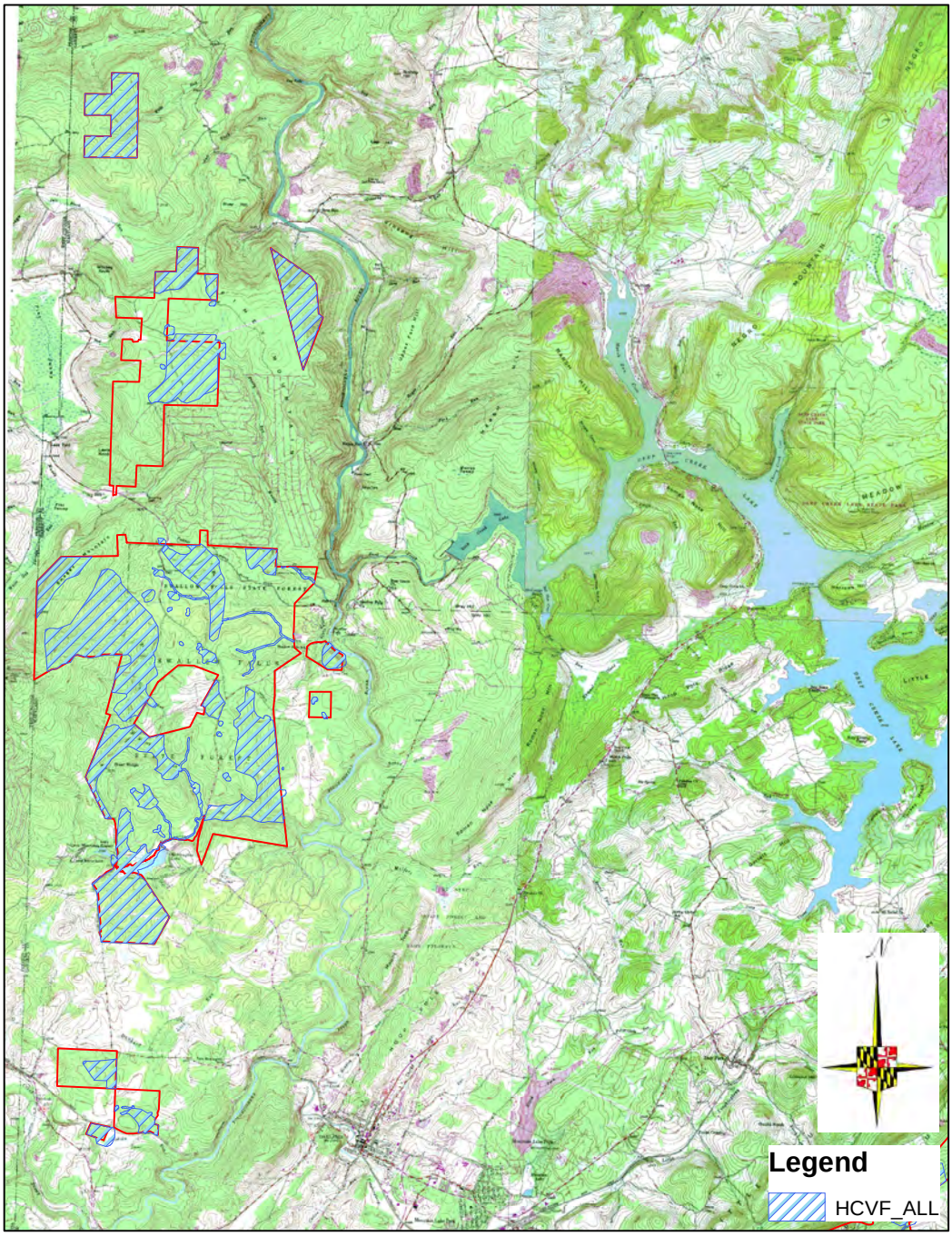
HCVF Potomac State Forest



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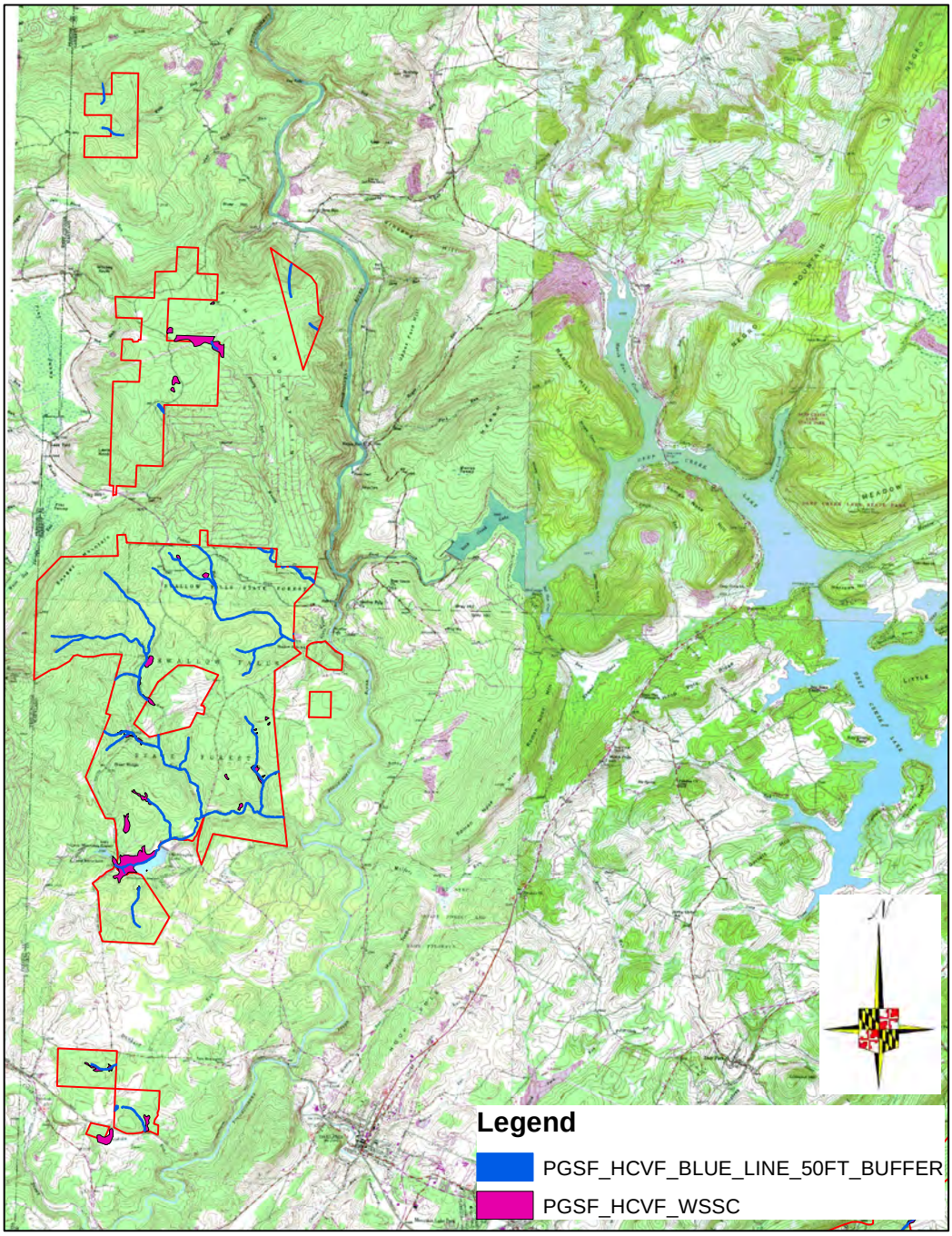
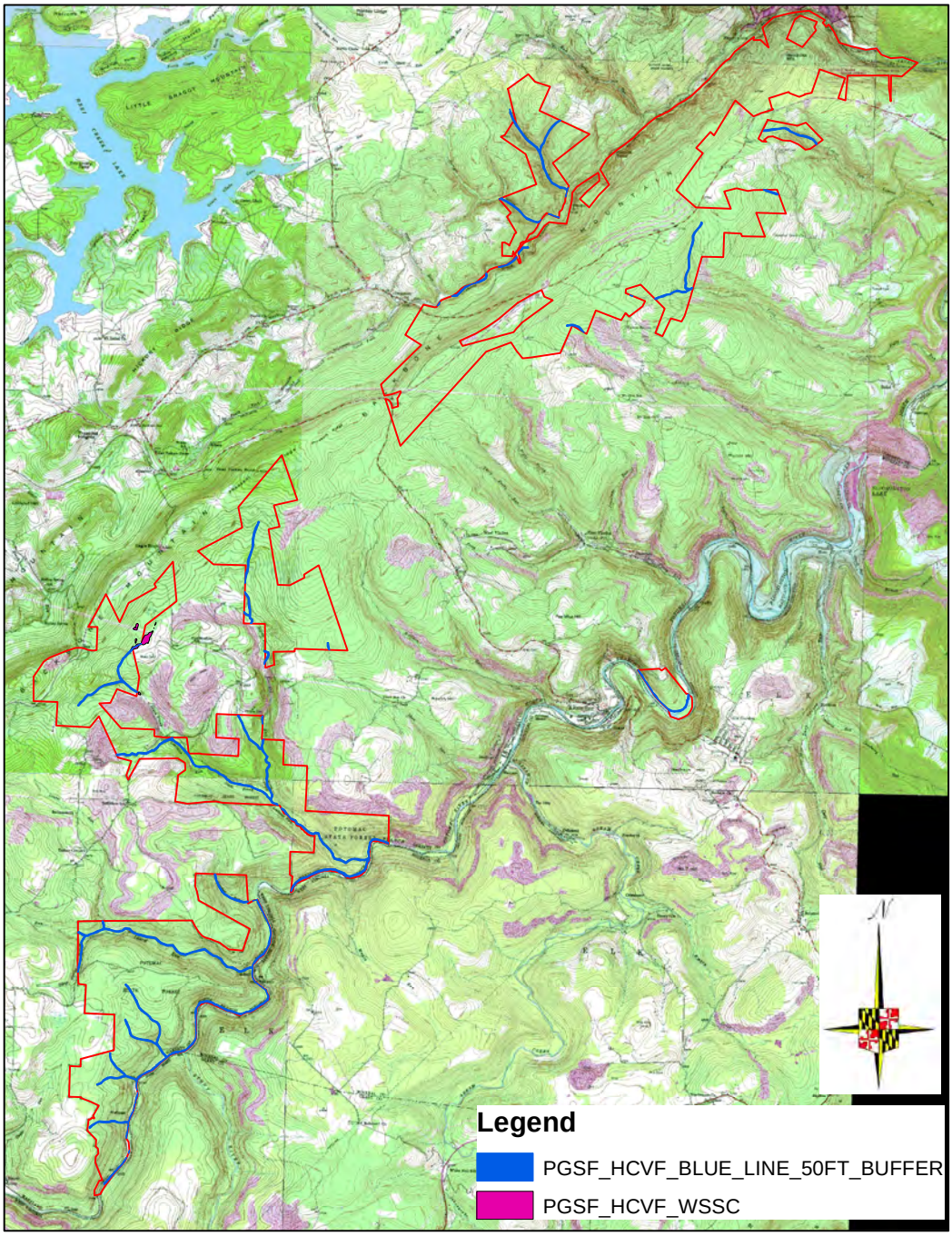
HCVF Garrett State Forest



Scale = 1:100,000

Riparian Buffers and WSSC Map Garrett State Forest



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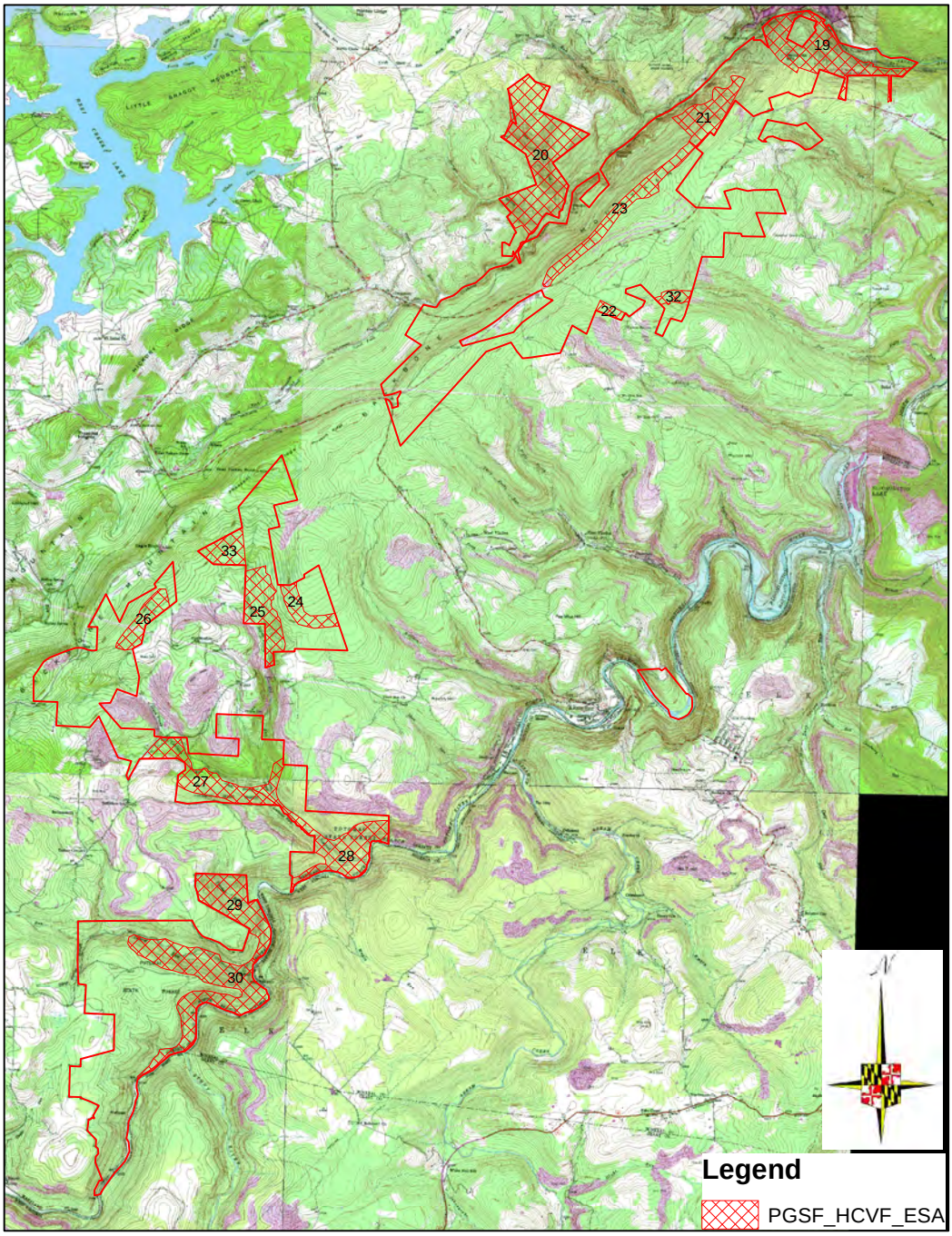
Riparian Buffers and WSSC Map Potomac State Forest



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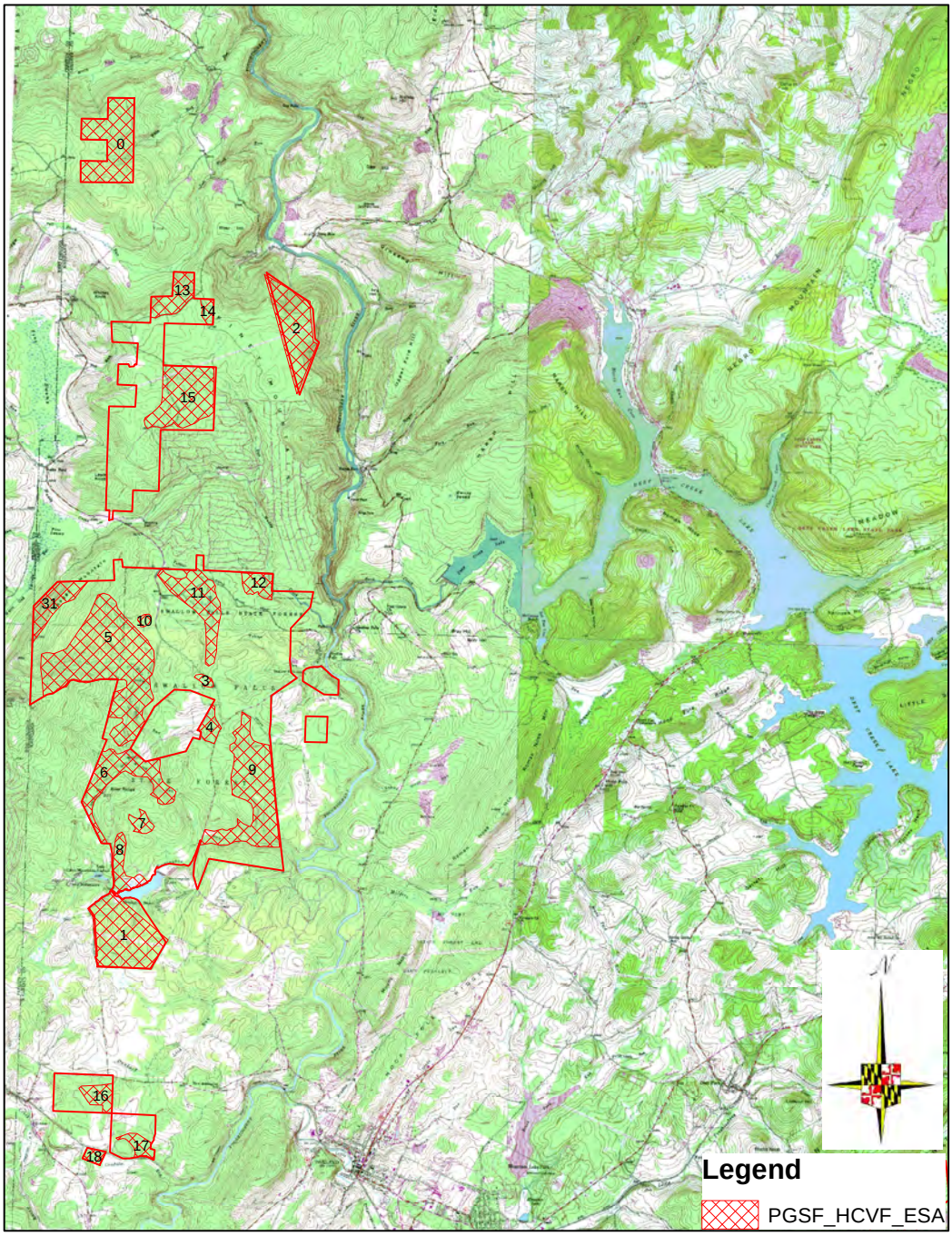
ESA Map Potomac State Forest



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ESA Map Garrett State Forest

Appendix J - An Evergreen Forest Analysis of Garrett and Allegany Counties in Maryland

AN EVERGREEN FOREST ANALYSIS OF GARRETT AND ALLEGANY COUNTIES IN MARYLAND

BY

THE MARYLAND DNR FOREST SERVICE
FOREST RESOURCE PLANNING SECTION

JANUARY 2018

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INTRODUCTION

THE MARYLAND FOREST SERVICE, a unit of the Maryland Department of Natural Resources (DNR) manages over 200,000 acres of state forest land for multiple uses, which include camping, hunting, fishing, timber products, non-timber forest products, animal viewing, hiking, water quality, and more. Four of these forests are found in Garrett and Allegany Counties, in western Maryland, namely Green Ridge State Forest, Savage River State Forest, and the jointly managed Potomac and Garrett State Forests.

Beginning in 2004, State Forests in Maryland became dual certified as a Sustainable Forest under the Sustainable Forestry Initiative (SFI) and the Forest Stewardship Council (FSC), two globally recognized forest sustainability non-profit organizations. The certification process involved a very detailed review of the forests by a third party auditor. In 2015, the four western forests also received dual certification by the FSC and SFI. Annual audits by third-party auditors ensure that forest management activities are following the Sustainable Forest Management Plan for each forest, and that activities are guided by the indicators specified by the FSC and SFI. Occasionally, an audit will reveal a deficiency or "opportunity for improvement", which can eventually be elevated to a Minor Corrective Action Request (CAR), or a more serious Major Corrective Action Request. These must be addressed in various periods of time (depending on the type of CAR), or the managing unit risks revocation of certification.

Recently, an observation by an auditor was made that management was not putting sufficient effort toward management of the western forest's evergreen forest component. This resulted in the issuance of an Opportunity for Improvement, where improvements could be made, but not required. Generally, "evergreens" in western Maryland take the form of naturally occurring hemlock (Tsuga spp.), Eastern White pine (Pinus strobus), Table Mountain pine (Pinus pungens), Pitch pine (Pinus rigida) and others, but also planted stands of spruce—notably Norway spruce (Picea abies). These species comprise the majority of the evergreen component in western Maryland forests.

METHODOLOGY

Evaluation of the evergreen component was done using ESRI Corp. ArcGIS software. Recent upgrades to ESRI software has enabled image classification, feature creation, and raster analysis available in one software package; thus simplifying the project work-flow. These tools were utilized to find potential evergreen tree cover in western Maryland, and quantify it. Additionally, the "iterator" tool used in the Modelbuilder package provides a very simple and effective means of automating the classification/extraction process, and other processes.

Over the years, the state has purchased very high resolution, leaf-off color imagery for the years 2008 and 2013. The recent 2013 imagery also included the color near-infrared band (CIR), in addition to the red/green/blue bands common to regular color imagery. Near-infrared enhances the appearance of healthy, green vegetation, which appears as bright red on the CIR image. The combination of imagery collection during leaf-off, and the inclusion of the CIR band, makes this the perfect imagery for determining evergreen coverage.

The imagery is provided to the state at 6 inch resolution, where one image pixel represents a 6 x 6 inch area on the ground. The assessment of evergreen coverage did not require

such high resolution, so the imagery was resampled to 3.2808 x 3.2808 feet per pixel (approximately 1 square meter)(figure 1). This made moving the numerous imagery files needed for the analysis more efficient, and made image processing/classification much faster.

The imagery was downloaded from the State's iMap Maryland data portal. This had the added benefit of completing the resample and mosaic (whereby several smaller images are combined into one) process prior to delivery for use. The delivered 1 meter resolution imagery was given a unique name and placed in a folder to await processing. A model was constructed in ArcGIS Modelbuilder to automate the processing, and followed the process outlined below:

1) Iterate Raster-- Image is loaded from the file by the iterator tool
2) Parse Path--Image name and location are defined/specified.
3) Float—Band 1 is extracted as a floating point decimal raster layer.
4) Float—Band 2 is extracted as a floating point decimal raster layer.
5) Raster Calulator—The bands are combined to produce a Normalized Difference Vegetation Index (NDVI) raster
6) Reclassify—The selected values for the Normalized Difference Vegetation Index calculation were reclassified to 1.

Figure 1: Color Infrared image of an area in Allegany County, MD in 2013. Note the red areas of evergreen vegetation at center and to the right.

Some additional processing extracted tree cover, and limited the returned data to those areas, so that only tree canopy was measured. This eliminated non-tree areas of evergreen shrubs, fields, and individual immature trees below the 6.5 foot threshold. There is a chance that some understory plants—namely Rhododendron and Mountain Laurel—could be classified as evergreen trees, where they occur under a hardwood overstory. This is unavoidable, but believed to be minimal for this assessment. It was possible to narrow the returns by selecting a higher threshold from the NDVI returns to eliminate these areas, and return mature evergreen trees, as these seem to have a higher NDVI value. .

The Normalized Difference Vegetation Index (NDVI) is a very commonly used method of evaluating the health of vegetation. A high index value indicates healthy, green vegetation; low index values indicate unhealthy or dead vegetation. The equation used by the ESRI NDVI tool was used to do the calculations in the Raster Calculator, and was entered as:

$$NDVI = \frac{(IR - R)}{(IR + R)} \times 100 + 100$$

Where *IR* is the pixel value from the infrared band (in this case, band 1), and *R* is the pixel value from the red band (in this case, band 2). The NDVI analysis was very effective at extracting evergreen vegetation from the leaf-off imagery, where the index values ranged from 0 to 200, and mature, healthy evergreens being classified at the higher area of the index. However, each image is slightly different for the next, and in order to have a consistent method for capturing the evergreen coverage from image-to-image, two different percentages were used to calculate the threshold for each image. Where the maximum value was greater than or equal to 180, 0.72 was used, and if the maximum was below 180, 0.78 was used. Therefore, an image with a maximum index value of 180 would have the index values between 129.6 and 180 extracted and considered mature evergreen forest. This seemed to limit the amount of understory (and thus shrub species) that was included.

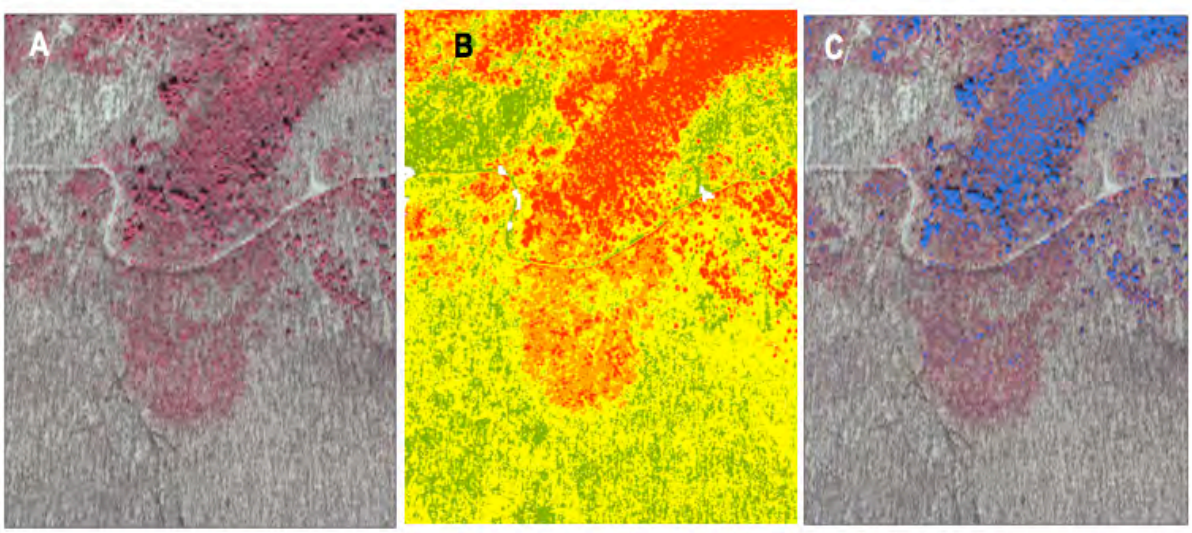

Figure 2: Sample area on the left located at 39.5311, -79.2825 in Garrett County. The left image (A) is the original CIR imagery. The Center image (B) depicts the same area after the NDVI analysis, and on the right, the same area after the evergreen trees are extracted (C). Note the amount of evergreen area in understory not extracted.

Once the evergreen vegetation was extracted as a complete dataset for each county, additional analysis could be conducted. The area was calculated using the Zonal Statistics as Table tool, and used to determine the evergreen coverage of the entire county, followed by each state forest (table 1).

Next, the Aggregate tool was used to create a raster data layer that made further processing faster. Since each 1 meter cell represents 1 meter of evergreen coverage, the tool created a new raster layer that had 3 x 3 meter cells (9 square meters), each cell representing the sum of the evergreen coverage. Thus, if the area had 3 meters of evergreen coverage, the new cell would have a value of 3.

The output of the Aggregate tool was used as the input to represent evergreen cover, and the data was assessed for intensity. This produced a raster data layer using the Focal Statistics

tool, which had a smoothing effect, and removed individual trees and smaller, disassociated clumps of evergreen trees. The result was an intensity map that could be used to identify evergreen stands.

Finally, because the original evergreen coverage data had been aggregated to a larger cell size, it made it easier to create a point density map (figure 3) for Allegany and Garrett Counties. The 3 meter raster representing evergreen coverage was converted to points—one point for each cell. Each point had the sum of the evergreen area as its value, and this value was used to give weight to the points for the density assessment.

Figure 3: Density analysis of evergreen cover for Garrett and Allegany counties, MD in 2013.

EVALUATION

Evergreen tree density values range from 0 to 112 acres per square mile. Some of the highest densities of evergreen tree cover in Garrett and Allegany counties center around state forests and upland areas. Areas in and around Savage River State Forest, northern portions of Green Ridge State Forest, northern portions of the Garrett State Forest, and in and around Swallow Falls State Park have high concentrations. Larger amounts of evergreen tree cover were found in Garrett county (table 1), than in Allegany county, with Garrett having roughly 7% of it's total tree cover as evergreen, and Allegany having about the same with 6%. Historically, the earliest survey with records was completed about 1913 by Fred W. Besley—Maryland's first State Forester. His completed book *"The Forests of Maryland"* offers incredible insight into how the state's forests were growing just after the turn of the century. The tools and methods used by Besley to determine forest areas then, are crude by today's standards, but can still offer a sense of the proportions of forest areas involved at the time. Figure 4 is a compilation of two

maps created by Besley and his staff for Garrett and Allegany Counties that reflect the 1909 forest inventory they completed. Pines are depicted in green on the Besley maps, and note the large concentration of pine in northeastern Allegany County. The slopes north of Cumberland also appear to have once contained enough pine to be noted on the map, but looking at the density map on the preceding page, numbers have declined over the last century. By contrast, Garrett County had only a few significant pine and hemlock stands at the time; note the significant stand running along Savage River. 100 years later, the densities have increased around the state forest and park lands. Total forest area was estimated by Besley for Garrett to be over 274,000 acres and 163,000 acres for Allegany. They also estimated pine in Allegany to be about 2% of the total forest area, and only 1% in Garrett.

Land Unit	Total Tree Cover (Acres)	Evergreen Area	Percent of Total Area
Allegany County	216,366	10,386	4.8%
Green Ridge State Forest	46,771	3,292	7.0%
Garrett County	302,245	18,446	6.1%
Savage River State Forest	52,789	3,940	7.5%
Potomac State Forest	10,454	397	3.8%
Garrett State Forest	7,308	362	5.0%

Table 1: Evergreen statistics for Garrett and Allegany Counties, Maryland. 2013.

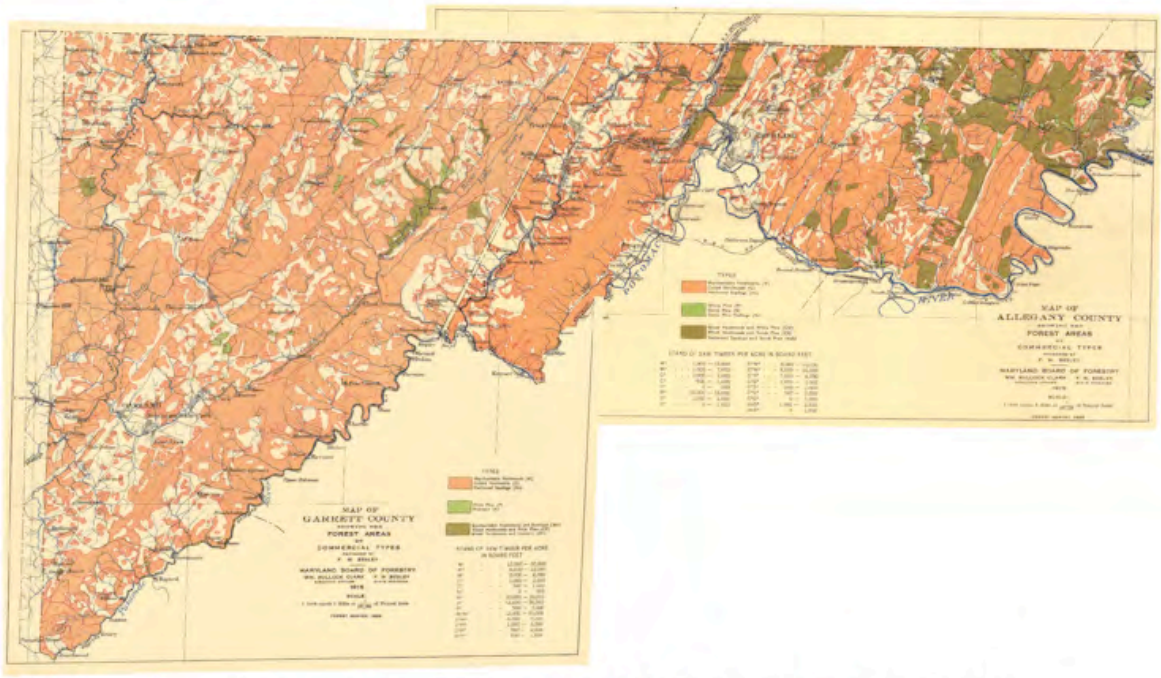

Figure 4: Earliest survey of forest in western Maryland completed in 1915 by F.W. Besley—Maryland's first State Forester. Pine areas are in green Some hemlock areas are depicted in orange.

The Conifer Component of the Forests of Garrett County

Introduction
Below is a synopsis of the conifer forest of Garrett County based on two historical documents, Maryland Geological Survey, The Forests of Garrett County, H. M. Curran (1902), and The Forests of Garrett County, Fred W. Besley (1916). These are textual pieces that were left for us to learn what that forest looked like then, and possibly what were it components leading up to that time.

According to early forest inventories sources such as Fred W. Besley (1916) report conifers have been present but a minor component to the Western Maryland forests.

Besley reported that the forest survey of 1913, one percent of the forests of Garrett County was found in pine and another one percent was in mixed hardwood and pine. Pine and hemlock stands occurred on 1,464 and 617 acres respectively. Hemlock and pine forest type on 1,277 acres.

These observations of that forest at the turn of the twentieth century offer a glimpse that the conifer component of that forest was small compared to the dominating hardwood forest, but did hold an important economic place which led to it being harvested to the point of even lesser distribution and place in the subsequent forests since then.

Maryland Geological Survey
The Forests of Garrett County
H. M. Curran
1902

Conifers

The following is a complete list of coniferous trees of Garrett County in 1902:
White Pine (Pinus strobus), Pitch Pine (Pinus rigida), Tamarack (Larix larinina), Black Spruce (Picea mariana), Red Spruce (Picea rubens) and Hemlock (Tsuga canadensis).

At that time Fifty-four per cent, or 235,200 acres, of Garrett County is wooded. Of this wooded area, 210,200 acres are cut-over or culled forest lands, and 25,100 acres are in virgin forests. At that time, the largest conifer component remaining was hemlock but barely at less than 0.2 percent. White pine was not even given a percentage. For trees over 12 inches dbh, even hemlock is not given a figure.

Of the forest class entitled Swamp Timber, it states: This is the last of the three principal types of virgin forest. The other two, Ridge Timber and Slope Timber, have each a much larger acreage than this. The Swamp Timber has fewer species than any of the types of forest, and yet contains the most valuable timber of all. The principal species are Spruce and White Pine, with a varying amount of Hemlock. The areas occupied by this type surround and extend into the swamps and

sedge-covered tracts along the streams, known as Glades and mountain meadows. The wetter portions of these areas are covered with herbaceous plants and alder brush, and the drier portions are heavily wooded. The timber growth is mainly Spruce, with occasional groups of excellent White Pine. The last of this Swamp Timber is found in the depressions between Negro and Meadow mountains at the head of Cherry Creek. It is being rapidly lumbered, and will be removed within two years.

Hemlock - The last stand of practically pure Hemlock is found on the Youghiogheny river near Muddy Creek. This, with the exception of the White Pine of the Swamp Timber, is the heaviest stand in the county. The trees are large and grow on steep, rocky slopes above the river. A dense thicket of laurel covers the ground under the trees and adds to the difficulty of lumbering. However, the cost of logging on this tract has not prevented the lumbermen from attempting the removal of the timber. A railroad is being built along the foot of this slope and with its completion logging will commence.

Hemlock and Hardwoods - The forests of this sub-type were once quite extensive, occupying the gradual slopes along the rivers and other streams. Recent lumbering operations have rapidly reduced these areas. There are three small tracts in the county, two on Castleman river and one on Bear Creek. The Castleman tracts are being lumbered, while the Bear Creek tract remains uncut. The largest operations in the county have had for their principal object the removal of Hemlock. Extensive stands on the Youghiogheny river, Bear Creek, and Cherry Creek have been recently cut. Except in the recent cuttings on Castleman river, fire has followed lumbering, killing the reproduction and small trees left by loggers. In many places the fire has been so severe as to completely destroy all vegetation on the area; the abundant humus, and even the top. Layers of the soil have also been burned. No reproduction of Hemlock can be expected on these areas. The probability of a future stand of this species in the county is practically destroyed, unless artificial planting is done.

White Pine - White Pine was once quite a common tree along the streams and rivers of Garrett county, and was one of the first timbers removed. It reached the best development and grew in almost pure stands on the moist level lands surrounding the swamps and mountain meadows. The areas occupied by this growth were never more than a few acres in extent, and the number of such areas was small. As a scattered tree along the streams and mountain slopes it was fairly common and reached large sizes. The reproduction of this pine is fairly abundant, considering the numbers of old trees and the treatment it has received. Young seedlings are found throughout the county and are making a good growth. The last group of pure White Pine in the county was cut recently.

Spruce - The winter of 1902 will probably see the last large stand of Spruce in the county removed. It is at the head of Cherry Creek, between Negro and Meadow mountains. The best of the Spruce occurs on the level or gradually sloping land surrounding the swamps. As the land rises, and becomes drier, oak and other hardwoods prevail. The stand of Spruce is good; the trees have grown rapidly, are tall, and the trunks are clean. In all respects it seems well adapted to this locality, and but for the fact that the lands upon which it grows are valuable for agriculture, it

would seem wise to encourage the growth of Spruce. The reproduction here is fair, and except for the fires which follow logging, would insure a good second growth.

Spruce, like White Pine, sometimes occurs as one of the lesser components of the moist slope forests. On Backbone Mountain, near the West Virginia line, it occurs with Hemlock in considerable abundance, but is being rapidly removed.