

Sustainable Forest Management Plan

FOR

Savage River State Forest

Sustainable Forests for People, the Bay and Appalachia



FOREST SERVICE



February 29, 2012

Final DRAFT PLAN

SAVAGE RIVER STATE FOREST 54,325 ACRES

PREFACE

The information contained within the Savage River State Forest Sustainable Management Plan was derived from a variety of sources. These include but are not limited to, the 1992 *Savage River State Forest - Ten Year Resource Management Plan*, and the 2010 *Sustainable Forest Sustainable Management Plan for Pocomoke State Forest*. Data presented in tables and charts that are specific to Savage River 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 54,324 acre Savage River State Forest is almost entirely contained within Garrett County except for about 40 acres in Allegany 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 |
| 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 |
| SRT | Savage River Tailwater |

| | |
|-------|---|
| 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

Introduction

1.1 Background and History of the Forest

Savage River State Forest is located in the north and northeastern part of Garrett County and there is a small part of the forest in Allegany County. It is in the Appalachian plateau physiographic province. Elevation ranges from 1400 to 3000 feet above sea level. The terrain is rolling hills to rather steep mountainous slopes. While the mountains lie generally in northeasterly/southwesterly direction, aspect is highly variable because of the number of deeply incised streams and creeks. Most of the forest drains into the Potomac River and hence into the Chesapeake Bay, but some of it drains into the Youghiogheny River and hence into the Gulf of Mexico.

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 hostile tribes. 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. Many 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 boom. 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 were shipped east.

By the early 1900's, narrow gauge railroads were used to facilitate logging on steeper slopes as the demand for wood products continued to increase.

The result was that 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 were left from the clear-cutting. As a result of the fires, a new forest was created. This legacy we can see today as most of our older forests are the same age and are approximately 100 years old.

In part, as a reaction to the rapid cutting of trees and the burning that was taking place, the Garrett Brothers, in 1906 gave 2000 acres to the state with the proviso 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. 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.

On January 8, 1929, the state purchased 9,352 acres of cut-over forest land from the N.U. Bond Company. This was the beginning of Savage River State Forest. Since that time there has been a number of acquisitions both big and small. Now Savage River State Forest consists of 54,324 acres.

In the 1930s, the Civilian Conservation Corps assisted the forest service with fire suppression efforts, tree planting, and constructing facilities for recreational activities. The CCC boys helped with the early snow skiing activities on the forest – later to become New Germany State Park. They helped build many trails where hiking, biking, horseback riding, and ORV riding are still taking place.

Coal mining has also been a part of the County's heritage for at least the last two centuries. There is no current strip mining on state forest land and only one deep mine that is active. But there are a number of reclaimed strip mines and some old deep mines as well. Natural gas exploration and storage started in the Accident area of the state forest in 1964.

Exotic invasive pests, be they diseases, insects, or plants, have become a big management issue in the last ten years. A big problem occurred with Chestnut blight in the 1930's that effectively eliminated the American chestnut from our forests. Recently, a sizable part of our oak forests has been lost due to gypsy moth defoliation and subsequent attack by other insects and diseases. One of our serious challenges for the future is how to regenerate oak in the presence of gypsy moth and other potential exotic pests.

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 §5-214)

The Sustainable Forest Management Plan for Savage River 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 Savage River 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 Savage River State Forest has been developed to replace the former ten-year Resource Management that was developed in 1992. The initial draft of the SRSF Sustainable Plan was crafted from sections of the former ten year plan and from information contained in the Sustainable Forest Management Plan for Pocomoke State Forest. The information utilized in the draft was originally prepared by an interdisciplinary planning team with assistance from the Savage River Forest Citizens Advisory Committee. The SRSF Sustainable 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 SRSF Sustainable Plan was presented to the Savage River State Forest 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 Savage River was completed in 2002. New stand level inventory data collection began in the summer of 2010.

1.4 Purpose and Goals of the Plan

The Sustainable Forest Management Plan for Savage River State Forest updates and expands the previous ten year resource management plan. This plan is intended to provide guidance and direction for forest staff to base their daily decisions upon. 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 Savage River 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 and riparian areas will be the site of watershed improvement practices specifically aimed at improving the quality of water entering the Chesapeake Bay.
- 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 Savage River State Forest that may potentially result in blockages to fish passage and recommend design changes that will allow continued fish passage during all stream flow conditions. Continue to identify existing blockages to fish passage and make recommendations for providing access to upstream habitat.

C) Protect and enhance biological diversity native to Savage River 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.

- Forest harvest levels will 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.
- 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 listed above, 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

- 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 will be integrated with those available within New Germany State Park and be consistent with Garrett County's Land Preservation, Parks and Recreation Plan. 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 Savage River State Forest

The original Savage River State Forest properties are located in Garrett County. The addition of new parcels to Savage River State Forest could help alleviate a number of management issues as described below and also build upon a network of well managed forest lands that would perpetually contribute to the goals for protecting and restoring the Potomac River and 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 Savage River State Forest:

- 1) The property is an in-holding within a Savage River State Forest Compartment and/or the parcel connects additional Savage River 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 Savage River Forest parcel, thereby improving on the implementation of management activities and or providing additional public access.

Properties that 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 will be prioritized for acquisition.

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

CHAPTER 2

Garrett County - 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 range 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 two weeks depending on the location within the county 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 on Garrett County

| Major Land Cover Category | Total Area | Percent |
|----------------------------------|-------------------|----------------|
| Urban & Developed | 36,522 | 8.7% |
| Agriculture | 89,142 | 21.2% |
| Forest | 285,508 | 68.0% |
| Wetland | 2,663 | 0.6% |
| Water | 5,795 | 1.4% |
| TOTAL | 419,630 | 100.0% |

Source: 2008 Garrett County Comprehensive Plan

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.

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.

Garrett County Land Cover

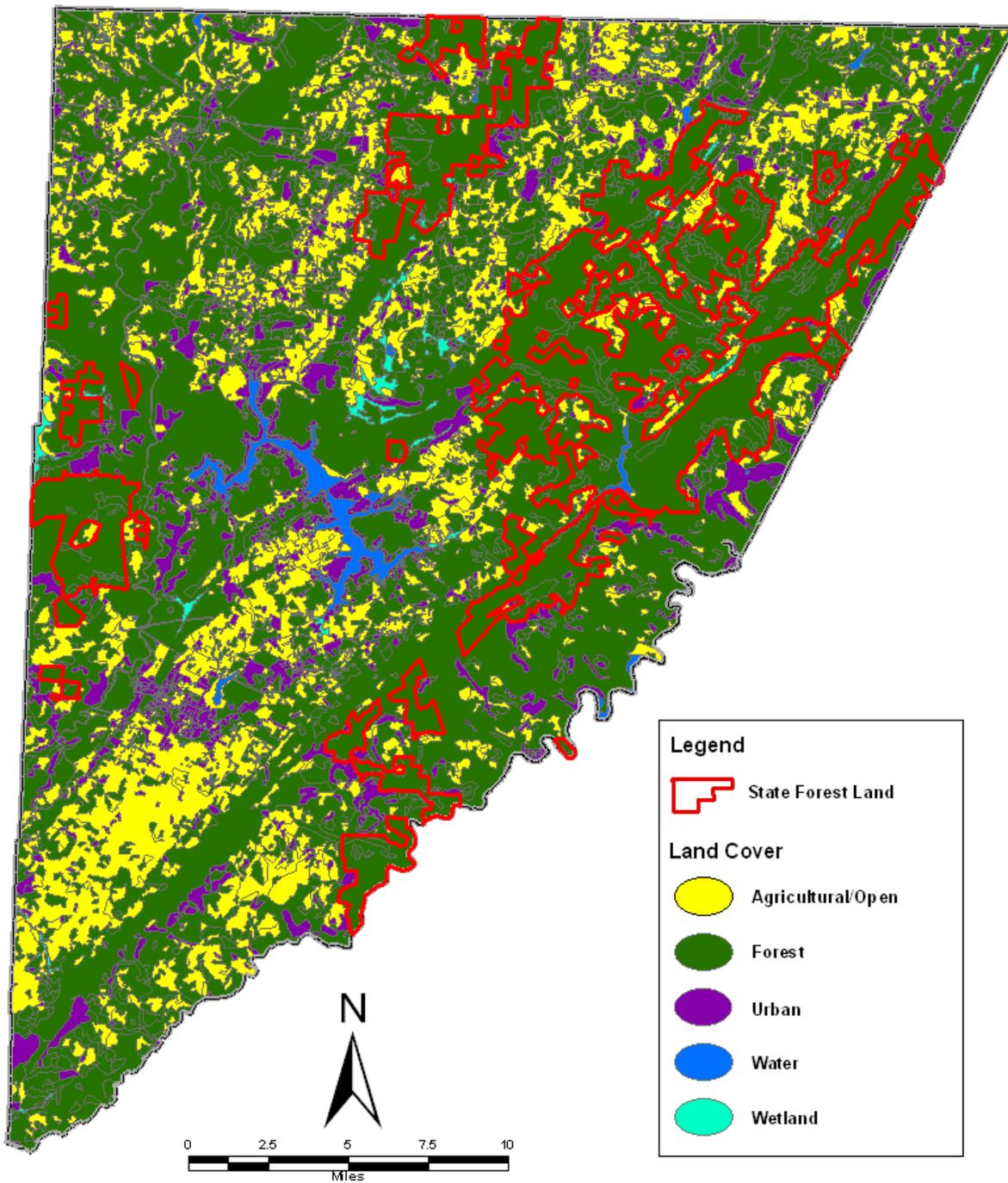


Figure 2.1: A complex mix of agricultural lands surrounds the State Forests

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 1964, New Germany State Park areas were separated from the Forest and developed for intensive recreational use. The State continues to purchase in-holdings. 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. Soils found in valleys are useful for farming, but they 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:

Groundwater is an important natural resource of Garrett County. Groundwater is derived from the weathered zone and 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 groundwater 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 (MBSS) 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 Family level-Benthic Index of Biological Integrity (FIBI) results indicate that 21% of the streams in the county were in good condition, while 39% rated good using the Benthic Index of Biological Integrity (BIBI). In contrast, 46% of the streams in the county scored as poor or very poor using the Combined Biotic Index (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 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 macro invertebrates 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 macro invertebrates 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 commercial 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.

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. Mountain biking, hiking, and cross-country skiing are also popular recreational activities that may be considered wildlife enhanced activities.

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 owners' income, \$15 million in state and local tax revenue, and \$16 million in federal tax revenue.

2.5 State Listed Species of Concern in Garrett County

A summary of current and historical rare, threatened and endangered animal species potentially found on or within ¼ mile of Savage River State Forest lands according to Maryland DNR-Wildlife & Heritage Service is included in Appendix E.

2.6 Plants of Special Concern (Federally 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. These species are discussed in some detail in the Ecologically Significant Area portion of this document.

2.7 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. 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 invertebrates 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 invertebrate 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 four-toed 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 SRSF. A sub-set of these pools 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 SRSF are in an ESA.

Spring Seepage Wetlands : There are numerous springs throughout SRSF. 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 SRSF 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 very rare rock vole (*Microtus chrotorrhinus*) also prefers this damp, cool habitat but has yet to be documented from SRSF. However, it has been documented close by on Potomac State Forest.

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. Only one significant sandstone glade has been identified on SRSF and it is included within an ESA.

2.8 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 smaller 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 Savage River State Forest acreage is open for public hunting, with the exception of 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). During the 2009-10 hunting season, Garrett County had the seventh 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 4,922 deer.

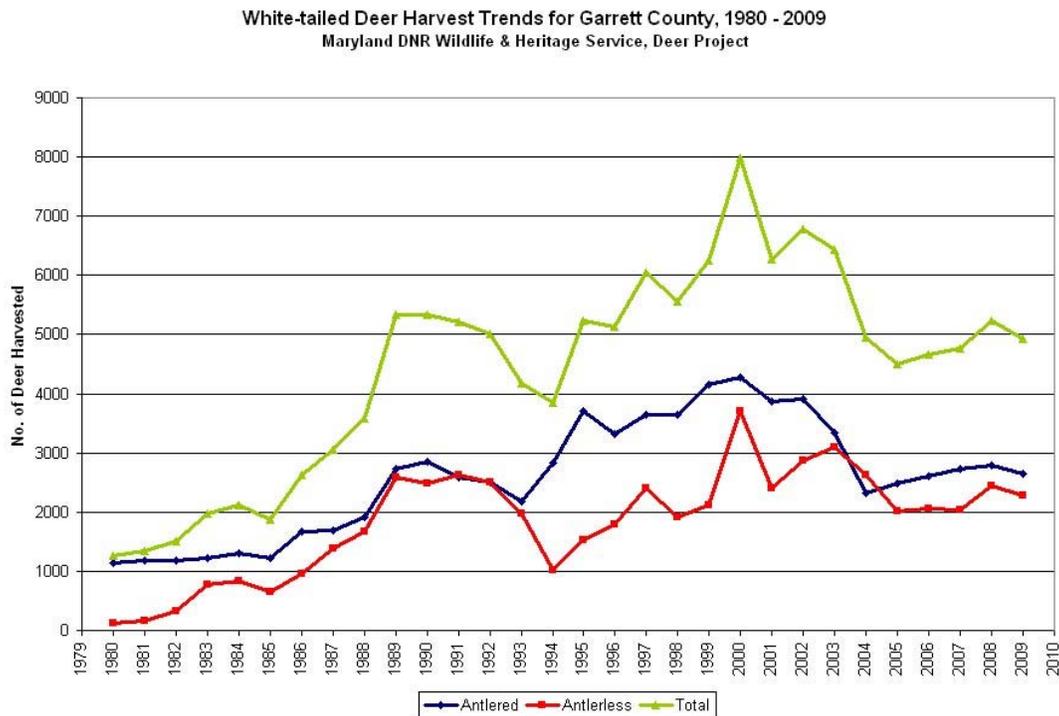


Figure 2.9.1: White-tailed deer are a popular game species in Garrett County.

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 to 12% harvest mortality. This was based on the objective of achieving 20 to 25% overall mortality (seasonal +non-

seasonal mortality). Harvest quotas have ranged from 30 to 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 of 2.8% (Figure 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.

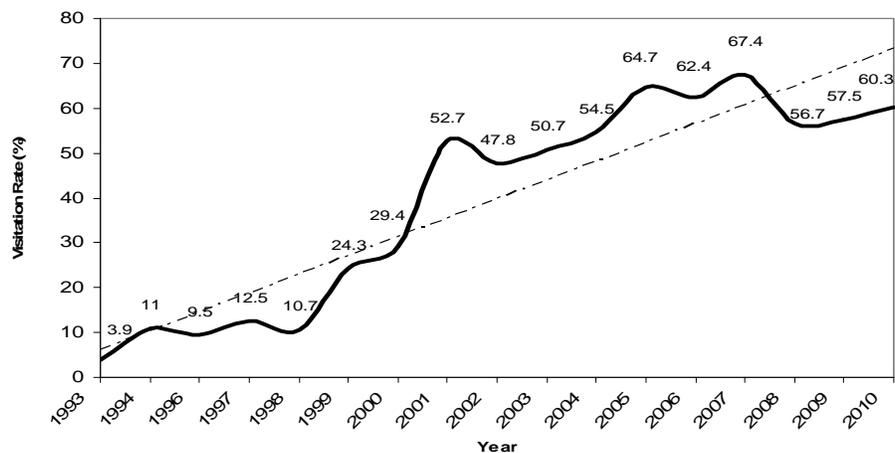


Figure 2.9.2. Bear Visitation at Scent Stations in Garrett County

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 Savage River State Forest. In Garrett County the turkey season is split with both a spring and a 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 Savage River 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 an average of four 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. With more information this should allow us to better estimate grouse population trends in the region. The number of flushed grouse per hour increased over the last two hunting seasons and approximately 78 percent of the hunts were on public land.

Furbearers – Resident furbearer populations are stable or growing within Garrett County. The diverse ecosystems support a rich and varied assemblage of furbearing 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 furbearers yield many user days of recreation, while also providing the nucleus for many traditionally based rural activities. The fur harvest industry is a multibillion-dollar enterprise nationally and offers significant contributions to Maryland's economy.

2.9 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 coordinated 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 use areas of State River State Forest 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.

2.10 Fish Species of Special Concern:

Brook Trout - 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 in Maryland are valuable for aesthetic, recreational, economic, and biological reasons. Because of their habitat and life history requirements, brook trout are typically found in the pristine, aesthetically pleasant areas of Maryland. While there is no commercial fishery for brook trout, recreational angling has been occurring for centuries, and there is increasing local and national recognition of the uniqueness and quality of fishing for native brook trout. 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, more than 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 and if impervious surface area is greater than 0.5% in a watershed, brook trout will typically be extirpated. 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 the year 2100.

Rare Fishes - Stonecat is the only known rare fish in Garrett County. Kline and Morgan estimate...”that a population of approximately 660 stonecat are present in the fourth order reaches of the Casselman River in Maryland. While no other populations of stonecat are known to exist in Maryland, this population extends downstream into the Pennsylvania portion of the Casselman River.” Little is known about the environmental or human caused factors limiting the abundance (acid mine drainage is thought to be a contributing factor) of this species, but it is logical to assume that strict adherence to BMP’s will help to lessen any impacts.

| Species | Status | Recent Record | Historical Record |
|------------------------------------|----------------|---------------|-------------------|
| Stonecat (<i>Noturus flavus</i>) | S1, Endangered | X | |

Rare fish recorded in the waters of the Casselman River: Source MD DNR Fisheries Division

2.11 The Forests of Garrett County

Historic land cover shows the region dominated by 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 to differences between neighbors. During the 1930's and 1950's many open areas were planted with conifers, mainly 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 2.12 illustrates. As Table 2.12 also illustrates, non-industrial private owners own the majority of the forests in Garrett County.

Table 2.12: Area of timberland by forest type and ownership group

| Garrett County | | <i>(thousands of Acres)</i> | | |
|----------------------------|-------------------|-----------------------------|----------------|--|
| Forest Type | All Owners | Public | Private | |
| White/red/jack pine group | 14.7 | | 14.7 | |
| Exotic softwoods group | 5.9 | 5.9 | | |
| | 20.6 | 5.9 | 14.7 | |
| Softwood total | | | | |
| 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 | |
| | 256.6 | 81.5 | 175.1 | |
| Hardwood total | | | | |
| 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% | |

Source: USDA Forest Service FIA data 2008.

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.

2.12 Forest Management in Garrett County

Most of the forests in 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, 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 foresters to service landowners in all counties of the state. 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.

2.13 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, pallets, railroad cross-ties, 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 three shifts to one 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.

2.14 People and Forests in Garrett County

2.14.1 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 still some unique bog areas that are typical of much more northern climates that are present – one is located on the 4-H center's property.

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 Youghiogeny 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 lead to a settlement boom. 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 were shipped east.

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

The result was that 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 of these activities on the forests were to create a new age class.. 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 the Garrett Brothers, in 1906 gave 2000 acres to the state with the proviso that an agency would be created to manage the property and to institute scientific forestry - this lead 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.

On January 8, 1929, the state purchased 9,352 acres of cut-over forest land from the N.U. Bond Company. This was the beginning of Savage River State Forest. Then in the early 1930s the state acquired another large tract of cutover timber land from John Dimeling. 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 effectively 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 Savage River, New Germany, Swallow Falls State Park, Potomac Camp, and Big Run. The men in the camps assisted the forest service with fire suppression efforts, tree planting, and constructing facilities for recreational activities. The CCC boys helped with the early snow skiing activities on the forest (this area later became New Germany State Park). They helped build numerous cabins, pavilions, and trails where hiking, biking, horseback riding, and ORV riding are still taking place.

2.14.2 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. While the full-time population of Garrett County has remained fairly steady (Table 2.15.2), the pressure has come from vacation/second home buyers.

Table 2.15.2: 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 | 5,699,478 | 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)

2.14.3 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 when areas become more urbanized.

Urbanization also creates large outflows of influence that tend to push land uses such as farming and forestry further away. Used water, air, waste materials are exported from the urban areas to cheaper rural land. Farming, forestry and other open space uses are generally out-priced when push comes to shove and a large population center needs to expand. 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 the Garrett County is attracting market prices that are two to five 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 will be on the area as a recreation destination. This 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, MD. and from Pittsburgh, PA.

2.15 Landscape Considerations

2.15.1 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 a consistent product to sell from year to year and to minimize costs of treatments, linked the management of different stands. 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 management 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 our rivers and bay, on lands that are in agriculture and housing, as well as on the forestland, making clean water a landscape issue.

Thus, a landscape-level perspective is intrinsic, if generally unspoken, in forest planning in 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 can 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.

2.15.2 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. See chapter 3 for additional characterization of Watersheds on the State Forest.

2.15.3 Climate Change and Maryland Forests

Research has speculated how forests and their management could be affected by a changing climate. While much of the research has been somewhat general, some researchers have focused their attention to areas including Maryland (McKenney-Easterling et al.: Climate change impacts on forests in the Mid-Atlantic Region, Climate Research Vol. 14: pages 195–206, 2000).

Species Migration

According to some of these studies, there are two major forest-related shifts that may result from the common climate-change scenarios. One, resulting warmer temperatures will likely cause a species distribution shift. Within this scenario some species may benefit while others will experience a range reduction. Certain forest-types such as oak-hickory, oak-pine and southern pine forest types, would probably benefit from dryer conditions while those requiring a more moist site will not.

“Large increases in some species of oak and pine, particularly those better adapted to warmer and dryer ecosystems. Consequently, those species preferring more moist conditions, such as elm-ash-cottonwood and maple-beech-birch forest types may be reduced from some landscapes, “results generally show warm-temperate mixed forest/evergreen forest moving northward, displacing temperate deciduous forest in the southern part of the MAR, and cool temperate mixed forest (such as maple-beech-birch) disappearing completely from the region.” (McKenney-Easterling et al.: Climate change impacts on forests in the Mid-Atlantic Region, page 204.)

Forest-Type Changes

The forest-type distribution in Maryland varies greatly--from the coastal plain to the Allegheny Mountains, ecosystems are quite different and so would the expected response to climate changes.

Eastern Shore

As mentioned elsewhere in this document, the Shore silviculture and ecosystems are dominated by southern yellow pine and pine-hardwoods. It would be expected that this forest-type will largely be unaffected in most of these scenarios.

“The southern pine types remain fairly stable even though individual southern pine habitat increases to the north for many pines. The explanation for this pattern is that the oak species also generally increase so that the proportions stay similar, or even favor oak-pine over loblolly pine for a portion of the current southern pine habitat.” (L.R. Iverson et al. / Forest Ecology and Management 254 (2008) 390–406, pg 401)

Western Maryland

The oak-hickory forest type may actually benefit from a warmer climate. Oak regeneration has been less than desirable for several decades due to the reduced occurrence of fire on the landscape, due primarily from human intervention. One study suggests that some disturbances promoted by climate change may open the canopy to actually enhance the probability for oak regeneration. This may not only increase the chance of gaining a larger oak component but also the wildlife that benefit from that forest-type.

“Several of these species are currently important commercial species of oak (Quercus) or pine (Pinus). Increased habitat for oak could indicate an increased commercial and wildlife resource (especially in the northern part of the country), but oaks currently are undergoing a regeneration crisis in the absence of fire or other agents that can partially open the canopy (Loftis and McGee, 1993; Iverson et al., 2004b).” (L.R. Iverson et al. / Forest Ecology and Management 254 (2008), pages 403-404).

Disturbance Increase

A secondary effect resulting from increased average temperatures is the increased incidence of insects, disease and fire. This will affect not only the composition of the forest but complicate their management. In the recent past, Maryland State Forests have been plagued by gypsy moth, southern pine bark beetle, hemlock wooly adelgid and recently emerald ash borer. A variety of other damage agents lay on our borders, namely sirex wood wasp, oak wilt and others.

Increased Severe Weather

The second response identified is the result of more severe weather events and the forest management implications that would result from these events.

“Second, we used a survey to gather information on the types of extreme weather events that are currently problematic for forest land managers, and the types of impacts they cause to forests and forestry operations. Respondents indicated that high winds and precipitation-related events have been more problematic than extreme temperatures alone, based on experiences over the past decade. Types of major impacts include operational impacts (in particular, altered access to forest areas) as well as structural impacts (direct damage to trees) and biological impacts (mortality, and increased problems with insects, disease and fire). This information, in conjunction with our results from the tree species distribution modeling, was used to make inferences about the potential impacts of extreme events in the future. We note that climate change may lead to alterations in the frequency, severity and duration of extreme events such that the past is an imperfect predictor of the future.” (McKenney-Easterling et al.: Climate change impacts on forests in the Mid-Atlantic Region, page 205.)

Sea-level Rise

The National Wildlife Federation report (2008) entitled Sea-Level Rise and Coastal Habitats of the Chesapeake Bay: A Summary, states that the Maryland Shore could lose 16,000 acres of undeveloped dry land by 2100. This would dramatically effect forest management on the Pocomoke State Forest and Chesapeake Forest Lands, affectively reducing the area of management acres and altering more.

Coastal habitats in the Chesapeake Bay region will be dramatically altered if sea levels rise globally about two feet by the end of the century, which is at the low end of what is predicted if global warming pollution remains unaddressed. Over 167,000 acres of undeveloped dry land and about 161,000 acres of brackish marsh would be lost, replaced in part by over 266,000 acres (415.6 square miles) of newly open water and 50,000 acres of saltmarsh. Ocean and estuarine beaches also fare poorly, declining by 58 percent and 69 percent, respectively, by 2100. In addition, more than half of the region's important tidal swamp is at risk.

Over 167,000 acres of undeveloped dry land would be lost or replaced with wetlands. As dry land becomes saturated, the water table will increase, contributing to the expansion of open water inland. Furthermore, sea-level rise will make coastal and inland areas more susceptible to storm surges.

Agency Response

The State of Maryland has been addressing the threats of global warming and climate change through various committee studies and reports.

In the Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change, Chapter 5, one of the key recommendations, in which DNR State Forests can have a role, was:

Retain and expand forests, wetlands, and beaches to protect us from coastal flooding. Identify high priority protection areas and strategically and cost-effectively direct protection and restoration actions. Develop and implement a package of appropriate regulations, financial incentives, and educational, outreach, and enforcement approaches to retain and expand forests and wetlands in areas suitable for long-term survival. Promote and support sustainable shoreline and buffer area management practices.

The Maryland DNR Forest Service response to these factors will be to maintain an adaptive management approach considering current research and regular forest (and other resource) inventories, monitoring and assessments and by proper staffing to maintain the ability to respond to these potentially destructive forces. (Western Maryland State Forests have begun a five-year forest inventory project beginning in 2011 and expected to be completed in 2016 which will provide baseline data to monitor forest changes and allow adaptive forest management approaches).

Additional information:

Sea-Level Rise and Coastal Habitats of the Chesapeake Bay: A Summary
(National Wildlife Federation, 2008)

http://www.nwf.org/~media/PDFs/Global-Warming/Reports/NWF_ChesapeakeReportFINAL.ashx

Fighting Climate Change to Secure a Sustainable Future for Maryland (DNR website)

<http://www.dnr.state.md.us/climatechange/>

Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change Phase I: Sea-level rise and coastal storms (July 2008)

<http://www.mde.state.md.us/assets/document/Air/ClimateChange/Chapter5.pdf>

Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change, Phase II: Building societal, economic, and ecological resilience (Jan 2011)

http://www.dnr.state.md.us/climatechange/climatechange_phase2_adaptation_strategy.pdf

2.16 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 to 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

2.16.1 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 causing 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.

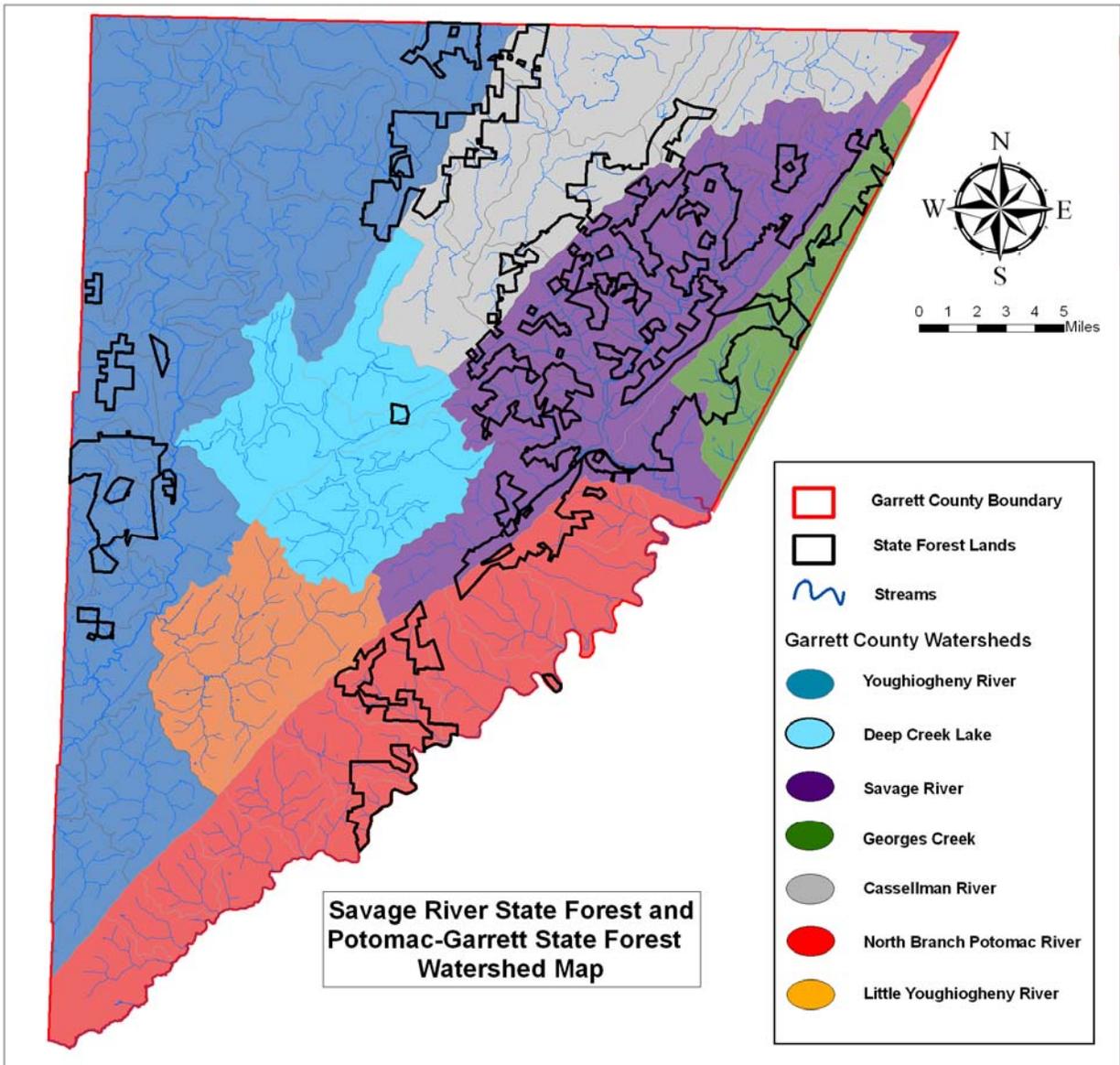


Figure 2.16.2: Watersheds in Garrett County

CHAPTER 3

Savage River State Forest - Resource Characterization

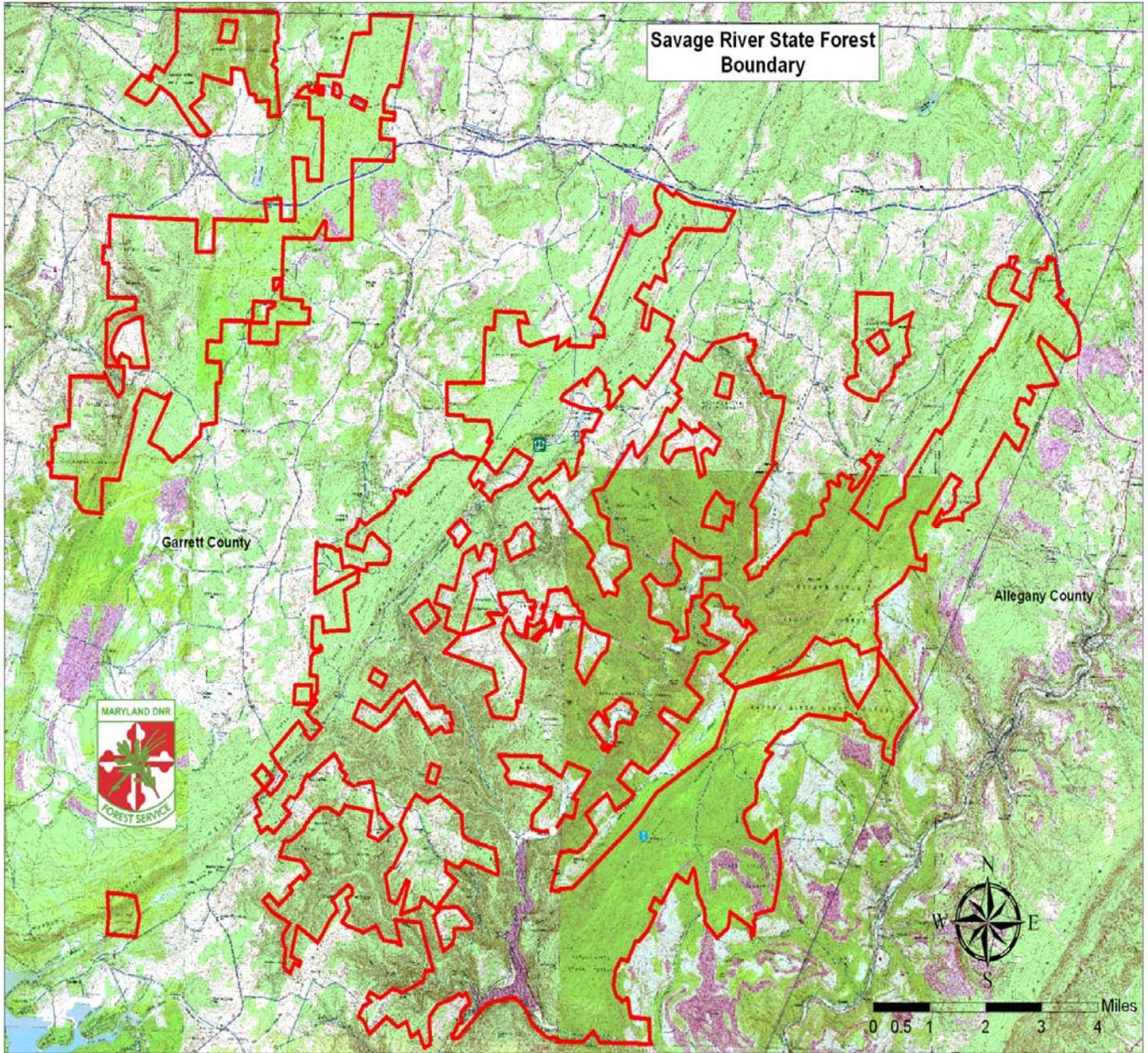


Figure 3.1 Savage River State Forest – Garrett County, Maryland

3.1 The Forests

The Savage River State Forest covers approximately 54,324 acres of land in Garrett County (40 acres are in Allegany County) (Figure 3.1). Mature mixed oak and northern hardwood forests comprise a large proportion of the Savage River State Forest, as illustrated in Table 3.1. In general, sixty-six percent of the area is composed of older, more mature forests, while thirty-four percent are younger and smaller. Table 3.1 lists the diameter classes and suggests a diversity matrix that provides a current baseline from which future changes in age structure or forest type diversity can be assessed for potential habitat or biodiversity effects.

Following are forest resource characterizations including forest type, size class and forest productivity for Savage River State Forest based on historic (2000) CFI data. The summaries in this plan will likely change as the result of the stand level data collection project that is being completed at the time of writing this plan. This project will likely take five years to complete and this plan will be updated periodically as the new inventory data is collected and analysis is completed.

Table 3.1: Forest Diversity Analysis:

Acres of forest type and forest structure by structural groups, with percentage of total area in each forest type/structure group combination (Total acres does not equal to 54,324 due to sampling error and acquisitions.)

| Structure Stage | Seedling | Sapling | Pole-timber | Small Saw-timber | Large Saw-timber | Total | Stand. Error | % Total |
|---------------------|----------------|----------------|-----------------|------------------|------------------|-----------------|--------------|---------|
| Forest Type | | | | | | | | |
| Hemlock | 0.0 | 0.0 | 314.5 | 1,572.7 | 209.7 | 2,097.0 | 21.9 | 3.9 |
| Northern Hardwood | 524.2 | 733.9 | 1,887.3 | 4,927.9 | 1,048.5 | 9,121.8 | 9.8 | 17.1 |
| Hardwood Hard Pine | 0.0 | 0.0 | 104.8 | 0.0 | 0.0 | 104.8 | 100.0 | 0.2 |
| Mixed Oaks | 629.1 | 629.1 | 7,758.8 | 16,880.6 | 4,193.9 | 30,091.4 | 3.9 | 56.3 |
| Cove Hardwoods | 104.8 | 419.4 | 1,363.0 | 2,516.4 | 524.2 | 4,927.9 | 13.9 | 9.2 |
| Red Maple | 0.0 | 524.2 | 838.8 | 1,258.2 | 104.8 | 2,726.1 | 19.1 | 5.1 |
| Black Locust | 0.0 | 209.7 | 629.1 | 314.5 | 0.0 | 1,153.3 | 29.9 | 2.2 |
| Hardwood White Pine | 0.0 | 0.0 | 314.5 | 0.0 | 0.0 | 315.5 | 57.6 | 0.6 |
| Loblolly Pine | | | | | | | | |
| Hardwood | 0.0 | 0.0 | 0.0 | 104.8 | 0.0 | 104.8 | 100.0 | 0.2 |
| Plantations | 419.4 | 104.8 | 838.8 | 1,467.9 | 0.0 | 2,830.9 | 18.8 | 5.3 |
| Total | 1,677.6 | 2,621.2 | 14,049.7 | 29,043.0 | 6,081.2 | 53,472.6 | 0.4 | 100.0 |
| Standard Error | 24.6 | 19.5 | 7.4 | 4.1 | 12.4 | 0.4 | | |

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 five 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.

Savage River State Forest has seven remnant areas of Old Growth Forest. These areas plus a 300 foot buffer around them total 1,758 acres and are found in difficult to reach areas; this is not surprising given the logging history of Garrett County. At Savage River State Forest we are creating larger Old Growth Forest management areas around these small remnant patches (see map appendix I-1. The larger areas will be mapped as old growth ecosystem management areas. This process is fully described in the *Policy and Procedures Handbook for Western Maryland Forests*, appendix E, “Management Guidelines for the Conservation and Protection of Old-Growth Forest”. Also see Chapter 5 for management guidelines for the identified “nearly old growth forest areas”.

3.3 Forest Production

Savage River State Forest has been managed for industrial forest production for decades, and has been a major contributor to the region’s forest products industry. Numerous sawmills and New Page paper mill operations provide outlets for timber from local forests.

Savage River State Forest makes up about 19.0% of the productive forests in the Garrett County area, see (Table 3.3). However Potomac-Garrett State Forest is managed in a similar manner as Savage River State Forest and these two state properties comprise almost 25.4% of forest in the county.

Table 3.3: Savage River SF and Potomac-Garrett SF as a Percentage of Garrett County

| State Forest | State Forest acres | SF as % of County Area | SF as % of County Forest |
|-----------------|--------------------|------------------------|--------------------------|
| Savage River | 54,324 | 12.8% | 19.0% |
| Potomac-Garrett | 18,242 | 4.3% | 6.4% |
| Totals | 72,566 | 17.1% | 25.4% |

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

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 Savage River State Forest management plan focuses on several aspects of this issue by focusing on water quality when managing for brook trout and riparian wildlife along our streams. 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 Savage River State Forest is located within six (6) of Maryland’s 8-digit watersheds. Those watersheds are Savage River, Upper North Branch of the Potomac and George’s Creek in the Chesapeake Bay Drainage and Casselman River, Youghiogheny River and Deep Creek Lake in the Ohio River Basin. The majority of Savage River State Forest is located within the Savage River watershed (57.8%) with smaller amounts in George’s Creek (12.7%), Casselman River (17.9%) and Youghiogheny River (10.7%) watersheds. Very small amounts of the State Forest are located in Deep Creek Lake (0.4%) and Upper North Branch of the Potomac (0.6%) watersheds.

The number of stream miles according to the Strahler stream order and grouped by major drainage is presented in Table 3.5.1.

Table 3.5.1: Strahler Stream Order by Watershed

| Watershed | Stream Order | | | | |
|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | 1st | 2nd | 3rd | 4th | 5th |
| Georges Creek | 55.8775 | 15.08063 | 12.91313 | 0 | 0 |
| Potomac River U N Branch | 90.67313 | 22.13625 | 7.47625 | 33.07813 | 0 |
| Savage River | 96.27 | 21.82875 | 16.80875 | 4.98 | 0 |
| Chesapeake Bay | 242.8206 | 59.04563 | 37.19813 | 38.05813 | 0 |
| Casselman | 60.95938 | 22.23813 | 13.105 | 0 | 0 |
| Deep Creek Lake | 24.4425 | 2.94125 | 1.70625 | 0 | 0 |
| Youghiogheny River | 166.7556 | 52.50938 | 30.00625 | 7.078125 | 19.84125 |
| Ohio River | 252.1575 | 77.68875 | 44.8175 | 7.078125 | 19.84125 |
| Grand Total | 494.9781 | 136.7344 | 82.01563 | 45.13625 | 19.84125 |

3.5.1 Stream Condition

The Maryland Biological Stream Survey (MBSS) has randomly sampled streams across the state of Maryland to assess stream ecological condition. Stream condition is measured two ways; by using information collected from the (1) fish and the (2) benthic macro invertebrate communities. This information is analyzed and reported in one of four categories; good, fair, poor or very poor. The results for the six Savage River State Forest watersheds are presented in Table 3.5.1.1 for fish and Table 3.5.1.2 for benthic macro invertebrates.

Table 3.5.1.1: Estimated Number of Stream Miles by Category; Fish Index of Biotic Integrity

| Watershed | Good | Fair | Poor | Very Poor | Not Rated |
|-------------------------------------|-------|-------|------|-----------|-----------|
| Savage River | 57.14 | 28.57 | 7.14 | 0 | 7.1 |
| Georges Creek | 20 | 20 | 60 | 0 | 0 |
| Potomac River | | | | | |
| Upper North Branch | 10 | 20 | 40 | 30 | 0 |
| Casselman River | 10 | 30 | 50 | 10 | 0 |
| Youghiogheny River | 18.75 | 31.25 | 50 | 0 | 0 |
| Little Youghiogheny/Deep Creek Lake | 0 | 10 | 70 | 20 | 0 |
| STATEWIDE | 26 | 25 | 21 | 19 | 9 |

Table 3.5.1.2: Estimated Number of Stream Miles by Category; Benthic Index of Biotic Integrity

| Watershed | Good | Fair | Poor | Very Poor | Not Rated |
|-------------------------------------|-------|------|------|-----------|-----------|
| Savage River | 85.71 | 7.14 | 7.14 | 0 | 0 |
| Georges Creek | 40 | 20 | 30 | 10 | 0 |
| Potomac River | | | | | |
| Upper North Branch | 20 | 40 | 30 | 10 | 0 |
| Casselman River | 30 | 20 | 30 | 20 | 0 |
| Youghiogheny River | 37.5 | 25 | 25 | 12.5 | 0 |
| Little Youghiogheny/Deep Creek Lake | 10 | 60 | 20 | 10 | 0 |
| STATEWIDE | 26 | 28 | 30 | 16 | 0 |

3.5.2 Aquatic Biodiversity

The Savage River State Forest is located within portions of 14 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>). These stronghold watersheds in the Savage River State Forest are important for the conservation of several state rare, threatened, or endangered species. These species include: Johnny darter, striped shiner, mottled sculpin, stonecat, brook trout and hellbender. The Savage River watershed also contains the most intact and connected population of brook trout in Maryland. The Casselman River watershed is the only known watershed with recent records for the stonecat and hellbender.

The MBSS has collected information on non-native aquatic species. Seven non-native fishes have been found on or in close proximity to the Savage State Forest. The seven non-native species are fathead minnow, brown trout, rainbow trout, smallmouth bass, rock bass, pumpkinseed and bluegill.

The MBSS has a long-term monitoring network called the Sentinel Site Network. This is a network of twenty-seven 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 catchments. Eight of the twenty-seven Sentinel Sites are located on or adjacent to the Savage River State Forest.

3.6 Soils

The soils on the forest are strongly dissected by natural drainage patterns. The soils are often steep, stony, or both and are ideally suited for woodlands, wildlife habitat and recreation. In the process of plan development, the soils on the forest were classified into eight Soil Management Groups (SMG), based on soil characteristics directly affecting forest management. (See Appendix: D for a listing of soil types (with symbols used by soil survey reports) by soil management groups.) The eight Soil Management Groups are defined as follows:

1. SMG 1 – Very poorly drained to poorly drained mapping units with moderate limitations affecting construction of haul roads and log landings.
2. SMG 2 – Very poorly drained to poorly drained mapping units with severe limitations affecting construction of haul roads and log landings.
3. SMG 3 – Somewhat poorly drained to moderately well drained mapping units with moderate limitations affecting construction of haul roads and log landings.
4. SMG 4 - Somewhat poorly drained to moderately well drained mapping units with severe limitations affecting construction of haul roads and log landings.
5. SMG 5 -- Well drained mapping units with slight to moderate limitations affecting construction of haul roads and log landings.
6. SMG 6 - Well drained mapping units with severe limitations affecting construction of haul roads and log landings.
7. SMG 7 - Soil mapping units that are variable and have no defined drainage class with moderate limitations affecting construction of haul roads and log landings.
8. SMG 8 - 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 were prepared for all the areas where the Savage River State Forest occurs. When the current land cover was compared to the soil survey data, it was clear that the majority of Savage River State Forest soils occur on SMGs 5, 6 and 8; with stony land, steep (SrF) being the largest single mapping unit. The distinctions within this soil are quite variable, and there is often considerable slope and aspect differences that make accurate identification and classification difficult, so experienced field personnel and accurate assessments are vital to the process.

3.7 Compartments

To facilitate management planning of the Savage River State Forest, the forest was grouped into Compartments. A Compartment is defined as contiguous area made up of individual stands 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 comprise the annual

work plan on the forest. Table 3.7.1 and figure I-2 reflects the identification and distribution of the eighty-one Compartments.

Table 3.7.1: Savage River State Forest Compartments

| Compartment | Total Acres | Compartment | Total Acres |
|--------------------|--------------------|--------------------|--------------------|
| 1 | 524 | 39 | 169 |
| 2 | 623 | 40 | 1101 |
| 3 | 511 | 41 | 466 |
| 4 | 819 | 42 | 497 |
| 5 | 728 | 43 | 1057 |
| 6 | 713 | 44 | 315 |
| 7 | 781 | 45 | 543 |
| 8 | 533 | 46 | 183 |
| 9 | 993 | 47 | 986 |
| 10 | 1067 | 48 | 292 |
| 11 | 1331 | 49 | 578 |
| 12 | 367 | 50 | 497 |
| 13 | 513 | 50A | 719 |
| 14 | 927 | 51 | 1730 |
| 15 | 1134 | 52 | 1035 |
| 16 | 766 | 53 | 576 |
| 17 | 1299 | 54 | 980 |
| 18 | 644 | 55 | 769 |
| 19 | 400 | 56 | 552 |
| 19A | 96 | 57 | 458 |
| 20 | 189 | 58 | 1555 |
| 21 | 507 | 59 | 1299 |
| 22 | 410 | 60 | 663 |
| 23 | 604 | 61 | 140 |
| 24 | 567 | 62 | 599 |
| 25 | 892 | 63 | 955 |
| 26 | 1088 | 64 | 258 |
| 27 | 278 | 65 | 243 |
| 28 | 925 | 66 | 123 |
| 28A | 440 | 67 | 149 |
| 29 | 1114 | 68 | 167 |
| 29A | 263 | 69 | 535 |
| 30 | 930 | 70 | 635 |
| 31 | 497 | 71 | 176 |
| 32 | 1049 | 72 | 684 |
| 33 | 496 | 73 | 687 |
| 34 | 694 | 74 | 415 |
| 35 | 629 | 75 | 161 |
| 36 | 684 | 76 | 939 |
| 37 | 1835 | 77 | 232 |
| 38 | 1456 | | |

The majority of the land base is in contiguous blocks (Table 3.7.2).

Table 3.7.2: Compartment Statistics by Size

| Size Class | Count | Ac Sum | Ac Avg. | Min | Max |
|------------|-------|--------|---------|-----|------|
| 0-400 | 19 | 4,201 | 221 | 96 | 400 |
| 401-600 | 21 | 10,714 | 510 | 410 | 599 |
| 601-900 | 18 | 12,734 | 707 | 604 | 892 |
| 901 + | 23 | 26,785 | 1,165 | 925 | 1835 |

Adjoining land uses such as agriculture or development, may constrain forest management activities such as prescribed fire. These forests provide needed habitat and esthetic 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 Western Maryland. 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 Savage River 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.

CHAPTER 4

Land Management Guidelines

4.1 Land Management

Due to the diverse landscape of the Savage River 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.

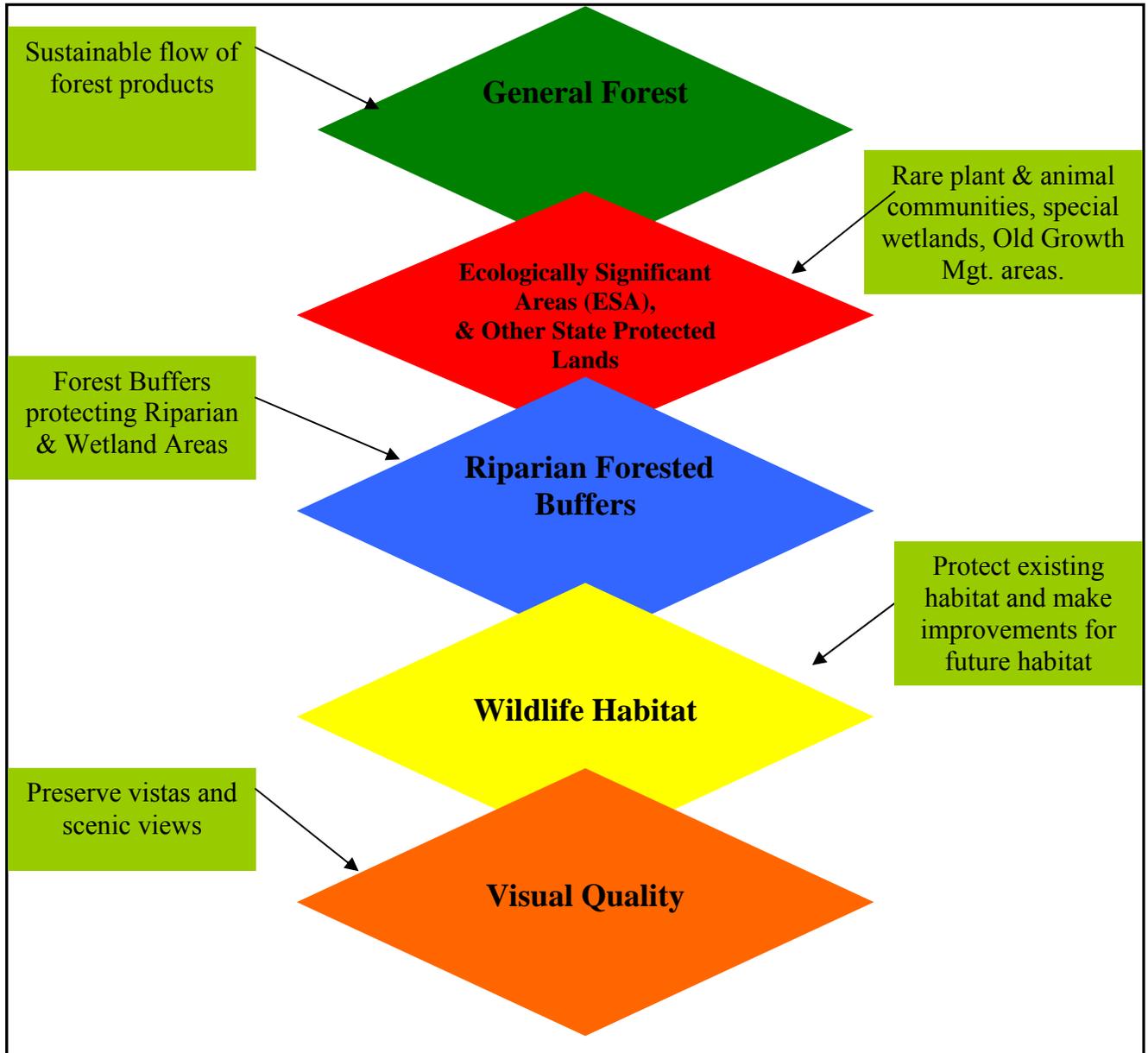


Figure 4.1: Schematic of Land Management Area guidelines

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 by providing forest-related employment and products. Most of this forest area is in mixed hardwood stands. See chapter 5.

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

Sites containing rare plant and or animal communities are identified and managed for their special qualities. The DNR Wildlife & Heritage Service is 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 have been developed for each site with the Natural Heritage Program. A listing of the descriptions and prescriptions for these special sites that have been identified on Savage River 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 an addition to ESAs. These land designations are State designated Heritage Areas, 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 (50 ft.) riparian forest buffers or 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 or wildlife habitat. The long-term goal is to achieve and maintain a mature mixed forest stand, except in those areas where early successional forest is preferred for wildlife such as woodcock or in deer wintering areas. Management will generally focus on marking boundaries so that field personnel and contractors can conduct adjacent operations properly, and closely monitor activities to prevent soil disruption or damage and protect stream bank and wetland integrity. Some riparian areas may be managed to provide better habitat for species such as woodcock. These areas will be regenerated during winter when grounds are frozen to lessen impacts on soil and water quality. Some of these riparian areas are concentration areas where deer “yard” during significant snow events or periods. In some cases it may be preferred to conduct regeneration harvests to promote areas of browse for over-wintering deer.

4.5 Wildlife Habitat Areas

The rich diversity of wildlife species located within Savage River State Forest, from endangered to common game species, requires the use of a wide array of traditional and 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 providing a variety of habitat types that include young and mature forest, open habitats, as well as the riparian forest buffers and 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 the goals and guidelines for these areas. Forest harvests that are planned to maintain a mosaic of age classes in small blocks will ensure valuable cover and edge habitat that supports some popular and declining game and non-game species such as American woodcock, ruffed grouse, and golden-winged warblers. A few areas will have specific plans made to target a mosaic of age classes to benefit early succession wildlife species.

4.6 Visual Quality Areas

These are areas that are managed to serve as visual buffers along public roads and adjacent properties to protect existing scenic views or vistas. Buffers protecting views of the land from the water should also be addressed in the establishment of riparian forest buffers.

4.7 Non-Forested Lands

These lands, although not fully identified as a particular “area” in the management plan, are estimated to cover less than 1.0% of Savage River State Forest. They consist primarily of roads, transmission lines, wildlife openings, bogs and swamps. 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, which benefit game species management and do not interfere with forest management. These areas may be especially valuable as brood habitat for wild turkeys and ruffed grouse and as foraging areas for other species. As this is the least abundant cover type on Savage River State Forest, it may be important to consider additional open habitat areas where they are lacking. These can be efficiently produced by planting and maintaining log landings. Control of invading brush, trees and invasive species will be an ongoing maintenance issue for these areas. Roads that are not needed for fire or emergency access are considered for closure.

CHAPTER 5

Forest Management

As stated in Chapter 1, the primary goal on the Savage River 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. Annual Work Plans for Savage River State Forest can be found on the DNR website at: <http://www.dnr.state.md.us/forests/workplans/>.

5.1 High Conservation Value Forest (HCVF)

Each acre of Savage River State Forest is placed in a particular category. Each category features specific resource objectives which are accomplished through implementation of a set of management guidelines for that area. These categories were delineated on a map by an analysis performed by MD DNR Forest Service, Freshwater Fisheries Service, and Wildlife & Heritage Service in early 2010. This analysis resulted in the identification of High Conservation Value Forest (HCVF) areas composed of: Wildlands, 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.* Thus, the identified high conservation value for each of the priority management areas indicated in table 5.1 and map I.3 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 running through it.

The remaining acreage on SRSF not designated as HCVF falls into an area not generally restricted to particular types of management.

5.2 Savage River State Forest – Mapping

SRSF Tract Maps are provided in Appendix I. Forest Compartment and Stand maps are approximate and subject to minor revisions by the DNR Inter-Disciplinary Team (ID Team) as dictated by on-site conditions verified by field review.

Similarly, changes and additions to priority management acreages will be subject to ID Team and Advisory Committee review. The boundaries for each area 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 5.1: Savage River State Forest Management Layers

| Management Layers | | |
|--|---------------------------------------|-----------------------------|
| Designation | Savage River State Forest Area | |
| | Acres | % of SRSF Total Area |
| General | 38,009 | 70.0 |
| Wildlands | 11,135 | 20.5 |
| Ecologically Significant Areas | 3,778 | 6.9 |
| Wetlands of Special State Concern | 202 | 0.4 |
| Forested Riparian Buffers | 1,772 | 3.3 |
| Old Growth Ecosystem Mgt. Areas | 11,650 | 21.4 |
| Total SRSF Area = 54,324 acres | | |

5.3 Forest Types and Silvicultural Practices – Savage River State Forest

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

5.3.1 Non-Forested Lands

Included in the non-forested types are 497 acres of open marsh & swamps, and 23 acres of power lines. The Savage River Forest road system comprises over 65 miles of main access roads and side feeder roads, which amounts to approximately 40 acres of open land.

5.3.2 Eastern Hemlock Type

This forest type is just over 2,000 acres. It 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 to maintain mature stands for stream protection, water quality, and thermal protection for many wildlife species. This type can be managed with uneven aged management techniques such as single tree selection. Major problems associated with this timber type are hemlock woolly adelgid and large deer populations. The adelgid is here and if it develops in large numbers, the adelgid could be devastating to the hemlock stands. When there are large numbers of deer around hemlock stands, it makes it difficult to regenerate hemlock because deer prefer to browse young hemlock seedlings. Some of these stands are in the High Conservation Value Forests.

5.3.3 Pine – Hardwood Type

These forest types, which total just over 500 acres, 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. There are many HC VF 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 pitch pine. Natural regeneration will be used within harvest sites, possibly supplemented with some planting of native hardwoods and/or native conifers.

5.3.4 Conifer Plantations

This forest type, which totals just about 3,000 acres, is made up of white pine, Norway spruce, red pine, and conifer mixtures. Other tree species mixed in this forest type are a variety of oaks, black cherry, maples, and hickory.

Many of these conifer plantations were established to restore degraded soils and ultimately to be regenerated to native hardwoods. Given the small amount of conifer cover on the state forest, these stands will be maintained in conifer cover. Over time, the non-native conifers will gradually be replaced with native conifers such as white pine and red spruce.

Silvicultural activities will involve prescribed fire and commercial thinning operations followed by regeneration harvesting, either by the seed tree, shelterwood or clearcut method.

5.3.5 Northern Hardwoods

This forest type, which totals just over 9,000 acres, 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 High Conservation Value Forests.

5.3.6 Cove Hardwoods

This forest type, which totals just about 5,000 acres, 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 Forest and will be managed for other objectives.

5.3.7 Mixed Hardwoods

This forest type, which totals just over 30,000 acres, makes up the bulk of the forests in Savage River State Forest. Oaks are typically a large component of larger canopy trees in this type and are at risk to a number of insect and disease problems. Also, there is not much oak in the understory to make up the next forest. Frequently, silvicultural treatments are designed to reduce the oak component of the type, but to ensure that the oak is not completely lost from the type.

5.4 Forest Management Guidelines

The above six 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 areas are as follows: High Conservation Value Forest

and Regular Conservation Value Forest. Within the High Conservation Value Forest are a number of overlapping areas such as Ecologically Significant Areas (ESA), Wildlands, Riparian Buffer Areas, Old Growth and Old Growth Ecosystem Management Areas.

5.5 General Management Areas

Regular Conservation Value Forests or General Management areas are those sites not impacted by specific restrictions of High Conservation Value Forests (in the five special management areas as outlined below).

In the designated general management areas, the forest will be managed on longer rotations (10 % longer than optimum financial maturity) thereby encouraging greater biodiversity. The goal is to grow larger trees and hold them longer on the landscape. 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.

All forest types within these management areas will be managed to produce a rapidly growing, vigorous, and healthy forest. This management will support local natural resource based industries, and at the same time, protect water quality through adherence to Best Management Practices.

The annual growth rate in this area based on our continuous forest inventory from 2000 is 6.5 mmBF.

The average annual harvest rate since 2000 is 2.3 mmBF. The annual harvest rates since 2000 are as follows:

| | |
|------|----------|
| 2001 | 2.7 mmBF |
| 2002 | 2.6 mmBF |
| 2003 | 1.9 mmBF |
| 2004 | 3.6 mmBF |
| 2005 | 3.4 mmBF |
| 2006 | 2.8 mmBF |
| 2007 | 2.6 mmBF |
| 2008 | 1.0 mmBF |
| 2009 | 1.7 mmBF |
| 2010 | 0.8 mmBF |

5.6 High Conservation Value Management Areas

5.6.1 Ecologically Significant Areas (ESA)

Portions of a number of the ESA management areas overlap State Wildlands, Wetlands of Special State Concern (WSSC), Forest Interior Dwelling Species (FIDS) and the Riparian areas; however management prescriptions will focus on enhancing and protecting the designated ESA.

Each ESA area has specific management prescriptions. See Chapter 7 of the plan for detailed explanations on the type of management activity recommended for each area and for the specific definition and prescription for each ESA category.

5.6.2 State Wildlands

State Wildlands are designated by the Legislature of Maryland as natural areas that are to be left minimally disturbed by human activity. Therefore, no intensive management is planned for these areas. The South Savage Wildland has been specifically designated by Law to allow for approved research activities.

5.6.3 Wetlands of Special State Concern (WSSC)

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

5.6.4 Riparian Forest Buffers

These buffers are 50 feet on either side of streams and rivers and the buffer is designed to protect the water quality and quantity, as well as improve the habitat for native trout and other riparian dependent wildlife.

5.6.5 Old Growth and Old Growth Ecosystem Management Areas

The relatively few acres of old growth forest that have been identified on Savage River State Forest will be protected via the Old Growth Management Policy and no major silvicultural activities are planned. The area will be monitored for invasive species, which may be suppressed if found.

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 Savage River State Forest there are several patches of old growth forest along with several 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 five acres in size with preponderance of old trees. See Policy and Procedures Manual 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 nonforested conditions within the buffer should be reforested, whenever feasible. Salvage harvesting should not occur within this buffer.
- Management zones 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 nonforested 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 management zone 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.

5.6.6 Other Special Management Areas:

A number of special areas exist on Savage River State Forest 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 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 Plan (AWP) process. Managers are expected to make diligent field inspections of these areas as part of the planning process when any activity or 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 database.
- 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.

5.7 Forest Management Activities

5.7.1 Regeneration & Site Preparation

Either natural regeneration or artificial regeneration will be used to re-establish the forest after harvesting. 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 before and after 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 Best Management Practices (BMP) compliance 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.

5.7.2 Vegetation Control

Chemical control of competing hardwoods, herbaceous vegetation, and exotic invasives may be used to enhance survival and growth of new regeneration. 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. Research plots will be established to monitor the effectiveness of various herbicide rates.

5.7.3 Pre-commercial Thinning

Pre-commercial thinning in 10 to 15 year old naturally regenerated stands is a form of density control that is useful to concentrate growth on larger stems, to control species composition, maintain an even distribution of trees across the site and is a practice usually accomplished by hand crews.

5.7.4 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. Commercial thinnings are determined by the stocking and growth rate of the stand. Based on management prescriptions for a particular site, any commercial thinning will produce higher quality merchantable sawtimber.

5.7.5 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.

5.7.6 Regeneration Harvest

Regeneration harvest will vary with the species being regenerated. The selection method may be used with northern hardwoods, clear-cut method may be used in cove hardwoods and conifer plantations, and shelterwood method may be used when regenerating oak. The goal will be to maintain a maximum conifer regeneration harvest area of 40 acres per *FSC Principle #10: Plantations*, and will include “Green Tree” retention areas in keeping with Forest Stewardship Council (FSC) standards. Guidelines for clear-cut harvest larger than 40 acres will be based on forest health, economic, and ecological necessity. Hardwood regeneration areas using even-aged techniques without retention will be 10 acres or less, and when using uneven-aged techniques will have canopy opening less than 2.5 acres. Cutting boundaries should follow natural boundaries on land to encourage irregular shapes that help diversify wildlife habitats and

improve aesthetic appearance. Clear-cut 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 standard.

Forest harvest by the shelterwood 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.

5.7.7 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 Savage River State Forest Sustainable Forest Management Plans 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 Savage River 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 five 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.

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 unharvested trees. These undisturbed forest sites can function as habitat corridors, or refugia, enabling species that are sensitive to disturbance in an area to persist until the surrounding landscape is able to regenerate

5.7.8 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 reintroduce 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 redistribution of nutrients and vegetation. However, with the urbanizing landscape and increasing number of houses, fire will be difficult to reintroduce on Savage River State Forest and will require careful planning. Land Managers will need to designate areas where significant reintroductions 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 unless smoke conditions can be mitigated around 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.

5.8 Practice Scheduling

Field surveys, GIS-based forest and habitat maps and associated databases and forest models such as Remsoft Spatial Woodstock or Oak Silvah 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).

5.9 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. 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).

5.9.1 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 Savage River State Forest, any road construction (even temporary access trails) will follow State BMP guidelines. 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 with approved seed 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.

5.9.2 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 two lined chestnut borer. 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.

There are a number of insect and disease problems in the forest, but most of them are localized and affecting only a few trees. However, the exceptions to that statement create or could create serious problems. The exotic insect gypsy moth (GM) has been in the forest since the late

1980's and early 1990's. The Maryland Department of Agriculture – Forest Pest (MDA) division along with our staff have been monitoring for GM egg masses in the fall. The MDA conducts a spray program when warranted based on these GM egg mass surveys. They also monitor the efficacy of the spray programs. This year they are using Bt on the state forest and in the rest of the county as well. However, during major infestations such as occurred several years ago, we do not have the financial resources to spray the whole forest – resulting in substantial mortality. More recently hemlock woolly adelgid (HWA) was found in the forest. This could be a serious pest as our hemlocks cover many native trout stream. At the present, the MDA advises that the adelgid is not spreading or reproducing as rapidly as they have elsewhere. The MDA, the USDA- Forest Service (USDA-FS) and co-operating universities are experimenting with exotic beetles to control the adelgid. There have been a few beetle releases in SRSF. There have been some pesticide injections of hemlock in the adjacent State Park, but such treatments are not practical on the state forest. Salvage operations resulting from GM defoliation and subsequent insect and fungus invasions are ongoing in the forest.

A couple of problems are on the horizon. Emerald ash borer (EAB) has been found in Pennsylvania, West Virginia, and in adjoining Allegany County and it is likely here. MDA is actively monitoring for it and working with the USDA-FS on control measures. At the present time there are no effective control measures for this insect. This insect could decimate the ash component of our forest, if the experience in other areas is repeated here. The Beech Bark Disease complex is found in WV and PA. MDA has discovered the exotic beech scale in southern Garrett County and the nectria fungus is found on the other side of the Potomac River in WV. Again pesticide applications are not practical, but there is hope that native beetles and fungi will help control the disease complex. Without control, this disease complex could compound the injury to our riparian forests. We are not anticipating timely and effective controls for HWA, EAB or beech-bark disease and are contemplating salvage measures when necessary.

5.10 Financial Returns

The long-term goals for the Savage River State 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 the general management areas 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. Yearly harvest acreages are determined through forest modeling, deviations larger than 10 percent from these acreage 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.

5.11 Forest Modeling

5.11.1 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.

5.11.2 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 timber available for harvest;
- The age and species distribution of the forest trees;
- The creation and maintenance of sufficient older, larger trees that create better habitat for wildlife;
- The protection of critical habitat areas such as those adjoining streams, marshes, or special soil conditions;
- 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.

5.11.3 The Forest Planning Model

The Maryland DNR Forest Service and Vision Forestry (contract land manager) studied available forest modeling systems and ultimately chose the Remsoft Spatial Woodstock model for development of long-term projections on the Chesapeake Forest and Pocomoke State Forest. Remsoft models were deemed adequate for modeling on the Savage River State Forest as well, even though the Eastern Shore forests are not in close proximity and have very dissimilar species and growing conditions. Even though these vast differences are present, a functional model was created using the basic framework of the Chesapeake Forest model. Information on the model is available at www.remsoft.com.

Spatial Woodstock is integrated with the Savage River 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 Savage River State Forest requires that the forest be divided into discrete areas (called stands) that have similar soils, vegetation, age, and other characteristics. Priority management areas have been identified.

A detailed Forest Model utilizing the current forest database from Savage River 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 H.

5.12 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 – Savage River 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:*

- Soil quality – through regular soil testing, particularly on areas 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.

5.12.1 Water Quality Monitoring

Due to the special attention on water quality in the Chesapeake Bay, the relative pristine native brook trout streams and the need to document more clearly how commercial forest management affects water quality, Savage River 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.

5.12.2 Timber Harvests

For Savage River State Forest, the Land Manager will ensure that for each harvest operation a pre-harvest plan is developed and a post harvest BMP inspection report is prepared and maintained on file. An important aspect to protect water quality on timber harvest sites is to insure a certified Master Logger carries out the harvest operation. Savage River State Forest was one of seven State Land sites included in a study of BMP implementation conducted in 2004 and 2005 as part of developing a Northeastern Area Regional BMP Assessment Protocol. The study revealed that statewide, sediment movement into water courses was avoided on 81% of the sites. The study was conducted by an independent contractor, Sustainable Solutions, LLC, and funded by the USDA Forest Service Northeastern Area State and Private Forestry.

5.12.3 Herbicide Applications

Herbicide applications are rarely used on Savage River State Forest. However, when management conditions warrant their use, the land manager will maintain records of tree growth,

application rates, soil nutrient levels, and vegetative community to track the effectiveness of herbicide applications.

On Savage River State Forest we expect to be using herbicides to help with regenerating oaks and controlling invasive plants. Currently, we anticipate that the herbicide applications will only be done during the regeneration phase of a particular stand unless there is an infestation of exotic, invasive plants that is quickly identified or that threatens unique habitat which may necessitate an off-cycle treatment.

The typical application method on Savage River State Forest for herbicides is backpack spraying and/or broadcast spraying from tracked vehicle. The particular chemical used will depend on the particular plant to be controlled – label directions will be strictly followed. Application will be done under the pesticide certification of the forest manager.

5.13 Forest Certification

A primary objective of Savage River State Forest (and all Maryland State Forests) is to become a national model of certified sustainable forestry. The first step in that direction was achieved in the spring of 2011 when Savage River State Forest received 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.

5.13.1 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/FSC certification process was begun on the Chesapeake Forest Lands which received dual certification in June 2004. The initial certification evaluation for Savage River State Forest occurred 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/FSC certification.

5.14 Forest Stewardship Council (FSC) – Guidelines & Principles

5.14.1 Invasive Plant Species Control

A detailed invasive plant species control plan will be developed in conjunction with the Wildlife and Heritage Service. In the meantime, stands that are being proposed for management activities will be examined for invasive species and control action will be taken prior to any 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.

5.14.2 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.

5.14.3 Representative Samples of Existing Ecosystems

Representative Sample Areas (RSAs) are designated 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.

CHAPTER 6

Water Quality Areas: Riparian Forest Buffers and Wetlands

(High Conservation Value Forest-HCVF)

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). Their management is critical to not only preventing water pollution, but to 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. The Upper Savage River watershed is also regionally recognized as a special brook trout habitat. It is becoming generally recognized that riparian areas and wetlands are key to many biodiversity issues. It is for these reasons that these areas have been designated as High Conservation Value Forest (HCVF). They also provide connectivity from Savage River State Forest through other public and private forestlands to the Chesapeake Bay. 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 RFBs, mark boundaries, and provide GPS coordinates for updating the GIS data system.

Generally, 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 from Savage River 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;
- 5) To maintain or establish native plant communities;

- 6) To allow these areas to revert into Old Growth Forest; and,
- 7) To provide early successional moist soil and browse areas for wildlife

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;
- 6) Encourage the development of a diverse, uneven age forest community in terms of species, canopy levels, and diameter class;
- 7) Where appropriate, regenerate alder and hardwood forest to provide dense cover with moist soils; and,
- 8) Where appropriate, regenerate small areas to provide important winter browse and cover.

6.2.1 Stand Composition

Riparian forests will be managed to encourage a mixed hardwood or mixed hardwood/conifer community with a combination of diverse herbaceous, mid-story, and overstory plants. Hardwood species will be encouraged to ensure maximum functions for denitrification, canopy diversity, woody debris, and nutrient uptake. Diversity in species and forest structure will 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

According to management goals and objectives, any vegetation management must be designed to improve the ecological functioning of the riparian forest and stream system. 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 complying 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 BMPs for road construction must 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, and
- 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. 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, and
- 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, and
- 3) Prevent further 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 (BMPs) 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 riparian 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 with products approved for aquatic application.

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 must 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 Savage River State Forest will extend 50 feet from the edge of all blue line streams as indicated on the USGS maps. Other riparian areas (not identified as blue line streams) that once examined through field review are determined based on evidence of stream function to be in need of a buffer will also have a 50 foot buffer. These buffers will provide additional nutrient uptake for water quality, and increased forest interior habitat for wildlife and wildlife travel corridors. They will be managed for the creation and maintenance of mature mixed hardwood 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 native brook trout.

Actual buffer layout must be done in the field, in response to the soil, topographic, and vegetative conditions encountered in each place. Prior to any silvicultural treatment an operational buffer of 50' plus an additional 4' for each percent slope will be created.

6.5 Management and Function of Riparian Forest Buffers

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-cut area regardless of current species composition, to avoid destabilizing stream banks. The remaining

50' plus 4' should be a limited harvest area, thus management activities will encourage the creation and maintenance of mature mixed forests. Tree removals, through thinning or harvest, will be done only to improve riparian forest function. 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 that they are in a condition to maintain the expected functions of stream shade, woody debris inputs for aquatic habitat, nutrient assimilation, and protecting the 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 two 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.*

For the above definition the “growing season” in Garrett County is roughly defined as the April 15-September 15 period, with annual variation.

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 unvegetated (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 or 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). 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 Savage River State Forest. The first 3 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 or more 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 (less than 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 SRSF these include 5 amphibians and a crustacean group, the fairy shrimp (at least four species in the Order Anostraca; Brown and Jung 2005). Amphibians include marbled salamander (*Ambystoma opacum*), spotted salamander (*A. maculatum*), eastern tiger salamander (*A. 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 SRSF facultative species include 16 amphibians, one reptile, and 17 invertebrates (Brown and Jung 2005), However only three of these, all amphibians, are rare or state-listed: barking tree frog (*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 Savage River 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 three was a Terrestrial Buffer for Core Habitat and extended 165 feet from Zone 2. At a minimum these three zones comprise 630 feet to greater than 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 three 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 greater than 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 greater than 50% of the canopy was maintained, no openings greater than one 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 (less than or equal to 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 (less than 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 Savage River 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 Heritage with possibility of a “one-time only” harvest of some areas by Forestry, but this will be on a case-by-case basis.

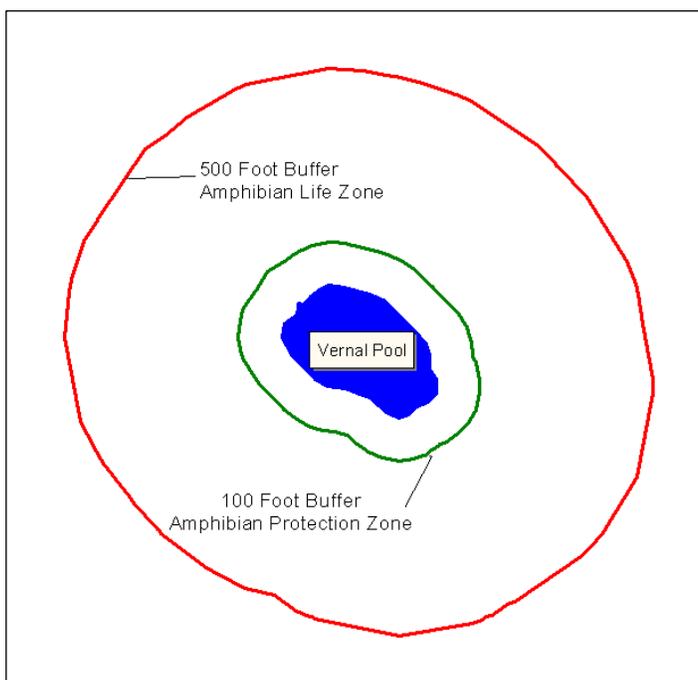


Figure 6.6.1: Amphibian buffer zone around a vernal pool

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

Management:

1) Saw timber rotations maintaining at least 50% canopy closure. A patch clearcut of less than or equal to 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 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 (50+ 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 at least 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.

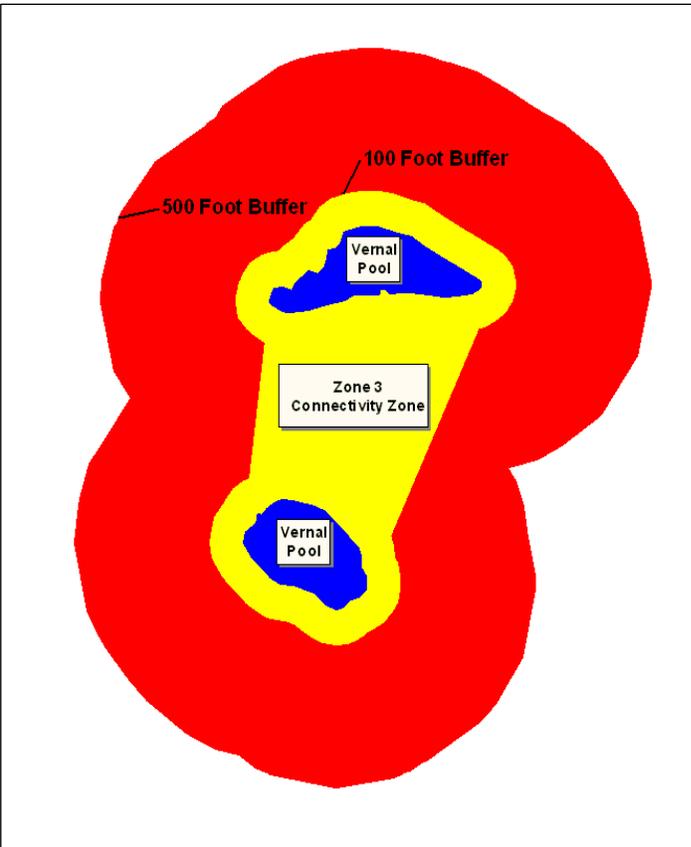


Figure 6.6.2: Vernal Pool connectivity zone for amphibian conservation

Zone 3 (Forestry responsible for management with input from 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 two breeding ponds are less than 1000 feet from each other (and readily 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.

CHAPTER 7

Ecologically Significant Areas & Other State Protected Lands

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 (see map I.5) and must be given careful management consideration. ESAs are areas that harbor or could potentially harbor rare, threatened or endangered (RTE) species and/or unique natural community types.

On Savage River State Forest 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); stream buffers and water quality; 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 part of the Savage River 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 Natural Heritage Program 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 SRSF. 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.

ESAs presently comprise approximately 3,778 acres or about 7 % 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. ESA boundaries in many cases overlapped other management areas. Timber management is still possible in most ESAs, but in some cases, may be a “one-time only” occurrence 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.

7.2 State Protected Lands

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 four areas described here: Natural Areas (Heritage Areas); Ecologically Significant Areas; State Designated Wildlands; and Historic and Archaeological Areas. The borders of these layers may overlap one another.

7.3 ESA Management

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.

7.4 ESA Description & Prescriptions

The ESA descriptions are largely driven by the database, inventories and mapping of the Maryland Heritage Service. Prescriptions and boundaries of the ESA are the result of a collaboration between the forest staff, Maryland Wildlife Service and the Heritage Service with the Heritage Service taking the lead.

7.4.1 Ecologically Significant Areas

Callahan Swamp

Description: Currently, all of Callahan Swamp is privately owned. It is a large wetland complex of sphagnum bog, shrub swamp, and sedge/grass swale that supports a large number of uncommon, rare and State-listed species. It is a top acquisition priority and a number of different landowners have been contacted over the years concerning the conservation of this important area. This ESA represents that portion of State Forest that is within a secondary protection boundary of this valuable wetland.

Prescription: This secondary protection zone is not necessarily a ‘hands-off’ buffer. However, any land use proposals within it should be scrutinized carefully, and, if carried out, be done so in a sensitive manner. There are a number of springs originating from this ESA that feed Callahan Swamp. These areas in particular should be treated with the utmost sensitivity.

Mudlick Run

Description: This ESA provides habitat for four State-listed plants, two of which are State Endangered and two of which are Threatened. One State Threatened damselfly also occurs here. A small population of a State sensitive reptile occurs here, as well. Another notable feature is an excellent riparian hemlock-northern hardwood forest along Mudlick Run. This forest provides breeding habitat for at least three regionally uncommon birds. There are several oxbow pools along Mudlick Run that support two vernal pool obligate amphibian species. This ESA is adjacent to and part of Mount Etna ESA which provides breeding habitat for an area-sensitive State Endangered raptor.

Prescription: There are several management issues associated with this ESA. One is the presence of the hemlock wooly adelgid in Garrett County and the threat it may pose to the riparian hemlock forest. Field reconnaissance is recommended in the near future to determine if the adelgid is present and if it has caused any damage. This may have already been done by MDA. One of the State Endangered plants, a sedge, is under pressure from deer browsing. This occurrence should be monitored regularly to assess the status of the population. The status of the other State-listed plants has not been updated in over 10 years. This is something that should be attempted soon. Another issue is the presence of a restaurant/lodge on a private in-holding in the middle of this parcel of State Forest. The lodge uses the State Forest for recreation such as hiking, biking, skiing, etc. Future management issues may be expected to be encountered.

Poplar Lick Headwaters/Wolf Swamp

Description: Because of land ownership patterns, this ESA will appear as two areas on our State Forest maps. However, ecologically, they form one large ESA and would appear as such if the State owned the properties in between. This extensive wetland/headwater stream complex boasts a number of exemplary sphagnum dominated bog/fen communities, grass/sedge swales interrupted by occasional beaver activity, shrub dominated bogs, forested bogs, forested spring seeps, and vernal pools. With such a diversity of habitats it is no surprise that this area supports a large number of uncommon, rare, and State-listed flora and fauna. Two State Endangered plants and two State Threatened plants have been documented, to date. One of these listed plants is represented by a historic record that has not been re-located in recent attempts. Several other plants that are not officially listed, but considered rare in the State, also occur here. Three animals listed as State Endangered have been recorded from here, as well as two State Threatened and three In Need of Conservation species. These listed animals consist of four butterflies, one amphibian, one bird, and two mammals. Other regionally rare or uncommon birds are probable breeders here, as well. The odonate fauna is diverse with several uncommon or localized species documented. A rare troglobitic amphipod and a flatworm possibly new to science have been found in a spring head within this area. This ESA truly represents a biological diversity 'hotspot' for our State. A very interesting geomorphic feature known as the Eastern Continental Divide is quite evident between the south end of Wolf Swamp and the headwaters of Poplar Lick Run. Near this divide, water can be observed flowing both north and south not far from one another. The drainage into Wolf Swamp flows north into the Ohio system and Poplar Lick flows south into the Atlantic Slope drainage. There are several ecologically significant vernal pools located in the general area of this divide.

Prescription: There are several management issues associated with this ESA. One is the continued unauthorized ATV use within the area. Wildcat trails originate off of the East Shale Rd. ORV trail and cross over Meadow Mt. into the ESA. Other access points originate on adjacent private land. Sections of these trails are environmentally degrading. One of the main trails over Meadow Mt. completely changed the drainage pattern of the headwaters of a small stream. Another section goes through a wet area near the aforementioned divide resulting in a muddy quagmire. Other wet areas have been compromised, too. The Department is in the process of addressing ATV issues on western region State Forests. Whether this specific issue will be addressed in that effort remains to be seen. If not, it is an issue that needs attention. Past logging operations have taken place within some of the tributaries on the east side of Poplar Lick. The proper management of this sensitive area should preclude any future timber harvests

from occurring anywhere within this ESA. Any private land that goes up for sale within or adjacent to the State-owned parcels should be high on the acquisition priority list. This is particularly true for the area in between the two State parcels and the property south of the ESA in Poplar Lick Swamp. The presence of the hemlock woolly adelgid in Garrett County is a threat to the hemlock forest present in much of this ESA. An evaluation to assess this threat should be undertaken.

Big Laurel Run (“Asa Durst”)

Description: This site provides habitat for a State Threatened plant and two State rare plants. Additionally, there is an exemplary northern hardwood forest community that is quite old and could be near old growth. This forest type remains to be analyzed by the Natural Heritage Community Ecologist, but the exceptional diversity of canopy tree species is different from any forest yet discovered on SRSF. The herbaceous layer of much of the site is also of interest, supporting a large diversity of species. These characteristics recently helped persuade an Interdisciplinary Team to recommend against a proposed timber harvest of the northern-most section of the area.

Prescription: The State Threatened plant is a species that has been compromised by high populations of deer at most sites where it occurs. The impact of deer at this site has not been fully evaluated in quite some time. This is a task that needs done, soon. The status of the State rare plant that was impacted by a past timber harvest should also be updated. During this past harvest, Japanese stilt grass was introduced to the area. It occurs on some of the forest roads at this time. Two roads which head in the direction of the ESA should be evaluated for the advancement of this weed.

Big Laurel Run Woods

Description: This ESA provides critical habitat for a State Threatened plant. It is considered a very good occurrence for the species.

Prescription: The rare plant occurrence needs updated since it has not been done in quite some time.

Puzzley Run

Description: There are a number of outstanding attributes associated with this ESA. The area provides habitat for a variety of sensitive flora and fauna. Puzzley Run represents a relatively large tract of forest that has remained free of major anthropogenic disturbance for over 130 years. The area also offers exemplary examples of several forest community types, most of which are near old growth. To date, two State Threatened plants and two rare plants have been documented. Because of the underlying geology (which is different from much of SRSF) the soil of much of the area is quite rich. This situation allows for an exceptionally diverse herbaceous flora. The stream continues to exhibit excellent water quality, but sediment and erosion problems are not entirely absent. This aquatic habitat supports a number of odonates, three of which are considered uncommon or rare in the State. The stream also supports a State Endangered mammal and a sensitive species of fish. Two State rare birds and a rare butterfly complete the list of sensitive species documented within this ESA, so far. For some reason not fully understood, the forest communities on the slopes of Puzzley Run seem particularly

susceptible to disturbances generated by high winds. The steep slope certainly has something to do with this, but does not seem to be the only factor. In any event, the result is a dynamic system with a large number of downed or damaged trees. The resulting coarse woody debris, snags, and light gaps have produced old growth characteristics in this forest at an earlier age than would normally be expected. Since much of the area is near old growth in age, Puzzley Run will continue to evolve into not only one of the most extraordinary forests on Savage River, but in all of Maryland.

Prescription: Perhaps the most pressing issue with this ESA is a proposal to drill wells to supplement the drinking water of the nearby town of Grantsville. Concerns voiced over whether these wells will impact the flow and quality of Puzzley Run seems to have been addressed in a recently published hydrological assessment. The results appear to claim no impact will occur, though this author is incapable of evaluating such a report. A concern that has not been adequately addressed to date is the impact of the access road to the wells. Currently, this access is an old narrow road that would seem to require a serious upgrade to function in the needed capacity. The old road cut has ‘healed’ to the point of supporting local vegetation and has several spring seeps crossing it. One of these spring seeps now supports a small population of a State Threatened plant and any disturbance in that area will destroy this occurrence. The concerns regarding this access road will undoubtedly be addressed in the near future. Another concern for this ESA is an unauthorized ATV trail that runs the length of the stream. Use seems highest during hunting seasons, but is not restricted to that time period. This issue remains to be addressed. Given the rich nature of much of the soil, an updated evaluation of the invasive plant situation should be done.

Little Bear Creek

Description: The primary features of this ESA include outstanding examples of ‘northern hardwood’ and hemlock forest, spring seep plant communities that show a more neutral or slightly basic water chemistry, excellent populations of various salamander species associated with springs and small streams, a population of a State rare dragonfly, and a population of a sensitive species of fish. The ‘northern hardwood forest’, which probably represents more than one forest community type, is near old growth in much of the area. A small pocket of probable old growth was recently discovered, as well. A number of uncommon plants have been documented here, and it is highly likely that further inventory would yield other interesting plant discoveries.

Prescription: It has taken considerable effort over the last 15+ years to conserve the integrity of the boundaries of this ESA. This was primarily caused by the continual proposal of timber sales that pushed the limits to the edges of the site. Field evaluation of the boundaries in relation to the unique forest communities should be completed to insure the integrity of the resources we wish to protect within this ESA. Given the rich nature of much of the soil, an evaluation of the invasive plant situation should be done. The hemlock wooly adelgid poses a threat to the hemlock forests here. Field reconnaissance is recommended to determine if the adelgid is present. This ESA would extend in several directions if the State owned the land. Several private parcels in the area represent important acquisition priorities.

Amish Road Swamp

Description: The primary feature of this ESA is a high quality headwater stream flowing through a mosaic of boggy openings, hemlock/red spruce swamp, and northern hardwoods. A decidedly northern bird fauna is present with several uncommon species breeding here. There is a diverse small mammal community with the potential for several rare species. An excellent naturally open cranberry bog, known as Flanagan Bog, occurs on private land in between the two State parcels that form this ESA. The main branch of the upper headwaters is on private land, as well. Ecologically, these features are part of the ESA and would be reflected as such if the State owned the land.

Prescription: The most important stewardship issue with this ESA is to acquire the land necessary to protect the integrity of the area. As such, the private land within and to the NE of this site represent high acquisition priorities should they come up for sale.

Negro Mountain Bog

Description: This ESA features the finest northern bog/fen system on SRSF. There is a mosaic of open sphagnum communities, old beaver ponds, shrub swamp, and forested wetland. A number of uncommon bog plants grow here as well as two State rare species. The odonate diversity is particularly high, with four State rare species documented, so far. A State rare butterfly has also been documented, and several uncommon northern birds are known to breed here. The area provides excellent cover habitat for secretive animals such as the black bear and bobcat. An acquisition that borders this ESA to the south by The Nature Conservancy, which is centered around a number of bogs, fens and swamps, results in the protection of a large, wetland complex along the east flank of Negro Mountain. There is potential to discover a State rare reptile within this ESA since it has been documented in similar habitat not too far away.

Prescription: An area of private land to the west, ‘sandwiched’ between this ESA and another section of State Forest, represents a prime future acquisition. Many springs emerging at the base of Negro Mt. feed this extensive wetland system. Currently, the fate of some of these water sources is out of our hands.

Bear Creek Springs/Upper Bear Creek

Description: This ESA highlights a protection area along Bear Creek established for the presence of a globally rare land snail. In addition, at the southern end of the area protection is provided for an excellent spring seepage wetland that supports a State Threatened plant. An unusual plant association exists in this wetland. The land snail, which has a global rank of G3, was documented during a county-wide inventory conducted a number of years ago. The species was found at four different locations along Bear Creek within the ESA. Because of the underlying rock strata, many of the springs feeding Bear Creek have a pH that approaches neutral, thereby influencing the plant communities that exist here. This is the case for the wetland that supports the State Threatened plant. Another plant that thrives in spring seeps with this type of water chemistry, and is considered uncommon in Maryland, occurs in good numbers within this ESA. The geology and resulting soil also influences the land snail community of a given area. Additionally, there is a diverse spring/small stream-dwelling salamander community here, as well.

Prescription: Past timber operations have come rather close to or crossed into this ESA in the past. Field reconnaissance of this area is highly recommended to determine the relationship between what land is needed to adequately protect this ESA, and what land should be available for timber management. The invasive plant situation should be evaluated because the area provides the type of growing conditions preferred by many of them. This area is another on the Forest where unregulated ATV activity occurs. The current status of this issue needs evaluated.

Upper Big Run

Description: The upper reaches of Big Run, including Whiskey Hollow and Miller Run, has several important features contributing to it being designated an ESA. First, it provides critical habitat for a State Endangered mammal. This secretive, semi-aquatic small mammal requires streams of high water quality and abundant cover. In addition, a northern species of dragonfly, rare in the region, has been documented living along these headwaters. Furthermore, this headwater system offers one of the finest examples of an Allegheny Plateau stream-side salamander community. All of the species expected to be here have been documented, and they occur in good population numbers. These headwaters also provide excellent spawning habitat for brook trout. A State rare plant occurs within this ESA, as well.

Prescription: The number one management issue with this area is keeping the potential insults that may occur in the extreme upper reaches of the streams to a minimum. A number of timber operations have occurred within the watershed over the years, and a few of them resulted in an influx of sediment. A current timber proposal on State Forest along the upper headwaters of Big Run is receiving a more generous water management zone than is normally the case because of these concerns. Also, much of the extreme upper reaches occur on private land where we have little control of land use activities. Furthermore, water management of New Germany and Big Run Roads has caused impacts in the past and has the potential to cause more in the future. Keeping these insults to a minimum is of obvious importance. The hemlock wooly adelgid has been documented in the vicinity. The hemlock cover is an important component to this ESA and the special resources within it. Monitoring the impact of the adelgid, and hopefully being able to manage those impacts, are important to the future integrity of this area.

Upper Monroe Run

Description: The features of this ESA are two-fold. It represents habitat for a State Endangered mammal and it represents an excellent example of Allegheny Plateau salamander communities, both stream-side and terrestrial. The diversity of stream dwelling salamanders is as high as it can be, as all species expected to be here have been documented. An unusual situation exists on one of the hillsides adjacent to the stream. Three species of *Plethodon* have been found co-existing in the same area. Two of these, the redback salamander and the ridge & valley salamander, only rarely occur together. This is particularly true farther east in the heart of the ridge & valley salamander's range. The ridge & valley salamander's range encroaches on the Allegheny Plateau and the full extent of its occurrence in this physiographic province is not known. The occurrence of these two species together is of scientific interest since the redback salamander is absent from the Ridge & Valley province.

Prescription: Minimizing disturbances that affect water quality is the main management recommendation. The aging of the forest will improve the salamander habitat.

Upper Poplar Lick

Description: The features of this section of Poplar Lick include the presence of a State Endangered mammal and a fresh water mussel listed as In Need of Conservation. Both of these species depend on having good water quality.

Prescription: Any lake management issues of New Germany Lake that may affect Poplar Lick's water quality should be carefully scrutinized. Additionally, any increase to the volume of the New Germany State Park's sewage treatment facility (which empties into Poplar Lick) should be reviewed carefully.

Bear Pen Run

Description: The heart of this ESA is the Bear Pen Wildland, which is all State Forest. The ecological boundaries of the ESA encompass all of the drainage into the Bear Pen watershed and include adjacent private land. This is to indicate the importance of these properties as acquisition priorities if they ever go up for sale. For instance, a property currently in the acquisition process is extremely important to improving the water quality of Bear Pen Run and it is hoped the State can secure ownership of it. Bear Pen Run is an important tributary to the Savage River and its protection as a Wildland secures a number of important features. It represents excellent forest interior bird habitat and includes a number of patches of old forest. The area supports a population of a State Threatened plant and a State sensitive reptile. The area offers excellent habitat for salamanders and a high diversity of species occur here. The entire area has had a history of gypsy moth defoliation. On one hand the mortality has created more structure to the forest and added old growth forest characteristics sooner than normally expected. On the other hand, some patches of old growth suffered serious mortality and many of the large, old trees were killed. Overall the area now exhibits a structurally diverse forest with a large amount of snags and coarse woody debris. In the long-term, the entire area will evolve into old growth.

Prescription: There are some invasive plant issues within this ESA. For the most part, the major problems occur along the stream and its floodplain and follow some of the tributaries. Japanese spiraea and garlic mustard are the two major culprits. Currently, a cooperative effort to manually remove the Japanese spiraea is underway and has been for a number of years. This plant's main pathway to invasion is via headwater areas, often from private land. The public's main access into this area is from Savage River Road, near Bear Pen Run's confluence with Savage River. Invasive plants like garlic mustard make their way into the area mainly from this access point. The aggressive invasive Japanese stilt-grass is now in the region and represents a threat to this area, if it has not already arrived there. Monitoring and management of invasive plants will be an ongoing issue with this Wildland/ESA. Acquisition of any bordering properties that go on the market, particularly in the headwaters, is of prime importance to the long-term integrity of the area.

Savage River-Warnick Run

Description: This ESA identifies a section of Savage River where three State rare odonates and two uncommon ones have been documented. Of the State rare species, two are dragonflies and the other is a damselfly. The damselfly is State-listed as Threatened.

Prescription: Water quality and streamside habitat are both important for odonates. The State Threatened damselfly is known to have specific streamside habitat needs. Advice from our State Zoologist may be necessary to determine any future management needs.

Warnick Run Hilltop

Description: This ESA is designated because of a site for a State Endangered plant and a rare breeding bird. The area also has habitat supporting two mammals listed as In Need of Conservation. The general habitat consists of a diverse mature forest with several scattered rock outcrops. At least half of this ESA is on private land.

Prescription: No known management needs at this time. However, the occurrences for the endangered plant and the rare bird need updated since the last observed dates are a number of years ago.

Warnick Point Southwest

Description: This ESA lies within the Big Savage Wildland. Its features include a site for a State Endangered plant and a State rare plant.

Prescription: No known management needs at this time. However, the occurrences for both of these plants needs updated.

Savage Ravines

Description: This ESA lies entirely within the Savage Ravines Wildland. The attributes of this Wildland/ESA are without parallel. There have been more rare species documented from here than any other ESA on SRSF. Eight rare plants, six of which are State-listed as Threatened or Endangered, have been documented from this ESA/Wildland. Eleven rare animals, six of which are State-listed as In Need of Conservation, Threatened or Endangered, have also been found within the area. There is little doubt that other flora and fauna of special interest will be found here in the future. Several patches of old growth and near old growth forest are known. An excellent vernal pool community is present. A site known as Avilton Woods, which is not part of the Wildland, joins the northern edge of this site and is included within the ESA.

Prescription: A major management issue is the continued unauthorized use of ATVs in significant portions of this ESA/Wildland. A recent effort to address the general issue of ATV use on western State Forests has been undertaken. Hopefully, the issue will be specifically addressed on this area. A nearby proposed industrial wind 'farm' on private land would have a negative impact on the character of this Wildland. The sight of the huge towers and the noise they make would be an insult to all who would visit the area. The acquisition of an adjoining property with frontage along the Savage River known as the Owens tract is extremely important to the ecological integrity of this area. If acquired this property should be included in this ESA if not added to the Wildland. As mentioned above, the recently acquired property to the north known as Avilton Woods (old Westvaco tract) should be added to this ESA and managed with appropriate silvicultural techniques while protecting unique habitat.

Big Savage-Mt. Zion

Description: This ESA lies within the Savage Ravines Wildland. The primary features are habitat for a State-listed salamander and habitat for a State-listed tiger beetle. The salamander is listed as In Need of Conservation and the tiger beetle is listed as Endangered. In addition, a patch of old growth forest has been documented.

Prescription: Unauthorized ATV use occurs within this area, specifically along the powerline. Since the Endangered tiger beetle's habitat is on the powerline, this use needs monitored if it cannot be stopped altogether. An evaluation of the impact of the most recent gypsy moth invasion on the old growth should be undertaken.

Upper Cucumber Hollow

Description: The primary feature of this ESA is an outstanding example of a natural community type known as a sandstone glade. Sandstone glades are quite rare in Garrett County and this is the finest example of such a community on SRSF. Named after its co-discoverer, it is known as Jesse's Glade. The ESA also provides habitat that supports a rare mammal which is State-listed as In Need of Conservation, and provides habitat for a State sensitive reptile.

Prescription: The sandstone glade is scheduled to receive a prescribed burn as part of a larger management prescription in an adjacent gypsy moth ravaged woods.

Cucumber Hollow

Description: The primary feature of this ESA is a stand of old growth forest imbedded within near old growth. Portions of this ESA are structurally complex and as it ages it will someday represent one of the finest old forest tracts on SRSF.

Prescription: In the aftermath of the most recent gypsy moth defoliation event, nearby oak forests received extremely high mortality. The old growth at Cucumber Hollow does contain oaks, but it is more of a mixture of species than the nearby sites that received this mortality. None-the-less, the old growth and near old growth of this ESA should be evaluated to document what impacts this latest gypsy moth event created. During the first wave of gypsy moth in the mid-1980s, the area within this ESA experienced moderate mortality. The overall effect of that event was the creation of some old growth characteristics in the near old growth and younger stands within the ESA. This event appeared to contribute to the overall structural complexity of the area, and from an ecological perspective seemed to have a fortuitously positive outcome. However, for some reasons not easily understood, some stands of old growth on SRSF have been seriously impacted by gypsy moth infestations to the point of near total mortality of the old trees. Proactive spraying with Bt may be necessary in an attempt to protect some of our old growth stands in the face of future gypsy moth infestations.

Russell Road Bog

Description: This ESA features occurrences for two State Endangered plants and a State Endangered butterfly. The most important aspects of this area are on adjacent private land and most of the ESA is off of State Forest. However, one of the Endangered plants, which is considered a prairie relic, occurs on the powerline crossing State Forest. The management to keep the powerline open appears to have fortuitously allowed the continued existence of this

plant. An important component to the life history of the butterfly is also present on the powerline crossing State Forest. Therefore, this section of the powerline should be considered part of the overall habitat for this Endangered species.

Prescription: The conditions responsible for the existence of the Endangered butterfly are the result of past disturbances that may be hard to re-create. A plant required by this species appears to have spread (perhaps from the powerline) and thrived in the aftermath of a past strip mining reclamation effort. The site has been monitored periodically since its discovery and succession appears to be occurring very slowly. Cattle grazing has occurred on and off over the years, possibly assisting in the slowing of succession. At some point in the future it may be necessary to intervene to keep the habitat suitable. The cooperation of the landowner will be necessary. The Endangered plant which is in the actual wetland portion of this ESA is a tenuous occurrence and its status is in need of an update. Whatever the management of the powerline has been seems to foster the continued existence of the other listed plant. However, it would be prudent to keep abreast of the future management techniques employed on this powerline.

Russell Road Pool

Description: This ESA identifies an ecologically significant vernal pool community. Three vernal pool obligate amphibians use the site for breeding habitat. One of these is considered uncommon in the State. A thriving invertebrate community exists, including an excellent occurrence of fairy shrimp. *Glyceria septentrionalis*, a grass that occurs State-wide but is infrequent on SRSF also occurs here. In the mountainous region of Maryland, this grass is most associated with vernal pool communities.

Prescription: Management recommendations for the conservation of vernal pools and their amphibian populations are included in a specific section of this plan.

Pine Swamp East/Pine Swamp Pools

Description: The majority of this ESA is on private land, but two important features are separated by Westernport Rd. To the southwest is Pine Swamp, an ecologically significant mountain bog. Portions of the secondary protection boundary are within the borders of State Forest. Two State-listed plants, one Endangered and the other Threatened, have been documented from this bog. A bird State-listed as In Need of Conservation also has been documented. Other uncommon plants occur here and there is an excellent chance of other rare flora and fauna being discovered. It is known as Pine Swamp East to distinguish it from Cranesville Swamp which is also known as Pine Swamp. The other important feature of this ESA is the presence of a series of vernal pools east of Westernport Rd. The two main pools lie just off of State Forest and are two of the most ecologically significant vernal pools discovered in Garrett County. A primary protection zone for these pools includes State Forest land. In other words, a percentage of the amphibian populations that utilize these pools for breeding occur on State Forest. At least seven species of amphibians utilize these pools, including a salamander considered uncommon in the region. A complex aquatic invertebrate community thrives here, as well. A sedge listed as State Threatened also occurs in one of the pools. It is the only known location for this sedge in Garrett County.

Prescription: Both Pine Swamp and the Pine Swamp Pools have been acquisition priorities for quite some time. Even though it makes sense ecologically to include them as one

ESA, Pine Swamp Pools are significant enough to stand alone as an important acquisition. Management recommendations for the conservation of vernal pools and their amphibian populations are included in a specific section of this plan.

Mill Run Rocks

Description: Two small mammals (both shrews) that are State-listed as In Need of Conservation occur on this ESA. Both require special habitat and one in particular has more specialized needs. Significant sections of Mill Run Rocks offer an outstanding example of this specialized habitat. Forested, moss-covered rocks offering a cool micro-habitat are the primary feature of this habitat. A State rare plant also occurs in portions of this habitat. This plant, which is a regional endemic, would be State-listed if it were not for some unresolved taxonomic questions. Finally, a patch of old growth forest has been documented on this ESA.

Prescription: No obvious management issues are known for this ESA at this time. However, it has been a number of years since this site was last visited. It is recommended that field reconnaissance be done soon to evaluate any current issues.

High Rock

Description: High Rock ESA extends into portions of two Wildlands, the High Rock Wildland and the Big Savage Wildland. Most of the attributes of this ESA are associated with the extensive ridge crest sandstone outcrops that occur on Big Savage Mountain. Four State-listed mammals have been documented from this ESA. Two of these are listed as Endangered and two are listed as In Need of Conservation. One of these mammals is declining throughout its range and this ESA provides core habitat to a meta-population within an extensive area on this section of Big Savage Mountain. The over-all decline is not totally understood, but if this species cannot persist within this area it may not have a chance to persist anywhere else in Maryland. In addition, three State rare birds have been recorded breeding within this ESA, and the area supports a population of a State sensitive reptile. Several springs on the northeast facing slope of Big Savage Mountain support occurrences for a State rare troglobitic amphipod that is listed as In Need of Conservation. Furthermore, several stands of old growth and near old growth have been documented. The entire area is destined to evolve into old growth. This ESA is part of an extensive area made up of other ESAs and Wildlands on the south end of Big Savage Mountain that represent an extremely important core area for Forest Interior Dwelling Birds. The rock outcrops on this ESA are significant from a geologic point of view, as well.

Prescription: One issue revolves around an access road to the High Rock fire tower. How this road is managed is an issue that should be taken up by the Interdisciplinary Team. The rock outcrop near the tower was used for climbing by an Outward Bound program for a number of years. In hindsight, the impacts brought to the area from this use were not compatible with the resources there. Future use of this kind should be prohibited. This area is a long-term monitoring site for a State Endangered mammal and should continue as such.

Coleman Hollow/South Savage

Description: The majority of this ESA lies within the South Savage Wildland. Along with supporting populations of several rare species, this area has some of the largest stands of old growth forest documented in Maryland. Two State-listed plants, one Endangered the other

Threatened, are known to occur within the ESA. Other notable species include a very rare land snail, three State-listed mammals, and sites for a State sensitive reptile. One of the mammals is Endangered and declining through-out its range. This area in conjunction with the High Rock ESA and Savage Reservoir Woods ESA represent a meta-population conservation area for this mammal. The site for the Endangered plant represents its only occurrence in Garrett County. It is highly likely that other notable flora and fauna will be documented here with further inventory. See comments regarding Forest Interior Dwelling Birds under High Rock description.

Prescription: The old growth forest stands should be monitored to document the extent of impacts from the recent gypsy moth eruption. Future gypsy moth events may warrant spraying this area with Bt to protect the oldest trees. An access road made for a timber harvest prior to this area being designated a Wildland has enabled several invasive plants to make their way into the site. The extent to which these invasives have made it into the adjacent forest should be evaluated.

Savage Reservoir Woods

Description: This steep, rugged ESA lies within the Big Savage Wildland and supports populations of four State-listed plants. Two of these are listed as Endangered and two are Threatened. Additionally, there are several stands of old growth forest and habitat for a State sensitive reptile. Three of the four rare plants occur here because of the unique geology of the area. There is a band of limestone that outcrops on the slope allowing for plant associations different from most that occur on Big Savage Mountain. The remote and rugged character of this site has resulted in a general lack of inventory work. Because of this, it is expected that other uncommon or rare flora will be found here in the future.

Prescription: Because sections of this area have soil characteristics preferred by many non-native invasive plants it is recommended that this situation be evaluated in the near future. A recent infestation of the gypsy moth may have impacted this area. The ESA should be evaluated for any impacts and recommendations formed for any future eruptions of this moth.

Middle Fork

Description: This ESA is a large watershed-based area with its core as the Middle Fork Wildland. The watershed boundary consists of much private land and represents an ideal protection boundary for the Middle Fork watershed. For the purposes of current State land management, the ESA is the Wildland plus an eastern extension of State forest land not designated as Wildland. The varied topography and slope aspects of this area result in a large number of different forest associations. It represents a core area of forest that will eventually evolve into old growth. There are several pockets of old growth that have already been identified. As a large tract of continuous forest Middle Fork represents excellent Forest Interior Dwelling Bird habitat. In addition, a butterfly listed as State Endangered and a plant listed as State Threatened have been documented from the area. The many small streams and springs support excellent salamander populations with a good diversity of species. This stream system is very important for a State sensitive fish. Finally, the area has habitat important to a State sensitive reptile.

Prescription: A road bulldozed into this area along Waters Run prior to it being designated a Wildland has contributed to some management issues. This road now allows access to an area that was previously very hard to get to. It is an entry-way for ATV use, and the

troublesome weed, Japanese stilt-grass, has spread down this road. An evaluation of the extent of the stilt-grass invasion should be undertaken soon. A private company that charges people to take them on hikes into Middle Fork uses this road as an access. Since the Wildland Regulations prohibit commercial gain from Wildlands, this appears to be a conflict. Unauthorized ATV use occurs in several areas bordering private land, and to varying degrees along Middle Fork itself. An evaluation of the impact of the most recent gypsy moth invasion on the old growth stands should be undertaken. Finally, any private land that borders the State Forest that goes up for sale should be an immediate acquisition priority.

Warrens Grove

Description: This small site represents a forest type not typically seen on SRSF, including a stand of very old beech trees. This site was suggested as a special area by the former forest manager of Savage River, Warren Groves.

Prescription: The site should be visited and the condition of the old beech trees evaluated.

7.5 Prescribed Burning within ESAs

Some mechanical fire line construction may be necessary within an 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 Heritage for recommendation as to type and location of fire lines. Forestry will contact Heritage within 48 hours preceding a prescribed burn on an ESA.

7.6 Use of Herbicides/Pesticides within ESAs

Chemicals may be used in ESAs to control invasive species only after consultation between the Forest Manager and Heritage. This also includes control of invasive animal species, particularly potentially damaging insects, such as the Hemlock woolly adelgid. 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 area is treated. In the latter case, consultations would also include the MDA Forest Pest Specialist. Furthermore, chemicals may be used to maintain or enhance the elements that define the ESA. For example, chemical application to control invading native trees on shale barrens may be permitted to maintain Kate's mountain clover populations and habitat.

7.7 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. All actions necessary to protect, restore or enhance affected ESAs will be considered during the AWP reviews.

7.8 Wildlands

7.8.1 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 Park, Wildlife Management Areas and State Forest lands.

Wildlands at Savage River

There are presently six designated Wildlands within Savage River State Forest: Big Savage Wildland (2,427 acres), Bear Pen Wildland (1,517 acres), Middle Fork Wildland (1,916 acres), High Rock Wildland (650 acres), Savage Ravines Wildlands (2,513 acres), and South Savage Wildland (2,155 acres) (see map I.6). The Wildland boundaries overlap some of the above described ESAs.

7.9 Historic and Archaeological Areas

This category features areas in which historical or archaeological artifacts or sites are known or suspected to exist. There are presently 22 archeological sites and one archeological survey on Savage River State Forest. 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 a site or potential archeological sites as the promotion of access to such sites may not be desirable.

While there are 22 archeological sites in SRSF only a small area within the State Forest has been surveyed for archeological sites. One parcel was surveyed in 1988 (Curry). Small sections within the Savage River State Forest were part of three additional archeological surveys. These were the Wall Survey of the coal region cited above, a statewide survey oriented toward the road system (Wesler et. al., and one local survey (Lee 1967).

Archeological surveys:

Archeological study of the Western Maryland coal region: the prehistoric resources.

Author: Wall, Robert D.

Call Number: GA 9B

Location: Main

Publisher: 1981

Archeological study of the Western Maryland coal region: the historic resources.

Author: Lacoste and Wall.

Call Number: GA 9C

Location: Main

Publisher: 1989

Note: the Maryland Coal Region survey produced a two-volume set, one for historic resources and one for prehistoric resources.

Archeological reconnaissance of Savage River State Forest Parcel.

Author: Curry, Dennis C.

Call Number: GA 18

Location: Main

Publisher: 1988

The M/DOT archeological resources survey. Volume 4: Western Maryland.

Author: Wesler, Kit W. et al.

Call Number: MD 1 Vol. 4

Location: Main

Publisher: 1981

Archeological survey of the Savage II project.

Author: Hanson, Lee H., Jr.

Call Number: GA 11

Location: Main

Publisher: 1967

There are 22 recorded sites in Savage River State Forest, listed in the table below. Most of these sites were recorded as part of the Maryland Coal Region Survey.

| Site Number | SITE NAME | OTHER NAME | SITE TYPE | Cultural Affiliation: | Report No. | OWNER | Form Completed By: | Form Completed Date: |
|-------------|------------|---------------------------------|--|-----------------------|------------|-------|-------------------------------|----------------------|
| 18GA166 | P-1 | | single prehistoric flake | Prehistoric Unknown | GA 9B | DNR | H.M. Dorsey | 4/9/1981 |
| 18GA270 | Wall 29 | Little Bear Creek Trash Midden | historic artifact scatter, possible trash midden | Late 19th?, 20th? | GA 9C | DNR | H.M. Dorsey | 4/9/1981 |
| 18GA271 | Wall 30 | Little Bear Creek Stone Feature | two parallel walls of loose stone | Historic Unknown | GA 9C | DNR | H.M. Dorsey | 4/9/1981 |
| 18GA197 | Field #334 | Old Morgantown Road Site | early to mid-19th century tavern and wagon stand, 19th century farmstead | 19th, Early 20th? | GA 9C | DNR | K. Youngs and K. Leeper (MGS) | 9/24/1980 |
| 18GA176 | Field #312 | Blue Lick Run Mill | grist mill, mill pond, tail race, possibly | Historic Unknown | GA 9C | DNR | K. Youngs (MGS) | 7/29/1980 |

| | | | | | | | | |
|---------|-------------------------------|-------------------------------|---|--|--------------|--------------------|-------------------------------|------------|
| | | | early 19th century | | | | | |
| 18GA274 | Wall 33 | Blue Lick Run Occupation Site | early - late 19th century farmstead, stone-lined well | Early 19th, Late 19th | GA 9C | DNR | H.M. Dorsey | 4/16/1981 |
| 18GA275 | Wall 34 | Blue Lick Run Earthworks | possible mid-late 19th century mill, earthwork and historic artifacts | 19th, 20th? | GA 9C | DNR | H.M. Dorsey | 4/16/1981 |
| 18GA142 | Swamp Road | | late 19th-early 20th century farmstead | Late 19th, Early 20th | GA 9B | DNR | K. LaCoste (MGS) | 11/6/1980 |
| 18GA297 | Dorsey I | | stone foundation and pit, stone piles and stone walls | Historic Unknown | | DNR | H.M. Dorsey | 10/28/1985 |
| 18GA238 | L. Savage R. Stone Foundation | | mid-19th century farmstead, stone foundation | 19th, 20th | GA 9C | DNR | K. LaCoste (MGS) | 10/10/1980 |
| 18GA204 | Field #47 | | mill race and dam | Historic Unknown | GA 9C | | R. David Williams (MGS) | 9/22/1980 |
| 18GA205 | Field #48 | | late 19th - 20th century farmstead, two foundations | Late 19th, 20th | GA 9C | DNR | R. Ervin, R.D. Williams (MGS) | 9/22/1980 |
| 18GA209 | Undetermined | | prehistoric lithics, early to mid-19th century artifact scatter | Prehistoric Unknown, late 18th, Early 19th, 19th | GA 9B, GA 9C | DNR | P. Jehle (MGS) | 9/22/1980 |
| 18GA294 | Wall 52 | | prehistoric lithic scatter | Prehistoric Unknown | GA 9B | DNR | H.M. Dorsey | 8/28/1981 |
| 18GA190 | Governor Thomas Mansion | | mid-late 19th century farmstead | Mid 19th, Late 19th | GA 9C | DNR | K. LaCoste (MGS) | 8/29/1980 |
| 18GA221 | Field #336 | Crab Tree Creek Midden | 19th century trash midden | Historic Unknown | GA 9C | State of Maryland? | K. LaCoste (MGS) | 9/30/1980 |
| 18GA171 | Field #306 | Bond Saw Mill | early 20th century saw mill and lumber camp | Early 20th | GA 9C | DNR | K. Youngs (MGS) | 6/26/1980 |
| 18GA165 | Field #237 | | single prehistoric flake | Prehistoric Unknown | GA 9B | | R.D. Williams (MGS) | 9/18/1980 |

| | | | | | | | | |
|---------|-----------------------|--------------------|--|-----------------------|-------|-----|------------------------------|-----------|
| 18GA193 | Field #330 | Salt Block Road | stone feature, possibly a well, foundation dating to late 19th century | Late 19th? | GA 9C | DNR | K. LaCoste (MGS) | 9/3/1980 |
| 18GA195 | Field #332 | Maynardier Ridge I | mid-late 19th century farmstead | Late 19th, Early 20th | GA 9C | DNR | K. Youngs (MGS) | 9/23/1980 |
| 18GA311 | Savage River | | prehistoric lithic scatter | Prehistoric unknown | | DNR | Dr. Durland L. Shumway (FSU) | 5/18/1999 |
| 18GA312 | Savage Mountain Brown | | historic stone foundation and pits | Historic unknown | | DNR | Maureen Kavanagh (MHT) | 3/7/2000 |

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

Native American Indian sites and burial grounds will not be disturbed. Further, the Maryland Commission on Indian Affairs and the Maryland Historic Trust will be notified upon discovery of additional sites.

CHAPTER 8

Wildlife Habitat - Protection and Management

8.1 Introduction

The rich diversity of wildlife species located within the Savage River State Forest requires the use of a wide array of adaptive and proven management techniques. The objective is to utilize appropriate management to address the ecological needs of this diverse assemblage 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 utilizing these lands.

8.2 INVERTEBRATES

In general, invertebrates have been poorly inventoried, and therefore, little is known about them on the Savage River State Forest. 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 Savage River State Forest, or very near the forest. Approximately 20 of these can be considered uncommon or rare on the forest. Six species documented from, or very near, Savage River 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 groups that have received research attention. A large number of dragonflies and damselflies occur on SRSF, with a number of uncommon or rare species being represented. Status evaluations are an ongoing process for this group and three species that are officially State listed occur on the Forest. One species of tiger beetle that is listed as State Endangered has been documented on SRSF.

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. One species of cave-adapted crustacean, an amphipod, has been documented from the Savage River State Forest. It is currently listed as In Need of Conservation in Maryland. Furthermore, a troglobitic flatworm that is new to science, and has yet to be formally described, was found at the same location as the amphipod. The diversity of other invertebrate groups is expected to be quite high on Savage River 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 Savage River 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.

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, and sandpipers. 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 Savage River State Forest include hawks, owls and occasionally the bald eagle and 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 goshawk is officially listed as Endangered in Maryland. 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 the 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. Savage River 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 requires 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 with a closed canopy are preferred. A mixture of hardwood species provides more bird species diversity, though appropriate habitat structure is the most important factor. A greater diversity of forest interior breeders occurs where streams or wetlands are found within forested tracts. Forest interior species include many of the warblers, vireos, scarlet tanagers, pileated woodpeckers, Acadian flycatchers and whip-poor-wills. Two raptor species, red-shouldered hawks and barred owl, are also considered forest interior breeders. 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 farther north and are typically associated with boreal

habitats. Remnants of these habitats are found in the Savage River State Forest and include bogs, spruce and hemlock forests. The breeding birds of concern are alder flycatcher, olive-sided flycatcher, golden-crowned 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 Savage River State Forest. These include shrews, bats, woodland mice, chipmunks and flying squirrels (see Appendix E). 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. The small-footed bat, a species recently listed as Endangered in Maryland, has been found in ridge-top rock outcrops. Porcupines have been documented in the state forest. Since they are at the southern periphery of their range here, they are considered uncommon, but their numbers appear to be slowly increasing.

8.4 REPTILES

Eighteen species of reptiles may occur in Savage River 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 distributional information. Reptiles use a variety of habitats throughout the forest. Beaver ponds, wetlands and streams are important for turtles 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 rattlesnakes. 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 in areas quite close to SRSF is State listed as Endangered. This secretive snake may be documented from SRSF in the future. Downed logs are a favorite haunt of many snakes and lizards. Only two species of lizard occur in Garrett County and one of these has been documented on SRSF.

8.5 AMPHIBIANS

Twenty-five species of amphibians may occur on the forest or very near to the forest. Amphibians, as a group, are primarily associated with moist environments. These environments do not necessarily have to be permanent bodies of water. Vernal pools and wetlands provide ideal breeding habitats for some species. Springs, seeps, and first order streams provide the appropriate habitat for other 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. The State Endangered hellbender has been documented on a stream system that occurs on SRSF, but this aquatic salamander's population is restricted to sections of the stream that are not on the Forest. The mountain chorus frog, also listed as Endangered in Maryland, has been documented on SRSF, but the species is rapidly declining and may have already disappeared from Garrett

County. Wehrle's salamander is State listed as In Need of Conservation and the Jefferson salamander is considered uncommon in Maryland. Both have been documented on the Forest. A state-wide herpetological atlas project recently begun will help provide additional distributional data on this group. 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 Wehrle's salamander, prefer 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 Savage River 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 Savage River State Forest and will be incorporated into the habitat management units. Deer populations are stable and within carrying capacity on Savage River State Forest and adjacent private properties. The present effects of the gypsy moth defoliation and mortality 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. Savage River State Forest continues to be a favorite destination for deer hunters. In 2009-10 hunting season, 471 deer were reported harvested from Savage River State Forest. This is almost 10% of the total countywide reported harvest. The harvest numbers remained 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 are used 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 to 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 Savage River 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 Savage River State Forest.

Savage River State Forest continues to be a primary destination for grouse hunters in Maryland. Partners like Ruffed Grouse Society and Garrett College have helped Garrett County to maintain

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 SRSF 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 hard mast - 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 Savage River 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 Savage River 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 similar 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 Savage River 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 Savage River 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 Savage River State Forest, the red squirrel is probably locally common within these conifer stands.

8.6.6 Black Bear

Currently, Maryland has a resident, breeding black bear population in Garrett, Allegany, Washington, and Frederick counties. Bears are considered common throughout all of Garrett County and utilize all areas of Savage River State Forest. 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 extent of forestland and variety of age classes, such as that found in Savage River State Forest provides excellent black bear habitat. 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. The annual home range size of female black bears is approximately 13 square miles and the annual home range size of male black bears may range to more than 50 square miles. Black bears are habitat generalists and will generally benefit from most common silvicultural practices.

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).

The Wildlife and Heritage Service along with partners like the Wild Turkey Federation have been working to ensure that Savage River State Forest offers good wild turkey habitat. Probably the greatest limiting factor is that only one percent of the forest is classified as open land. Only 120 acres of the Savage River State Forest is maintained in permanent wildlife openings. An additional 415 acres of utility rights-of-way provide marginal turkey brood habitat. Of course some of this lack of open land 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 prescription intended to maintain healthy oak stands will benefit wild turkeys.

8.6 Coyote

Coyotes are associated with forested and upland or agricultural habitats where they can find abundant prey. Coyotes are known to be one of the most adaptable species and can use almost any habitat type and live in close proximity to human activity and development. Optimum habitat occurs wherever prey species are most abundant. This may include brushy forested areas and the edge habitats where agriculture and forest come together. Although the coyote has no closed season for hunting, populations are high and likely growing throughout western Maryland and on Savage River State Forest.

8.7 UPLAND GAME BIRDS AND MAMMALS

For the purpose of the Savage River State Forest planning effort, the following wildlife species are described 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 Savage River State Forest because 85% of the forest is immature to mature forestland. It is probably locally common adjacent to the open land 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 more popular when habitat conditions were more suitable and populations were higher. There are a few sites on Savage River State Forest where there is potential to do more intensive management for this once popular game species. Most notable are the Margroff Plantation near Accident, the reclaimed strip mine site along Amish Road and the reclaimed dump site along West Shale Road. As planning progresses toward operational plans and specific work plans, more specific habitat alterations are planned for these areas to target early successional habitats for species such as eastern cottontails.

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). It should be considered rare in the forest.

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 Savage River 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 Midwest and northeastern states

(Sanderson, 1987). The breeding range overlaps much of the winter range with Maryland near the southern limit of the breeding range. During the breeding season, woodcock are fairly common in the Appalachian Mountain region of Maryland including Savage River State Forest. Woodcock habitat in Maryland is generally associated with the early stages of forest succession, thickets or open stages of shrubs and small trees adjacent to damp or wet areas. Woodcock prefer areas with little or no vegetation covering the ground (Sanderson, 1977).

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

Some habitat does exist for American woodcock in Savage River 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 concerted effort to improve habitat for the American woodcock in Savage River State Forest. Specific plans and areas will be determined following a GIS exercise to determine best potential sites for implementing habitat alterations to benefit American woodcock. The strategy will be to incorporate Best Management Practices as outlined by AMWI. Areas of Savage River 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 Savage River State Forest. Low populations may exist adjacent to open land habitats or near private agricultural lands adjacent to the forest.

8.8 WATERFOWL

Aquatic habitats located within and surrounding Savage River State Forest, support several species of waterfowl. Open water areas include the Savage River Reservoir, New Germany Lake, and nearby Little Meadows Lake, as well as several swamps. Waterfowl use of these habitats includes 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 Savage River 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.

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

Numerous species of waterfowl use the aquatic habitat of the Savage River State Forest as stopovers or resting areas during migration. Ducks, geese and swans have been observed periodically throughout these habitats.

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

8.9 AQUATIC & SEMI-AQUATIC FURBEARERS

Aquatic & semi-aquatic furbearers on the state forest include beaver, mink, muskrat and river otter. This group, though taxonomically diverse, are commonly dependent upon aquatic habitats. Historical management strategies have centered on 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 the remote sections of Savage River State Forest. They are dependent upon plentiful, constant sources of water with nearby woody vegetation. They quickly modify their environment using rocks, sticks and mud to build dams and protective lodges. Entirely vegetarian, they prefer soft plant foods including grasses, ferns, stems and leaves of aquatic and terrestrial plants. They also eat the bark, twigs and buds of aspen, maple, willow, birch, alder and cherry trees.

8.9.2 Muskrat

Musk rats 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 that can be found in Savage River State Forest. Mink 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 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 Savage River. Studies indicate an individual mink requires approximately three miles of stream and riverbank habitat.

8.9.4 River Otter

The presence of river otters in Garrett and Allegany counties is the result of a reintroduction program that took place throughout the 1990s. River otters are now considered common throughout Garrett County and Savage River State Forest. River otters 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.

8.10 UPLAND FUR BEARERS

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 Savage River State Forest. In spring and summer months, all three species prefer to reside near streams, spring seeps, ponds and edges to seek aquatic prey, but will frequent other areas. Den trees and snags 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 Savage River 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 inholdings (powerline, gas wells, etc.) in Savage River 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 Savage River State Forest provides this type of habitat, 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 forests. It dens in hollow trees or logs, in abandoned animal dens or under large boulders. Fisher populations have been growing throughout the county and can be found throughout Savage River State Forest. Fishers were reintroduced to West Virginia and Pennsylvania and have expanded throughout

western Maryland from these relocations. Trappers from throughout the state travel to Garrett County and Savage River 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 utilizes a variety of habitats including woodlands, marshland, intermittent grassland, and rocky outcrops. It is highly carnivorous and shows a preference for small 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 Savage River State Forest.

8.10.7 Bobcat

Optimal bobcat habitat is woodland interrupted by brushy thickets, old fields and rocky outcrops. Interspersed openings including swamps, bogs, clearcuts and other early successional sites are key components of preferred bobcat habitat. A bobcat population study conducted in 1986-87 by the DNR indicated that this feline will use all habitat types in Savage River State Forest. Sightings have been documented throughout forest.

8.11 Management Objectives and Strategies

The DNR commonly regulates 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; upland species such as eastern cottontail, American woodcock and morning dove; and 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

Objective 1: 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, powerline rights-of-way, and road edges.

Objective 2: Maintain diverse age classes and species across the 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 3: 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 4: 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 1: 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.
- Rotational mowing.
- 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 2: 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 Habitat Management Units

In order to address more specific habitat needs of various wildlife species on Savage River State Forest further planning will be done. Habitat Management Units (HMU) will be delineated to facilitate more specific habitat goals and objectives. Habitat unit plans will address management needs to improve or maintain desired conditions for individual species or groups of species that are targeted within each HMU. A detailed inventory of current habitat conditions and potential management opportunities will need to be completed to prepare more specific habitat recommendations.

Objective 1: Develop area specific wildlife habitat plans for the State Forest to guide management and showcase wildlife best management practices (BMP).

Strategies:

- Complete inventory and analysis of State Forest Compartments and develop ecological habitat management units (HMU).

- Develop HMU specific habitat goals and plans to target desired habitat conditions with specific guidelines for species composition, age class, and permanent wildlife openings.

8.11.4 Recreation Objective

Objective 1: Provide quality access for wildlife dependent 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

See appendix E

8.13 Populations Estimates

See appendix E

8.14 Fisheries Resources within the Savage River State Forest.

8.14.1 Upper Savage River Watershed and Youghiogheny River Watershed streams

The upper Savage River watershed supports a native reproducing brook trout population as evidenced by the presence of multiple year classes of trout. Brook trout abundance generally increases as distance upstream of the Savage River Reservoir increases. Brook trout populations are also found within the Youghiogheny River drainage of the Savage River State Forest. The fish species assemblage found in the upper Savage River and Youghiogheny River watersheds are considered coldwater/coolwater communities (Table 8.14.1).

The upper Savage River watershed upstream of the Savage River Reservoir, is Maryland's only unfragmented brook trout resource, consisting of 16 named streams, and numerous unnamed tributaries, comprising over 120 miles of interconnected streams. These streams and other streams within the Savage River State Forest outside of the Savage River Watershed are presented in the 2006 Brook Trout Management Plan (MD DNR 2006). The Savage River system accounts for 25% of all brook trout stream miles statewide, supports the highest densities statewide, and is located in the mountainous portion of Maryland that is predicted to be least affected by global warming. The majority of stream lengths are on public land (Savage River State Forest), however, the critical headwater portions of most of these

streams are on private lands. Even with the protection of flowing through public lands, many threats have been identified to the long-term viability of the resource. Along the headwater streams on private land, agriculture and timbering are prevalent and stream channelization, increasing housing and farmette development are occurring. Associated impacts with these activities include sedimentation, temperature and flow regime alterations, groundwater disturbance, and loss of flow, etc. In addition, numerous impoundments occur along the Upper Savage section, adversely affecting summer water temperatures. We recorded higher summer water temperatures in the Savage headwaters in three different tributaries, the reverse of what would occur in an unimpacted system. Off-road vehicle (ORV) use has increased dramatically in Maryland in the past two decades. The presence of ORV use is adversely affecting the water quality of the system, and the health of system is in decline (Heft 2007). Because of the unique nature and value of this resource, and the increasing (and accumulating) pressures on the watershed surrounding this resource (particularly the headwater streams), a specific management plan to conserve and restore this resource is needed and is being worked on as outlined in the 2006 Brook Trout Management Plan. State acquisition of private lands in the watershed is an important measure for long-term protection and enhancement of fisheries resources.

Table 8.14.1. A list of common and scientific names, and general occurrence of fish collected in the Savage River in sample stations (1 through 4) upstream of the Savage River Reservoir, 2002 - 2005. Occurrence rated as abundant (A), common (C), scarce (S), or absent (-)

| Common Name | Scientific Name | 1 | 2 | 3 | 4 |
|---------------------|--------------------------------|----|----|----|----|
| Central stoneroller | <i>Campostoma anomalum</i> | A | A | A | A |
| Rosyside dace | <i>Clinostomus funduloides</i> | C | C | C | C |
| Cutlips minnow | <i>Exoglossum maxillingua</i> | S | S | S | S |
| Common shiner | <i>Luxilus cornutus</i> | - | - | S | S |
| River chub | <i>Nocomis micropogon</i> | S | - | C | C |
| Blacknose dace | <i>Rhinichthys atratulus</i> | A | A | A | A |
| Longnose dace | <i>Rhinichthys cataractae</i> | A | A | A | A |
| Creek chub | <i>Semotilus atromaculatus</i> | C | C | - | C |
| White sucker | <i>Catostomus commersoni</i> | C | A | A | A |
| Northern hog sucker | <i>Hypentelium nigricans</i> | - | - | C | C |
| Yellow bullhead | <i>Ameiurus natalis</i> | - | - | S | - |
| Margined madtom | <i>Noturus insignis</i> | - | - | S | S |
| Rainbow trout | <i>Oncorhynchus mykiss</i> | S | C | C | C |
| Brown trout | <i>Salmo trutta</i> | S | S | S | S |
| Brook trout | <i>Salvelinus fontinalis</i> | C | C | C | S |
| Potomac sculpin | <i>Cottus girardi</i> | C | C | C | C |
| Blue Ridge sculpin | <i>Cottus caeruleomentum</i> | A | A | A | A |
| Rock bass | <i>Ambloplites rupestris</i> | - | - | C | C |
| Pumpkinseed | <i>Lepomis gibbosus</i> | S | - | - | S |
| Smallmouth bass | <i>Micropterus dolomieu</i> | - | - | - | S |
| Fantail darter | <i>Etheostoma flabellare</i> | A | A | A | A |
| Total species = | 21 | 15 | 13 | 18 | 20 |

Management and Monitoring

Brook trout populations have declined across the eastern seaboard, and Maryland populations are no exception. The Savage River watershed above the dam is the last remaining stronghold of well-connected streams with strong brook trout populations. However, even these brook trout populations appear to be slowly declining based on electro fishing surveys, and there is evidence that both numbers and sizes of adults are depressed the closer a site is to a road. The emerging trend of declining populations prompted the MD DNR Fisheries to implement regulations designed to protect brook trout in the Savage River watershed before their populations reach a point of deterministic decline. Recent perceived declines in the brook trout populations inhabiting the Savage River watershed prompted the Fisheries Service of the Maryland Department of Natural Resources to initiate surveys to assess the veracity, extent, and nature of the declines. Because of the surveys, a restrictive regulation was implemented in which only artificial lures could be used to fish for brook trout in waters above the Savage River Reservoir Dam, and brook trout could not be harvested. A long-term assessment program was initiated in 2006 to determine: 1) if the ease of angler access has an influence on brook trout population characteristics; and 2) if the new no kill regulations achieve the Fisheries Service desire to both increase the numbers of adult brook trout and to increase the numbers of large (> 8-10 inches) brook trout. Many brook trout populations appeared to respond to the new regulations with increased numbers of fish exceeding eight inches in the high angler accessibility sections and little or no response in the low angler access sections. Specific fishing regulations are as follows:

Special Regulations for the Upper Savage Brook Trout Management Area:

- A Zero Creel and Possession Limit for Brook Trout has been established in this area. Regulations apply to the mainstem Savage River upstream of Poplar Lick and tributaries, and to all tributaries of the Savage River Reservoir upstream of the Savage River Dam.
- Harvest of brook trout is prohibited. Harvest of brown and rainbow trout is allowed under general statewide regulations.
- Angling can be done only with artificial lures (including artificial flies). Possession of any bait is prohibited.
- Open season: January 1 through December 31, inclusive.

Put and Take Trout Management

A portion of the mainstem Savage River from the Savage River Reservoir upstream to the confluence with Poplar Lick is managed as a special Put and Take Trout Fishing Area, where about 8,500 adult rainbow trout are stocked on an annual basis. The Savage River Reservoir and New Germany Lake also fall under this management scheme, and details of this regulation are contained in the Maryland Sport Fishing Guide.

Brook Trout Passive Integrated Transponder (PIT) Tagging Project

In June 2009, DNR Inland Fisheries, in cooperation with University of Maryland researchers, as well as volunteers from both federal and private organizations, began a large-scale brook trout life history project in the Savage River watershed. Nearly 1000 trout, ranging in size from 4” to over 12” were fin clipped and implanted with individually coded passive integrated transponder (PIT) tags in order to study their movements, growth rates, mortality rates, and other important life history traits. The tagged fish will be tracked periodically, using both stationary antennas as well as portable tag readers linked to data recorders.



Physical habitat metrics are also being collected along each of the ninety 50-meter sample segments. Variables such as woody debris counts, pool quality and type, epifaunal habitat and over-all instream habitat, among others are being recorded. Using Excel and GIS computer programs, these values will be used to relate fish densities to the available habitat in order to help better determine exactly what types of habitats are needed for strong brook trout populations.

This study is being conducted on the largest interconnected watershed in Maryland. The Savage River watershed consists of 12 named streams that are fully connected, with no barriers. The resident brook trout in these streams can move easily from one waterway to another and providing an opportunity to study the species in wide ranging habitat and also providing insights for future management and protection of brook trout in Maryland. The project is set to continue for a minimum of five years. Once completed, this will be one of the largest in-stream tagging projects to take place on the east coast and will yield invaluable information about one of Maryland's most prized game fish.

8.14.2 Savage River Reservoir

The Savage River Reservoir is an oligotrophic 142-hectare (350 acre), maximum depth of 46 meters (150 ft) impoundment on the Savage River located in Garrett County, Maryland. The watershed upstream of the dam is about 105 square miles, mostly within the Savage River State

Forest. The Savage River Reservoir, operated by the Upper Potomac River Commission, was completed in 1952 for flood control and domestic water supply. The Savage River Reservoir is a popular fishing destination, and public access is allowed around the entire shoreline. Public boat launches are located at Big Run State Park, Dry Run, and near the dam breast. Boats are limited to electric motors. The Savage River Reservoir supports at least seventeen fish species including diverse warmwater, coolwater, and coldwater fish species (Table 8.14.2). Warmwater game fish and panfish are managed under Maryland’s statewide regulations and trout are managed under Put and Take regulations as described in the 2010 Maryland Freshwater Sportfishing Guide (MD DNR 2010). The lake was completely drained in the winter of 2009 – 2010, in order to complete necessary dam repairs (MD DNR 2010). However, many of the fish species re-colonized or were re-stocked into the reservoir during 2010. Fish population monitoring will occur on an annual basis

Table 8.14.2. A list of common names, scientific names, occurrence estimates of seventeen fish species collected in Savage River Reservoir, 2009. Occurrence rated as abundant (A), common (C), or scarce (S)

| Common name | Scientific name | Occurrence |
|--------------------|--------------------------------|------------|
| Golden shiner | <i>Notemigonus crysoleucas</i> | S |
| Swallowtail shiner | <i>Notropis procne</i> | A |
| Bluntnose minnow | <i>Pimephales notatus</i> | S |
| White sucker | <i>Catostomus commersoni</i> | C |
| Yellow bullhead | <i>Ameiurus natalis</i> | C |
| Rainbow trout | <i>Oncorhynchus mykiss</i> | C |
| Brook trout | <i>Salvelinus fontinalis</i> | S |
| Rock bass | <i>Ambloplites rupestris</i> | A |
| Redbreast sunfish | <i>Lepomis auritus</i> | S |
| Green sunfish | <i>Lepomis cyanellus</i> | S |
| Pumpkinseed | <i>Lepomis gibbosus</i> | C |
| Bluegill | <i>Lepomis macrochirus</i> | A |
| Smallmouth bass | <i>Micropterus dolomieu</i> | C |
| Largemouth bass | <i>Micropterus salmoides</i> | A |
| Black crappie | <i>Pomoxis nigromaculatus</i> | C |
| Yellow perch | <i>Perca flavescens</i> | A |
| Walleye | <i>Sander vitreus</i> | S |
| Total species = 17 | | |

8.14.3 The Savage River Tailwater

The Savage River Tailwater (SRT) is a 7.9 km stream reach of the Savage River between the Savage River Dam and its confluence with the North Branch Potomac River (NBPR). The Savage River Tailwater supports at least eight fish species (Table 8.14.3). The SRT was managed entirely as a put and take trout fishery prior to 1987. After the completion of Jennings Randolph Reservoir on the NBPR upstream of the mouth of the Savage River in 1982, the United States Army Corps of Engineers (USACE), operators of both reservoirs, coordinated flow

management from the Savage Reservoir closely with that of Jennings Randolph Dam. The result was more flexibility in the management of the Savage River Dam, and increased potential for wild trout management downstream. By 1986, the USACE had begun to implement flow and lake level management recommendations from the MD DNR Inland Fisheries Service designed to enhance coldwater fisheries management downstream of the Savage River Dam. The SRT is regulated under Trophy Trout regulations implemented in January 1987 and further modified in 1991. The current regulation strategy includes a Fly-fishing Only Trophy Trout Management Area located in the section of the river from the Savage River Reservoir downstream approximately 2.1 km to the Allegany Bridge. A Trophy Trout Management Area, restricted to the use of single hook artificial lures or flies, is located between the Allegany Bridge and the mouth of the river, a distance of approximately 4.4 km. Regulations for both Trophy Trout Management Areas include a year-round open season, a 305 mm minimum size limit for brook trout *Salvelinus fontinalis*, a 457 mm minimum size limit for brown trout *Salmo trutta*, and a two-trout daily creel limit. There is no minimum size limit on rainbow trout *Oncorhynchus mykiss* in either area. The stocking of hatchery trout in the SRT was discontinued after 1990. Today the Savage River Tailwater area is arguably one of the premier wild trout fisheries in the Eastern US (MD DNR 2010).

Table 8.14.3. A list of common and scientific names and general occurrence of fish species collected in the Savage River Tailwater, 2009.

| Common Name | Scientific Name | General Occurrence |
|--------------------|-------------------------------|---------------------------|
| Blacknose dace | <i>Rhinichthys atratulus</i> | Common |
| Longnose dace | <i>Rhinichthys cataractae</i> | Common |
| White sucker | <i>Catostomus commersoni</i> | Common |
| Rainbow trout | <i>Oncorhynchus mykiss</i> | Scarce |
| Brown trout | <i>Salmo trutta</i> | Abundant |
| Brook trout | <i>Salvelinus fontinalis</i> | Abundant |
| Potomac sculpin | <i>Cottus girardi</i> | Common |
| Blue Ridge sculpin | <i>Cottus caeruleomentum</i> | Abundant |

CHAPTER 9

Public Use & Education

9.1 Background

Savage River State Forest is an integral component of a larger greenway system that connects other public and private forest and state parks. These sites, in addition to their natural, cultural and historic values, provide a variety of recreational opportunities. Decisions affecting public uses (recreational opportunities) on Savage River 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.”* In addition, recreational opportunities will complement those that are provided within Big Run and New Germany State Parks.

9.2 Current and Future Public Uses

The demand, both nationwide and locally, indicate that outdoor recreational activities such as 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 Savage River State Forest include activities such as hunting, trapping, fishing, hiking, birding, nature/wildlife observation, environmental education, and access for canoeing and kayaking. In select cases, minimal development may be undertaken to provide and maintain, mountain bike trails, hiking trails, horseback riding trails and disabled hunter access trails.

9.2.1 Hunting, Trapping and Fishing

Hunting has traditionally been the most common form of outdoor recreation on Savage River State Forest, which continues to be one of the most used public lands for both local and visiting hunters. White-tailed deer is the most popular species hunted on Savage River State Forest 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.

It is anticipated that the demand for hunting forest game will continue and likely escalate 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.

Wildlife populations must be managed to ensure a healthy forest. Therefore, public hunting opportunities will be provided for public enjoyment, while at the same time limiting population growth of some game species and ensuring the protection of the forest and other habitat areas. This plan attempts to identify the proper combination of hunting along with other appropriate recreational use. The forest is open to hunting and fishing in season. Because 96% of the forest is classified as forestland, the forest game group of wildlife species is common throughout the forest. Trapping on portions of the Savage River State Forest 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. Small populations of eastern cottontail rabbit, bobwhite quail, 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. Open waters include the Savage River and Savage River Reservoir, its tributaries, and several swamps/bogs. 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 hunting seasons. Target shooting is prohibited except at the rifle range. All game birds and game mammals with open seasons may be hunted. Tree stands or blinds 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.

A rifle range, located on New Germany Road, provides opportunity to target practice and for sighting in firearms prior to the hunting season.

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

Although hunting is the most popular activity, there is an extensive forest road system on the Savage River State Forest that offers ample opportunities for hiking, biking, horseback riding and nature observation. These activities will be encouraged on existing roadways provided there are no other user conflicts.

9.2.3 Savage River State Forest Trail System

The trail system on Savage River State Forest is part of Maryland's effort to make the state trail system second to none. Trail Grants will be utilized to improve the existing network of trails throughout the Savage River Forest trail system. All new trail system proposals as well as maintenance work will be submitted and reviewed through the Annual Work Plan process.

The following is an inventory of existing trails that may be hiked, biked, or backpacked within Savage River State Forest. The trails that may be accessed by ORV use have a special statement in each description. Also, stated in the description is the length of each trail, degree of difficulty, and brief bit of information about the trail.

Meadow Mountain Trail 12 miles - moderate

Originally created for fire control in the forest, this rocky trail fluctuates in elevation. The 4-mile trail section near I-68, also known as East Shale Road, is open for off-road vehicle (ORV) use. The remaining 8-miles, southwest of New Germany Road, is closed to off-road vehicles, except for snowmobiles. This portion of the trail generally follows the crest of Meadow Mountain and provides an excellent view at the Meadow Mountain Overlook. A spur trail (1.5 miles roundtrip) provides access to the overlook.

Monroe Run Trail 6.4 miles - moderate (one-way)

Crumbling bridge abutments are the only remaining evidence that this scenic trail was formerly a connection road built by the Civilian Conservation Corps (CCC) during the 1930s. There are plenty of chances to cool your feet along this trail, which has frequent stream crossings (no bridges!). This trail ends near the Savage River Reservoir in Big Run State Park. To avoid the uphill trek at the end of the trail, begin your hike at the trailhead on New Germany Road. This trail is open only to hikers.

Negro Mountain Trail 8 miles - difficult

Stream crossings and uneven terrain make this trail challenging for hikers and mountain bikers. Winter sports lovers can enjoy adventurous snowmobiling on this trail.

Big Savage Trail 17 miles - difficult

This popular backpacking trail will lead you through upland forests of oak and hickory, old farmsteads planted in pine and rocky terrain blanketed by wild azalea and rhododendron. At High Rock you will find the remnants of an old fire tower lookout cabin. Before lacing up your hiking boots, please plan ahead. There are few reliable water sources on this trail, so pack plenty of water. This trail is open only to hikers.

Margraff Trails 7.5 miles - moderate

A series of circuit, gravel roads provide less technical hiking and mountain biking opportunities, while more advanced cyclists can test their skills on the area's abundant and challenging single track trails. With an elevation of 2,800 feet, visitors enjoy splendid views year round. Sections of this trail system are also open for snowmobile use.

Mt. Aetna Tract Trails 7.6 miles - moderate

A detailed pocket guide is available at the forest headquarters for this scenic 700-acre area. Diverse loop trails offer opportunities for bird watching, mountain biking and hiking. A winter of heavy snowfall supports snowshoeing and cross-country skiing activities.

Asa Durst Trails 4.5 miles - moderate

Along the trail you will observe stands of pine and spruce, stream valleys rimmed in rhododendron, and upland hardwood forests that have reclaimed former pastures and farmlands. For those looking to get away from more heavily used trails at New Germany in

the winter, we recommend a visit to this area for a backcountry snowshoe or cross-country ski experience.

Backpacker Loop 24 miles - moderate

Plan a multi-day backpacking trip by connecting a series of trails and forest roads that include designated primitive campsites. The loop begins or ends at New Germany State Park, using Meadow Mountain Trail, Monroe Run Trail, Savage River Road and Poplar Lick Trail. Stop by the forest headquarters to receive a backcountry permit before starting your trip.

Poplar Lick Trail 6 miles - moderate

The foot bed of this trail is a forested dirt/rock road, which begins at New Germany Road and ends at the Savage River Road, is the remainder of a CCC roadway constructed in 1934. Visitors in July are rewarded with rhododendron blooms and colorful wildflowers. The trail has 13 stream crossings, but only five bridges - so be prepared to get your feet wet when hiking. This trail fords Poplar Lick Run which is a native brook trout stream several times. This trail is open only to hikers.

New Germany Trails 10 miles - easy to difficult

Groomed ski trails offer cross-country skiers a chance to experience the forest in the beauty of a Garrett County winter. This picturesque circuit trail system is also popular year-round for hiking and mountain biking.

Camping

There are currently 72 designated primitive campsites within Savage River State Forest. These sites are all spread out around the state forest. The areas with primitive camping include Big Run Road, Savage River Road, Westernport Road (Elk Lick), Blue Lick Road, Poplar Lick Trail, and Whitewater sites just down from Dry Run road. These are designated camping areas but the entire forest is open to backcountry backpacking and camping trips. You must acquire a backcountry pass from the state forest office before heading out on one of these adventures.

9.2.4 Savage River State Forest Off Road Vehicle (ORV) Trail

East Shale Road 4 miles

The four mile trail section (of Meadow Mountain Trail) near I-68, also known as East Shale Road, is open for off-road vehicle (ORV) use.

Poplar Lick Trail 6 miles

This six mile trail was open for off-road use but is now open to only foot traffic.

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.*

9.2.5 Water Access for Canoeing, Kayaking

The Savage River and the Savage River Reservoir offer opportunities for canoeing, kayaking and fishing. For the experienced boater, the river offers white water opportunities in the spring and when water is occasionally released from the reservoir. The reservoir offers flat-water boating for the novice or experienced canoeist. Only boats with electric motors can be used on the reservoir – no gasoline engines are permitted.

9.3 Education and Public Outreach

A Department goal for Savage River State Forest is that, 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, it will be a national model of sustainable forest management. 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 will be very important. This goal will be achieved by:

- The continuation and constant update of the Savage River State Forest website;
- The development of brochures and other written material about the Forest; and
- The provision of tours and other public forums for educating the public about the Forest.

Savage River State Forest Website

The website <http://www.dnr.state.md.us/publiclands/western/savageriverforest.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. Its future value is dependent on the Department's ability to continually update the information.

9.3.1 Educational Material

The Department is considering 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. The Department annually updates its educational trail guide by developing information emphasizing sustainable forest management. The Department should also consider the development of a CD-ROM that contains information about the forest, its resources and the connection to the Bay. This could be a cooperative effort between the Forest Service, the Wildlife and Heritage Service and the Park Service.

9.3.2 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 educate the public about the Department's approach to forest management and the relationship between their use of the forest and forest management. The Department will continue to sponsor cooperative research projects as part of the implementation of the Monitoring Plan (see Chapter 10). Possible partners include universities such as Frostburg State University, West Virginia University and the University of Maryland – Appalachian Laboratory, private non-profit organizations like the Chesapeake Bay Foundation and local community service organizations.

In addition, the Department should involve the Maryland Conservation Corps, local school groups, scouting organizations and local environmental groups in the implementation of projects identified in the Annual Work Plan (AWP).

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 Savage River State Forest interdisciplinary team and the Savage River Advisory Committee and once 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 Monitoring Plan – Chapter 10).

Chapter 10

Savage River State Forest Monitoring Plan

10.1 Introduction

The primary goal of the Savage River State Forest is to provide sustainable natural resources, such as fresh water, fish and wildlife habitat, timber products and to provide education and recreation opportunities while contributing to the environment and local economy. 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. Maryland DNR participates in the National Roundtable for Sustainable Forests 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 Savage River State Forest (SRSF) 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 ten principles, and monitoring data is 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 Savage River State Forest Plan will not be successful unless support continues to be adequate, whether financed by Forest income or other sources.

On Savage River State Forest (SRSF) we have begun to implement stand level data collection and analysis 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 Savage River State Forest Project using a multi-tiered approach:

- Tier I: a landscape-scale inventory
- Tier II: a stand/compartments-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 staffing units. 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, allowing 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 Savage River State Forest's 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 height of canopy layers, species, diversity, and presence of invasive species;
- 3) Wildlife and habitat information, habitat features like snags, woody debris, stand size class, percent canopy, and vertical diversity; and
- 4) Water quality surveys of nutrient status, macro invertebrate 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, 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 have been 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 Savage River State Forest included stakeholder satisfaction with results. Existing processes, including public review of annual work plans, interdisciplinary team for management review, and the Citizens Advisory Committee, all provide outlets for expression of stakeholder views. Information is provided on the DNR website, <http://www.dnr.state.md.us/publiclands/western/savageriverforest.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 the geomorphic region and the stream network, while terrestrial sampling uses strata based on forest type and habitat for sensitive resources (Table 10.3.2.1). 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 Savage River State Forest GIS system.

Table 10.3.2.1: Strata for Long-term Monitoring on Savage River State Forest

| Stream and Water Quality Sampling | | Terrestrial Vegetation and Species Sampling | |
|--|----------------------------|--|---|
| <i>Geomorphic Region</i> | <i>Stream Location</i> | <i>Forest Composition</i> | <i>Sensitive Resources</i> |
| Surficial Confined | Originates in State Forest | Pine | Owls |
| Fine-grained Lowland | Passes through SRSF | Upland Hardwood | Forest Interior Dwelling Species & High Conservation Value Forest |
| Well-drained Upland | Passes through SRSF | Bottomland Hardwood | Ecologically Significant Areas & High Conservation Value Forest |
| Poorly Drained Upland | | Mixed Pine-Hardwood | Riparian/Wetland Areas, |
| Poorly Drained Lowland | | | |

10.3.3 Terrestrial Vegetation and Species Sampling

Vegetation structure and composition will be quantified using methods and protocol from Silvah-Oak. Plots are systematically sampled from a random grid overlaying the management unit. In addition, percent ground cover, tree regeneration, coarse woody debris, forest health indicators, and data for invasive species, shrubs, and herbaceous plants will be collected. Data summaries for forest overstory include tree volume, number of trees, 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 for additional data collection 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 SRSF parcel. These stream sampling points are re-randomized for each sampling event (at least every five 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 (°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 NO³, NO², NH⁴) and dissolved inorganic phosphorus (mg P/L PO⁴). All analyses are conducted in accordance with US EPA protocols.

Aquatic benthic macro invertebrates are collected using methods developed for mid-Atlantic 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 macro invertebrate stations. Summary measures include the Benthic Macro invertebrate Index of Biotic Integrity, Habitat score, and percent of suitable habitat.

10.4 Tier II: Stand/Compartment-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 compartments 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 occur 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 Savage River State Forest include: red pine, white pine and Norway spruce plantations. Overstory and regeneration will be monitored to determine that these less abundant pine types 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: hemlock stands, old growth and nearly old growth forests, and other High Conservation Value Forests.

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 macro invertebrate 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; and
- 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). 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 Savage River 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 three 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, streamside management zones (SMZ) & stream crossings, safety BMPs, and Aesthetics.

The harvest area selection process occurs through Interdisciplinary Team and Citizen's Advisory Committee review, based on an Annual Work Plan recommended activity list generated by the forest manager. Stands are selected based on relative density, age, stocking levels and species composition. Consideration is given to size of the area to be harvested and its proximity to stands less than five years of age. Currently, most silvicultural prescriptions in mixed oak stands are being managed to ensure a sustainable oak component. Silvicultural prescriptions may be modified based on the following:

- Presence of rare species, Wetlands of Special State Concern, Threatened and Endangered species (state and federal) (existing database and some field checks);
- Stream buffers (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 or after thinning to control understory vegetation and encourage regeneration of desirable native 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 Heritage staff specialists evaluate selected sites with high potential for rare species for presence and abundance of target species following burn treatment. On the Savage River State Forest, understory burning to enhance 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 is being minimized on Savage River 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. Herbicides are applied according to label

restrictions, with spray buffers around flowing streams or open water. Application is most commonly done by broadcast sprayers mounted on tracked units with backpack application used where spot spraying is the only need. Oak species tend to be more resistant than other hardwoods, such as red maple to commonly used herbicides at reduced rates. While red maple is a native species, the lack of wildfire has allowed their 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. Trials of reduced herbicide rates will be tested on Savage River State Forest.

10.6.4 Mechanical Treatment

Mechanical site preparation is rarely used in Savage River 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. 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 Savage River 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. Five years after the intermediate operation the stand will be re-examined to determine the efficacy of the treatment.

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 Savage River 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.

Habitat Improvement Projects are chosen in areas with great potential to support rare species or natural community types. Maryland Natural Heritage Program 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.

10.6.7 Special Area Projects for Wildlife & Heritage

Portions of Savage River 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. Other projects are periodically proposed to increase game and fisheries habitat, these projects are often done in conjunction with local college and universities.

10.6.8 Public Use and Recreational Activity

Hunting is permitted on Savage River State Forest. For land 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, 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.

Other recreational activities (such as trail use for horseback riding, bird watching, or hiking) are monitored through use agreements outlining terms and conditions of use for organized for-profit groups. 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 Savage River 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).

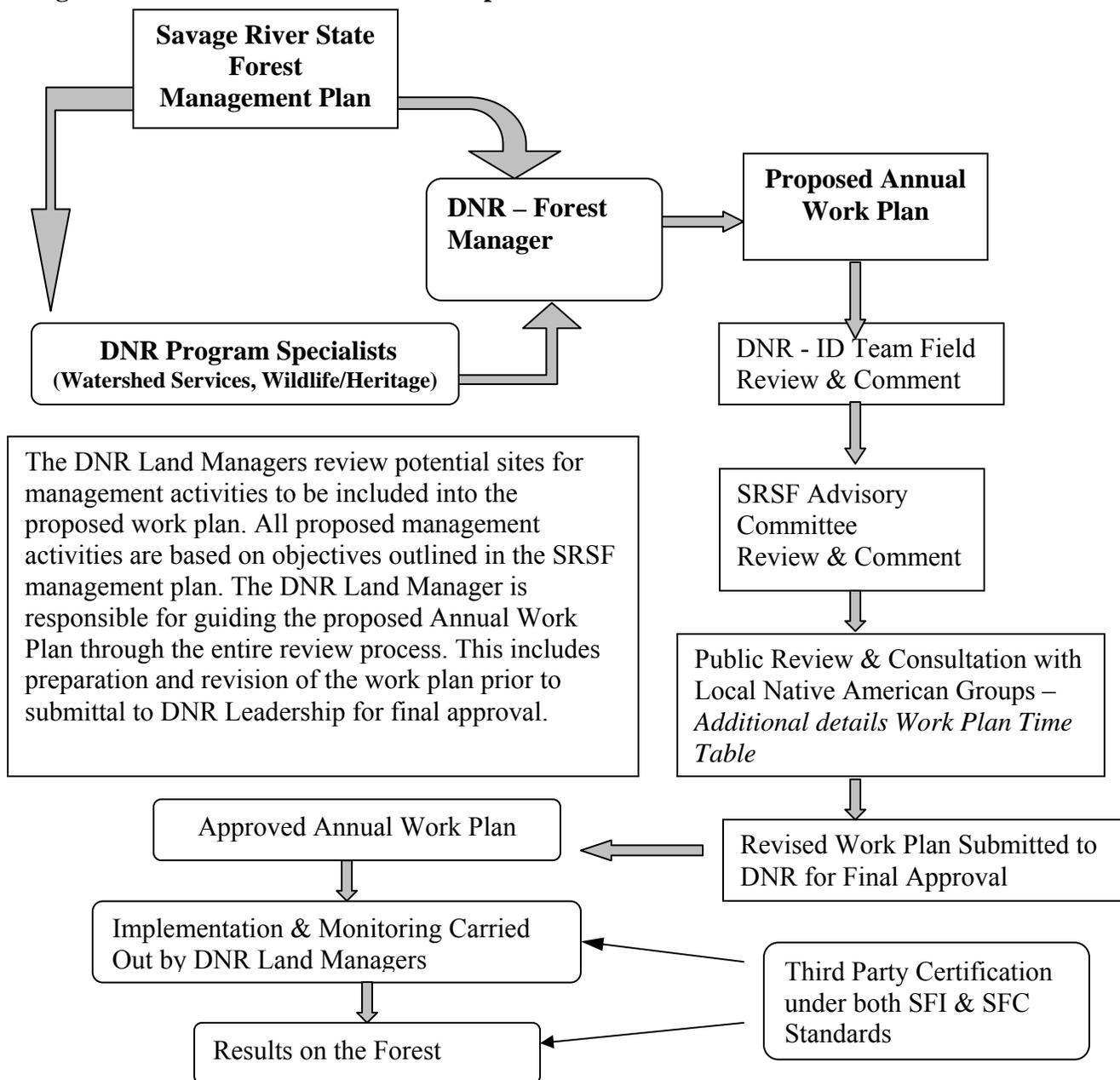
CHAPTER 11

Savage River State Forest 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 Savage River 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 Savage River State Forest. It will be the responsibility of the DNR State Forest Manager to oversee day to day operations on Savage River 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 plan out 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 through surveillance audits each year. 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 Savage River 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 1st.
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 by August 30th.

4. The DNR Land Manager presents the proposed work plan to the Savage River State Forest Citizens Advisory Committee for comment and review by September 30th.
5. AWP is put on the web for Public Review and Comment, process to be completed by December 1.
6. 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.
7. The DNR Land Manager reacts to needed changes and submits a revised plan to DNR Headquarters by January 1st.
8. The DNR obtains final official approval of the Annual Work Plan, as revised, by March 1st.
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 year.

11.3 Contents of the Annual Work Plan will include:

Forest Overview

Includes an overview 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 of 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 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

G. Watershed Improvement Projects

Includes special projects to enhance water quality, wetland restoration, and other such activities.

H. 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 ecosystems.

I. Monitoring Projects

Includes CFI forest inventories, and other inventory projects being conducted on the forest, watershed monitoring, and other such projects.

J. Budget

Includes a proposed budget specific to the forest.

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 Savage River State Forest. It is the Department's intent that most of the revenues generated from the SRSF will be used to pay for the management and operation of the Forest. As stated in Chapter 1 of this plan, "*The primary goal of the Savage River 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.*"

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 on Revenues and Operational costs associated with the Savage River Forest. These figures are only estimates that are based on projected revenues and operational expenses. Yearly changes in the timber markets and weather conditions can severely affect revenues. Operational expenses will vary from year to year, mainly based on costs associated with proposed restoration projects. For many watershed restoration projects other sources of revenues, such as matching grants, will be sought to help offset the cost to the Department.

12.2 Savage River State Forest Revenue

Estimated: \$300,000 to \$400,000

Revenues that are generated from the Savage River Forest are deposited into the Department's Forest Reserve Fund. In order to cover expenses out of this Fund, a Savage River State Forest Budget must be developed a year in advance as part of the larger DNR budget. It 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).

Forest Product Sale Revenue: This revenue is generated from the sale of forest products, which are identified in the Annual Work Plan. Traditional forest products include pulpwood and sawtimber from thinnings and regeneration harvests. This revenue is tied to forest harvest activities identified in the annual work plan and will vary each year.

Miscellaneous revenue sources include: revenue from camping, use of the rifle range, and royalties.

12.3 Operational Cost

Estimated total Annual Expenses: \$565,503

Operational expenses are those costs paid directly out of Savage River State Forest Revenues by the State Forest Manager. These cost are only estimates and will vary each year, some of these cost are tied directly to the amount of revenues generated each year.

13.3.1 Staffing Cost

Estimated: \$350,000

This cost is associated with Departmental contractual staffing and State Personnel classified salaries. This staff is responsible for developing annual work plans, managing the daily activities on the forest, including boundary line work, road and gate repairs, recreational activities such as the public hunting programs and implementing all restoration projects.

12.3.2 Land Operation Cost

Estimated: \$100,726

This includes expenses for office and field equipment, vehicles, gates, 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, pre-commercial thinning and other forest management practices. Some of these costs will vary greatly from year to year based on the activities identified in the Annual Work Plan.

12.3.3 Forest Certification, Inventory & Monitoring Program

Estimated: \$ 5,000

This estimate reflects the annual cost of various on-going research projects on the forest. Expenses are directly tied to the Savage River Forest Monitoring Plan and 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 Savage River 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.

12.3.4 County Payments

Estimated: \$110,000

These are revenue payments to the Garrett County government which will vary every year. Payments are made on an annual basis based on 25% of the timber revenue generated from the forest. These payments are used to help the county offset the loss in property tax revenues which are not paid on state owned lands.

12.4 Other Revenue/Funding Sources

Annual Amounts Vary

Other budgetary funding that is utilized on an annual basis in the management of Savage River Forest comes from a variety of sources. There are General Funds which are state tax revenues provided annually to cover a small portion of the operational budget. Most of these funds are used to pay Savage River Forest staff salaries. At this point, there are four full-time state personnel working on the Savage River Forest, a forest manager, forester, maintenance supervisor, and administrative assistant. Future plans include hiring additional staffing to cover wildlife management activities, restoration projects and additional forestry related activities.

Other funding comes in the form of grants through state and federal sources and primarily is utilized in habitat and watershed restoration projects. These funds are project specific. Some funding will be obtained through partnerships and grants, such as State Highway SAFETEA funds. Expenses include the installation of culverts, removing invasive species and re-establishing native plant communities and habitat. Additional funding comes through submitting applications for trail grants for forest trail maintenance and construction.

12.5 Summary

This is the general breakdown on Revenues and Operational Cost associated with the Savage River State Forest. As described, these figures will vary from year to year. A more detailed picture on revenues and operational cost will be provided within each Annual Work Plan and an annual report prepared by the Land Manager. This generalization of the operating budget suggests the importance of maintaining income levels in order to achieve the goals set forth in the other portions of this plan (i.e. sustainability).

Appendix A

Savage River State Forest - 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 are:

- (a) Wildlife Professional
- (b) Fisherman
- (c) Conservationist
- (d) Timber
- (e) Forestry Professional
- (f) Economic
- (g) Recreation User
- (h) Youth
- (i) Hunting
- (j) Recreation Professional
- (k) Ecologist

Appendix B

FSC – Standards and Principles

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)

2010-2014 STANDARD

Note: This following information is an excerpt from Section 2 of the 2010-2014 SFI Standards. For additional details go to http://www.sfiprogram.org/sustainable_forestry_initiative_standard.php

Principles for Sustainable Forestry

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 forest land bases. They support sustainable forestry practices on forestland they manage, and promote it 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 forest land base, and to protect and maintain long-term forest and soil productivity. In addition, to protect forests for 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 zones and to conform to 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 forests and lands of special significance (ecologically, geologically or culturally important) in a manner that protects their integrity and 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. Avoidance of Controversial Sources including Illegal Logging in Offshore Fiber Sourcing
To avoid wood fiber from illegally logged forests when procuring fiber outside of North America, and to avoid sourcing fiber from countries without effective social laws.

9. Legal Compliance

To comply with applicable federal, provincial, state, and local forestry and related environmental laws, statutes, and regulations.

10. Research

To support advances in sustainable forest management through forestry research, science and technology.

11. Training and Education

To improve the practice of sustainable forestry through training and education programs.

12. Public Involvement

To broaden the practice of sustainable forestry on public lands through community involvement.

13. Transparency

To broaden the understanding of forest certification to the SFI 2010-2014 Standard by documenting certification audits and making the findings publicly available.

14. Continual Improvement

To continually improve the practice of forest management, and to monitor, measure and report performance in achieving the commitment to sustainable forestry.

These SFI principles are further refined in objectives 1-20.

OBJECTIVES FOR SUSTAINABLE FORESTRY

SUMMARY

Some Program Participants own forest land, others own forest land and manufacturing facilities and others own manufacturing facilities only. As such:

- SFI Standard land management objectives 1-7 provide measures for evaluating Program Participants' conformance with the SFI 2010-2014 Standard on forest lands they own or control through long-term leases. Through these objectives, addressed in forest management plans, Program Participants are implementing sustainable forestry principles by employing an array of economically, environmentally and socially sound practices in the conservation of forests – including appropriate protection, growth, harvest and use of those forests – using the best scientific information available.
- SFI Standard fiber sourcing objectives 8-10 provide measures for evaluating Program Participants' conformance with the SFI 2010-2014 Standard through their fiber sourcing programs within the United States and Canada.

- SFI Standard fiber sourcing objectives 11-13 provide measures for evaluating Program Participants' conformance with the SFI 2010-2014 Standard through their fiber sourcing programs outside the United States and Canada.
- SFI Standard land management and fiber sourcing objectives 14-20 provide measures for evaluating all Program Participants' conformance with the SFI 2010-2014 Standard for research, training, legal compliance, public and landowner involvement, management review, and continual improvement.

A summary of SFI 2010-2014 Standard objectives follows:

Objective 1. Forest Management Planning

To broaden the implementation of sustainable forestry by ensuring long-term forest productivity and yield based on the use of the best scientific information available.

Objective 2. Forest Productivity

To ensure long-term forest productivity, carbon storage and conservation of forest resources through prompt reforestation, soil conservation, afforestation and other measures.

Objective 3. Protection and Maintenance of Water Resources

To protect water quality in streams, lakes and other water bodies.

Objective 4. Conservation of Biological Diversity including Forests with Exceptional Conservation Value

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 habitat diversity and the conservation of forest plants and animals, including aquatic species.

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 ecologically, geologically, or culturally important in a manner that takes into account their unique qualities.

Objective 7. Efficient Use of Forest Resources

To promote the efficient use of forest resources.

Objective 8. Landowner Outreach

To broaden the practice of sustainable forestry by forest landowners through fiber sourcing programs.

Objective 9. Use of Qualified Resource and Qualified Logging Professionals

To broaden the practice of sustainable forestry by encouraging forest landowners to utilize the services of forest management and harvesting professionals.

Objective 10. Adherence to Best Management Practices

To broaden the practice of sustainable forestry through the use of best management practices to protect water quality.

Objective 11. Promote Conservation of Biological Diversity, Biodiversity Hotspots and High-Biodiversity Wilderness Areas

To broaden the practice of sustainable forestry by conserving biological diversity, biodiversity hotspots and high-biodiversity wilderness areas.

Objective 12. Avoidance of Controversial Sources including Illegal Logging

To broaden the practice of sustainable forestry by avoidance of illegal logging.

Objective 13. Avoidance of Controversial Sources including Fiber Sourced from Areas without Effective Social Laws

To broaden the practice of sustainable forestry by avoiding controversial sources.

Objective 14. Legal and Regulatory Compliance

Compliance with applicable federal, provincial, state and local laws and regulations.

Objective 15. Forestry Research, Science, and Technology

To support forestry research, science, and technology, upon which sustainable forest management decisions are based.

Objective 16. Training and Education

To improve the implementation of sustainable forestry practices through appropriate training and education programs.

Objective 17. Community Involvement in the Practice of Sustainable Forestry

To broaden the practice of sustainable forestry by encouraging the public and forestry community to participate in the commitment to sustainable forestry, and publicly report progress.

Objective 18. Public Land Management Responsibilities

To support and implement sustainable forest management on public lands.

Objective 19. Communications and Public Reporting

To broaden the practice of sustainable forestry by documenting progress and opportunities for improvement.

Objective 20. Management Review and Continual Improvement

To promote continual improvement in the practice of sustainable forestry, and to monitor, measure, and report performance in achieving the commitment to sustainable forestry.

For additional information on the Sustainable Forestry Initiative go to the homepage at:
<http://www.sfiprogram.org/index.cfm>

Appendix D

Savage River State Forest: Soil Management Groups

This is a forest management grouping designed specifically for the Savage River State Forest plan, based on the soil series descriptions contained in the survey.

SMG 1 - Very Poorly Drained to Poorly Drained Mapping Units with Moderate Limitations Affecting Construction of Haul Roads and Log Landings

Ar, Armagh Silt Loam, 2.2 Acres, <1% of total

BrA, Brinkerton and Andover Silt Loams, 0 to 3 percent slopes, 47 Acres, <1% of total

BrB, Brinkerton and Andover Silt Loams, 3 to 8 percent slopes, 38 Acres, <1% of total

Ls, Lickdale very stony silt loam, 2 Acres, <1% of total

Acreage total of 88.6 Acres, <1% of Total Area

SMG 2 - Very Poorly Drained to Poorly Drained Mapping Units with Severe Limitations Affecting Construction of Haul Roads and Log Landings

An, Alluvial Land, 796 Acres, 1% of total

Ao, Alluvial Land, Very Stony 383 Acres, 1% of total

At, Atkins Silt Loam, 74 Acres, <1% of total

BsC, Brinkerton and Andover Very Stony Silt Loams, 0 to 15 percent slopes, 876 Acres, 2% of total

Acreage total of 2128.9 Acres, 4 % of Total Area

SMG 3 - Somewhat Poorly Drained to Moderately Well Drained Mapping Units with Moderate Limitations Affecting Construction of Haul Roads and Log Landings

AbB, Albrights Silt Loam, 0 to 8 percent slopes, 43 Acres, <1% of total

AbC2, Albrights Silt Loam, 8 to 15 percent slopes, 93 Acres, <1% of total

CoB, Cavode silt loam, 0 to 8 percent slopes, 46 Acres, <1% of total

CoC2, Cavode silt loam, 8 to 15 percent slopes, moderately eroded, 47 Acres, <1% of total

CtB, Cookport channery loam, 0 to 8 percent slopes, 12 Acres, <1% of total

CtC2, Cookport channery loam, 8 to 15 percent slopes, moderately eroded, 1 Acres, <1% of total

CuD, Cookport and Ernest very stony silt loams, 8 to 25 percent slopes, 2795 Acres, 5% of total

ErA, Ernest silt loam, 0 to 3 percent slopes, 13 Acres, <1% of total

ErB, Ernest silt loam, 3 to 8 percent slopes, 108 Acres, <1% of total

ErC2, Ernest silt loam, 8 to 15 percent slopes, moderately eroded, 106 Acres, <1% of total

ErD2, Ernest silt loam, 15 to 30 percent slopes, moderately eroded, 1 Acre, <1% of total

WhB2, Wharton silt loam, 0 to 10 percent slopes, 53 Acres, <1% of total

WhC2, Wharton silt loam, 10 to 20 percent slopes, 27 Acres, <1% of total

Acreage total of 3344.8 Acres, 6% of Total Area

SMG 4 - 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, 903 Acres, 2% of total

CuB, Cookport and Ernest very stony silt loams, 0 to 8 percent slopes, 2804 Acres, 5% of total

Ph, Philo silt loam, 17 Acres, <1% of total

Acreage total of 3723.8 Acres, 7% of Total Area

SMG 5 - Well Drained Mapping Units with Slight to Moderate Limitations Affecting Construction of Haul Roads and Log Landings

CaC2, Calvin-Gilpin-Ungers channery loams, 10 to 20 percent slopes, 188 Acres, <1% of total

CaD2, Calvin-Gilpin-Ungers channery loams, 20 to 35 percent slopes, 257 Acres, <1% of total

CaD3, Calvin-Gilpin-Ungers channery loams, 20 to 35 percent slopes, severely eroded, 96 Acres, <1% of total

CnC2, Calvin, Ungers, and Lehew channery loams, 10 to 20 percent slopes, 1479 Acres, 3% of total

CnD2, Calvin, Ungers, and Lehew channery loams, 20 to 35 percent slopes, 698 Acres, 1% of total

CnD3, Calvin, Ungers, and Lehew channery loams, 20 to 35 percent slopes, severely eroded, 265 Acres, <1% of total

CrB, Clymer channery loam, 0 to 10 percent slopes, 48 Acres, <1% of total

DbB, Dekalb channery loam, 0 to 10 percent slopes, 434 Acres, 1% of total

DbC2, Dekalb channery loam, 10 to 20 percent slopes, moderately eroded, 348 Acres, 1% of total

DbD2, Dekalb channery loam, 20 to 35 percent slopes, moderately eroded, 79 Acres, <1% of total

DgD, Dekalb and Gilpin very stony loams, 15 to 25 percent slopes, 3024 Acres, 6% of total

DID, Dekalb and Leetonia very stony sandy loams, 15 to 25 percent slopes, 1928 Acres, 4% of total

GnB2, Gilpin channery silt loam, 0 to 10 percent slopes, 502 Acres, 1% of total

GnC2, Gilpin channery silt loam, 10 to 20 percent slopes, 976 Acres, 2% of total

GnD2, Gilpin channery silt loam, 20 to 35 percent slopes, 290 Acres, 1% of total

GnD3, Gilpin channery silt loam, 20 to 35 percent slopes, severely eroded, 22 Acres, <1% of total

LaD, Laidig very stony loam, 8 to 25 percent slopes, 197 Acres, <1% of total

McB, Meckesville silt loam, 0 to 8 percent slopes, 50 Acres, < 1% of total

McC2, Meckesville silt loam, 8 to 15 percent slopes, moderately eroded, 72 Acres, < 1% of total

MdD, Meckesville very stony silt loam, 8 to 25 percent slopes, 605 Acres, 1% of total

UcB, Ungers, Calvin, and Lehew channery loams, 0 to 10 percent slopes, 877 Acres, 2% of total

UnB, Ungers-Gilpin-Calvin channery loams, 0 to 10 percent slopes, 114 Acres, <1% of total

VsF, Very stony land, steep, 154 Acres, <1% of total

Acreage total of 12703 Acres, 24% of Total Area

SMG 6 - Well Drained Mapping Units with Severe Limitations Affecting Construction of Haul Roads and Log Landings

CIE, Calvin and Lehew channery loams, 35 to 50 percent slopes, 872 Acres, 2% of total

DcC, Dekalb-Calvin-Lehew very stony loams, 0 to 15 percent slopes, moderately eroded, 870 Acres, 2% of total

DcD, Dekalb-Calvin-Lehew very stony loams, 15 to 25 percent slopes, moderately eroded, 1946 Acres, 4% of total

DgC, Dekalb and Gilpin very stony loams, 0 to 15 percent slopes, 2153 Acres, 4% of total

DIC, Dekalb and Leetonia very stony sandy loams, 0 to 15 percent slopes, 2192 Acres, 4% of total

LaB, Laidig very stony loam, 0 to 8 percent slopes, 28 Acres, <1% of total

MdB, Meckesville very stony silt loam, 0 to 8 percent slopes, 203 Acres, < 1% of total

VsD, Very stony land, rolling, 2730 Acres, 5% of total
Acreage total of 10993.5 Acres, 20% of Total Area

SMG 7 - Soil Mapping Units that are Variable and have no Defined Drainage Class with Moderate Limitations Affecting Construction of Haul Roads and Log Landings

Cv, Cut and Fill Land, 3 Acres, <1% of total
St, Strip Mines and Dumps, 145 Acres, <1% of total
Acreage total of 147.5 Acres, <1% of Total Area

SMG 8 - Soil Mapping Units that are Variable and have no Defined Drainage Class with Severe Limitations Affecting Construction of Haul Roads and Log Landings

Dam, 9 Acres, <1% of total
SrF, Stony Land, Steep, 20433 Acres, 38% of total
Sw, Swamp, 53 Acres, <1% of total
W, Water, 374 Acres, 1% of total
Acreage total of 20868.4 Acres, 39% of Total Area

Table D.1: Map Symbols used in County Soil Survey for Savage River State Forest

| Map Unit Symbol | Soil Name | Acres | Percent |
|------------------------|---|--------------|----------------|
| AbB | Albrights silt loam, 0 to 8 percent slopes | 43 | 0% |
| AbC2 | Albrights silt loam, 8 to 15 percent slopes, moderately eroded | 92.8 | 0% |
| AgC | Albrights very stony silt loam, 0 to 15 percent slopes | 903.4 | 2% |
| An | Alluvial land | 796.1 | 1% |
| Ao | Alluvial land, very stony | 382.6 | 1% |
| Ar | Armagh silt loam | 2.2 | 0% |
| At | Atkins silt loam | 74 | 0% |
| BrA | Brinkerton and Andover silt loams, 0 to 3 percent slopes | 46.8 | 0% |
| BrB | Brinkerton and Andover silt loams, 3 to 8 percent slopes | 38.1 | 0% |
| BsC | Brinkerton and Andover very stony silt loams, 0 to 15 percent slopes | 876.2 | 2% |
| CaC2 | Calvin-Gilpin-Ungers channery loams, 10 to 20 percent slopes | 188.3 | 0% |
| CaD2 | Gilpin-Ungers channery loams, 20 to 35 percent slopes | 257 | 0% |
| CaD3 | Calvin-Gilpin-Ungers channery loams, 20 to 35 percent slopes, severely eroded | 95.6 | 0% |
| CIE | Calvin and Lehew channery loams, 35 to 50 percent slopes | 871.8 | 2% |
| CnC2 | Calvin, Ungers, and Lehew channery loams, 10 to 20 percent slopes | 1479.2 | 3% |
| CnD2 | Calvin, Ungers, and Lehew channery loams, 20 to 35 percent slopes | 698.4 | 1% |
| CnD3 | Calvin, Ungers, and Lehew channery loams, 20 to 35 percent slopes severely eroded | 265.3 | 0% |
| CoB | Cavode silt loam, 0 to 8 percent slopes | 45.5 | 0% |
| CoC2 | Cavode silt loam, 8 to 15 percent slopes, moderately eroded | 47.2 | 0% |
| CrB | Clymer channery loam, 0 to 10 percent slopes | 48.3 | 0% |
| CtB | Cookport channery loam, 0 to 8 percent slopes | 11.9 | 0% |
| CtC2 | Cookport channery loam, 8 to 15 percent slopes, moderately eroded | 0.8 | 0% |
| CuB | Cookport and Ernest very stony silt loams, 0 to 8 percent slopes | 2803.5 | 5% |
| CuD | Cookport and Ernest very stony silt loams, 8 to 25 percent slopes | 2795.4 | 5% |
| Cv | Cut and fill land | 3 | 0% |

| | | | |
|------|---|---------|-----|
| DAM | Dam | 9.3 | 0% |
| DbB | Dekalb channery loam, 0 to 10 percent slopes | 433.5 | 1% |
| DbC2 | Dekalb channery loam, 10 to 20 percent slopes, moderately eroded | 347.6 | 1% |
| DbD2 | Dekalb channery loam, 20 to 35 percent slopes, moderately eroded | 79.1 | 0% |
| DcC | Dekalb-Calvin-Lehew very stony loams, 0 to 15 percent slopes | 870.1 | 2% |
| DcD | Dekalb-Calvin-Lehew very stony loams, 15 to 25 percent slopes | 1946 | 4% |
| DgC | and Gilpin very stony loams, 0 to 15 percent slopes | 2153 | 4% |
| DgD | Dekalb and Gilpin very stony loams, 15 to 25 percent slopes | 3023.7 | 6% |
| DlC | Dekalb and Leetonia very stony sandy loams, 0 to 15 percent slopes | 2192.1 | 4% |
| DlD | Dekalb and Leetonia very stony sandy loams, 15 to 25 percent slopes | 1928.4 | 4% |
| ErA | Ernest silt loam, 0 to 3 percent | 13.1 | 0% |
| ErB | Ernest silt loam, 3 to 8 percent slopes | 107.9 | 0% |
| ErC2 | Ernest silt loam, 8 to 15 percent slopes, moderately eroded | 105.8 | 0% |
| ErD2 | Ernest silt loam, 15 to 30 percent slopes, moderately eroded | 1.1 | 0% |
| GnB2 | Gilpin channery silt loam, 0 to 10 percent slopes | 502 | 1% |
| GnC2 | Gilpin channery silt loam, 10 to 20 percent slopes | 975.9 | 2% |
| GnD2 | Gilpin channery silt loam, 20 to 35 percent slopes | 289.8 | 1% |
| GnD3 | Gilpin channery silt loam, 20 to 35 percent slopes severely eroded | 22.3 | 0% |
| LaB | very stony loam, 0 to 8 percent slopes | 27.7 | 0% |
| LaD | Laidig very stony loam, 8 to 25 percent slopes | 197.1 | 0% |
| Ls | Lickdale very stony silt loam | 1.5 | 0% |
| McB | Meckesville silt loam, 0 to 8 percent slopes | 49.8 | 0% |
| McC2 | Meckesville silt loam, 8 to 15 percent slopes, moderately eroded | 71.5 | 0% |
| MdB | Meckesville very stony silt loam, 0 to 8 percent slopes | 203.3 | 0% |
| MdD | Meckesville very stony silt loam, 8 to 25 percent slopes | 605.2 | 1% |
| Ph | Philo silt loam | 16.9 | 0% |
| SrF | Stony land, steep | 20432.8 | 38% |
| St | Strip mines and dumps | 144.5 | 0% |
| Sw | Swamp | 52.6 | 0% |

| | | | |
|------|---|--------|----|
| UcB | Ungers, Calvin, and Lehigh channery loams, 0 to 10 percent slopes | 877 | 2% |
| UnB | Ungers-Gilpin-Calvin channery loams, 0 to 10 percent slopes | 113.8 | 0% |
| VsD | Very stony land, rolling | 2729.5 | 5% |
| VsF | Very stony land, steep | 154.2 | 0% |
| W | Water | 373.7 | 1% |
| WhB2 | Wharton silt loam, 0 to 10 percent slopes | 52.9 | 0% |
| WhC2 | Wharton silt loam, 10 to 20 percent slopes, | 27.4 | 0% |

Appendix E

State Listed Species of Concern Documented on Savage River State Forest

Plants:

| | |
|---|---|
| Climbing Fumitory, <i>Adlumia fungosa</i> | T |
| Porter's Reedgrass, <i>Calamagrostis porteri</i> | E |
| Wild Calla, <i>Calla palustris</i> | E |
| Long-stalked sedge, <i>Carex pedunculata</i> | E |
| Maple-leaved Goosefoot, <i>Chenopodium gigantospermum</i> | E |
| Standley's goosefoot, <i>Chenopodium standleyanum</i> | E |
| Purple Clematis, <i>Clematis occidentalis</i> | E |
| Yellow Clintonia, <i>Clintonia borealis</i> | T |
| Goldthread, <i>Coptis trifolia</i> | E |
| Bunchberry, <i>Cornus canadensis</i> | E |
| Fraser's Sedge, <i>Cymophyllus fraserianus</i> | E |
| Leatherwood, <i>Dirca palustris</i> | T |
| Stiff Gentian, <i>Gentianella quinquefolia</i> | E |
| Oak Fern, <i>Gymnocarpium dryopteris</i> | E |
| White-fruited Mountainrice, <i>Oryzopsis asperifolia</i> | T |
| Black-fruited Mountainrice, <i>Piptatherum racemosum</i> | T |
| Purple Fringeless Orchid, <i>Platanthera peramoena</i> | T |
| Large Purple Fringed Orchid, <i>Platanthera grandiflora</i> | T |
| Mountain goldenrod, <i>Solidago roanensis</i> | E |
| Rose Twisted-stalk, <i>Streptopus roseus</i> | T |
| American Yew, <i>Taxus canadensis</i> | T |

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

Animals:

Mollusks:

| | |
|--|---|
| Squawfoot, <i>Strophilus undulatus</i> | I |
|--|---|

Crustaceans:

| | |
|--|---|
| Franz's Cave Amphipod, <i>Stygobromus franzi</i> | I |
|--|---|

Insects (Odonata):

| | |
|--|---|
| Superb Jewelwing, <i>Calopteryx amata</i> | I |
| Sable Clubtail, <i>Gomphus rogersi</i> | I |
| Spatterdock Darner, <i>Rhionaeschna mutata</i> | E |

Insects (Coleoptera):

| | |
|--|---|
| Northern Barrens Tiger Beetle, <i>Cicindela patruela</i> | E |
|--|---|

| | |
|--|---|
| Insects (Lepidoptera): | |
| Pepper-and-salt Skipper, <i>Amblyscirtes hegon</i> | I |
| Frosted Elfin, <i>Callophrys irus</i> | E |
| Harris' Checkerspot, <i>Chlosyne harrisii</i> | T |
| Two-spotted Skipper, <i>Euphyes bimacula</i> | E |
| Compton Tortoiseshell, <i>Nymphalis vau-album</i> | E |
| Amphibians: | |
| Wehrle's Salamander, <i>Plethodon wehrlei</i> | I |
| Mountain Chorus Frog, <i>Pseudacris brachyphona</i> | E |
| Birds: | |
| Northern Goshawk, <i>Accipiter gentilis</i> | E |
| Henslow's Sparrow, <i>Ammodramus henslowii</i> | T |
| Blackburnian warbler, <i>Dendroica fusca</i> | T |
| Alder Flycatcher, <i>Empidonax alnorum</i> | I |
| Nashville warbler, <i>Vermivora ruficapilla</i> | I |
| Mammals: | |
| Porcupine, <i>Erethizon dorsatum</i> | I |
| Bobcat, <i>Lynx rufus</i> | I |
| Least Weasel, <i>Mustela nivalis</i> | I |
| Eastern Small-footed Bat, <i>Myotis leibii</i> | E |
| Allegheny Woodrat, <i>Neotoma magister</i> | E |
| Long-tailed Shrew, <i>Sorex dispar</i> | I |
| Smoky Shrew, <i>Sorex fumeus</i> | I |
| Southern Water shrew, <i>Sorex palustris punctulatus</i> | E |
| Appalachian Cottontail, <i>Sylvilagus obscurus</i> | I |

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

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

T = Threatened

E = Endangered

Appendix F

EFFECTIVE: JULY 19, 2005
OPERATION ORDER 2005-601 ANNAPOLIS, MARYLAND

Policy for SFI 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.

Steven W. Koehn, Director / State Forester

Appendix G

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 H

Savage River State Forest – 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 35-60, no activity after thinning for 20 years
 - Northern Hardwood – Age 35-60, no activity after thinning for 20 years
 - Variable Retention Harvest
 - Mixed Oak – Age 80-150 (with or without thinning)
 - Northern Hardwood – Age 80-150 (with or 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 2500 acres per year
 - Total Thin area cannot exceed 2000 acres per year
 - Total Variable Retention area cannot exceed 1500 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 Savage River 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.

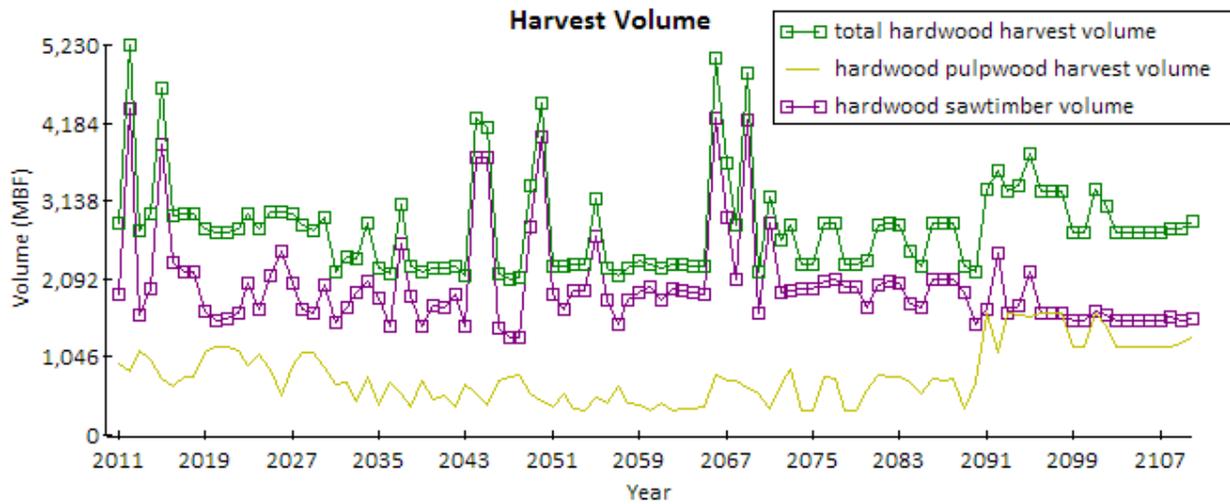


Figure H.1: Estimated Harvest Volume on SRSF based on 100 year projection.

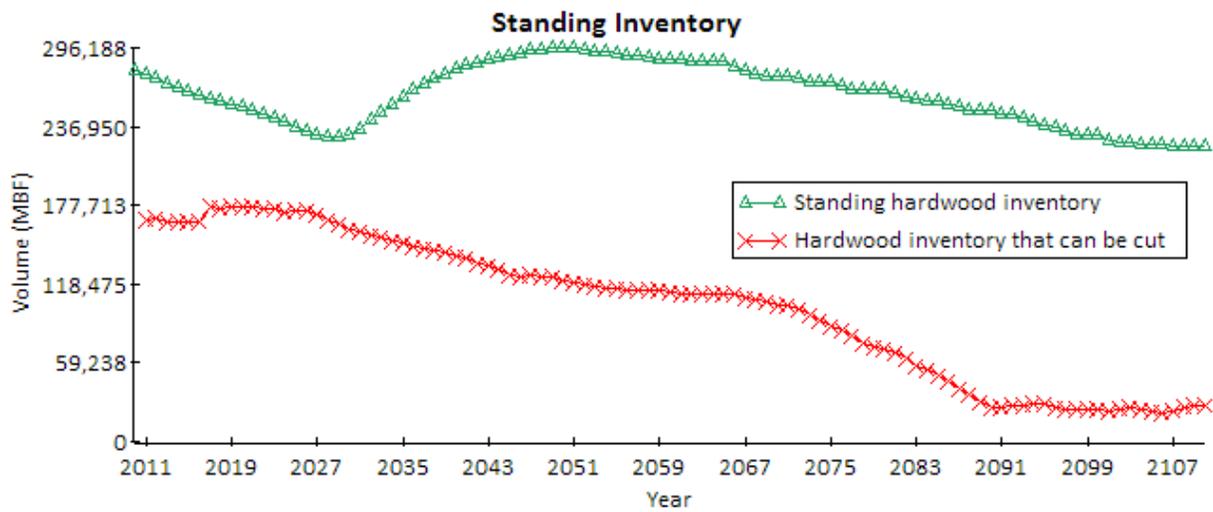


Figure H.2: Standing Inventory on SRSF based on a 100 year projection.



Figure H.3: Size Class Area in Acres on SRSF over 100 year projection.

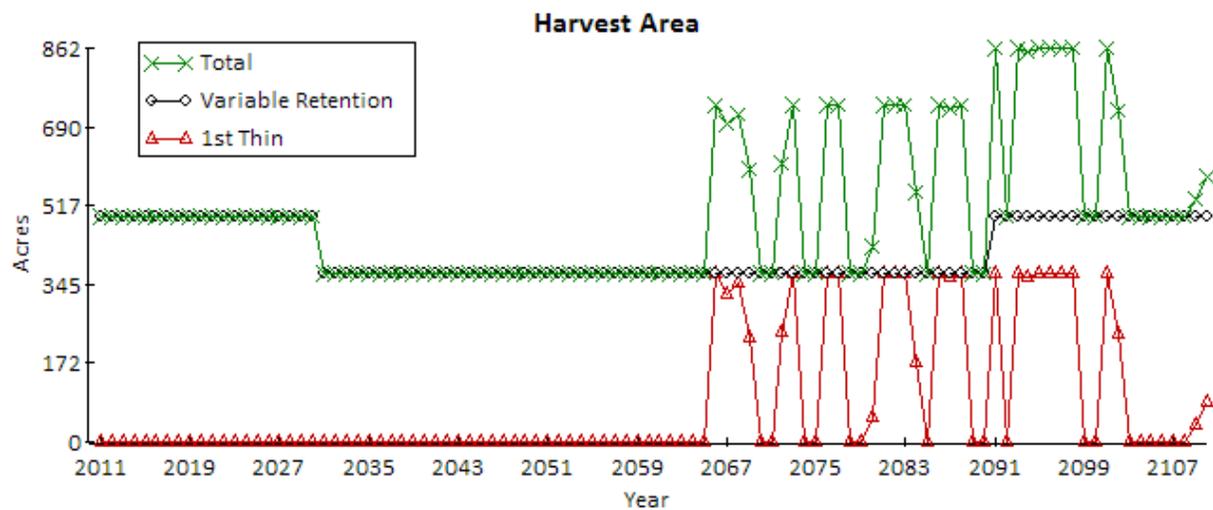


Figure H.4: Estimated Available Harvest Acres for Various Harvest Methods over a 100 year period.

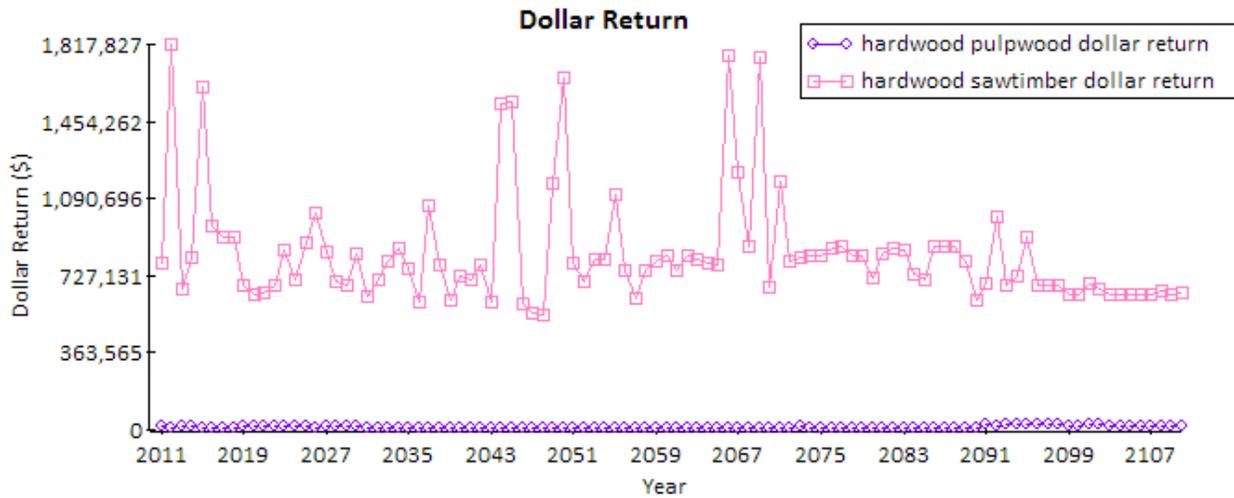


Figure H.5: Estimated Revenue projections from various Harvest Types, 100 year period.

The annual growth rate on the forest based on our continuous forest inventory from 2000 is 12.9 mmBF. The breakdown by forest zones (used at that time) are as follows:

| | |
|----------------------|----------|
| General Zone | 6.5 mmBF |
| Special Zone | 1.4 mmBF |
| Water Influence Zone | 4.1 mmBF |
| Recreation Zone | 0.1 mmBF |
| Wildland Zone | 0.8 mmBF |

The average annual harvest rate in the general zone since 2000 is 2.3 mmBF. The annual harvest rates since 2000 are as follows:

| | |
|------|----------|
| 2001 | 2.7 mmBF |
| 2002 | 2.6 mmBF |
| 2003 | 1.9 mmBF |
| 2004 | 3.6 mmBF |
| 2005 | 3.4 mmBF |
| 2006 | 2.8 mmBF |
| 2007 | 2.6 mmBF |
| 2008 | 1.0 mmBF |
| 2009 | 1.7 mmBF |
| 2010 | 0.8 mmBF |

The target for the next 5 years is not to exceed the annual growth rate in our harvests. In five years we expect the stand level inventory to be completed. At which point a new annual growth rate will be calculated and our harvest target will change.

Appendix I

Savage River State Forest – Tract Maps

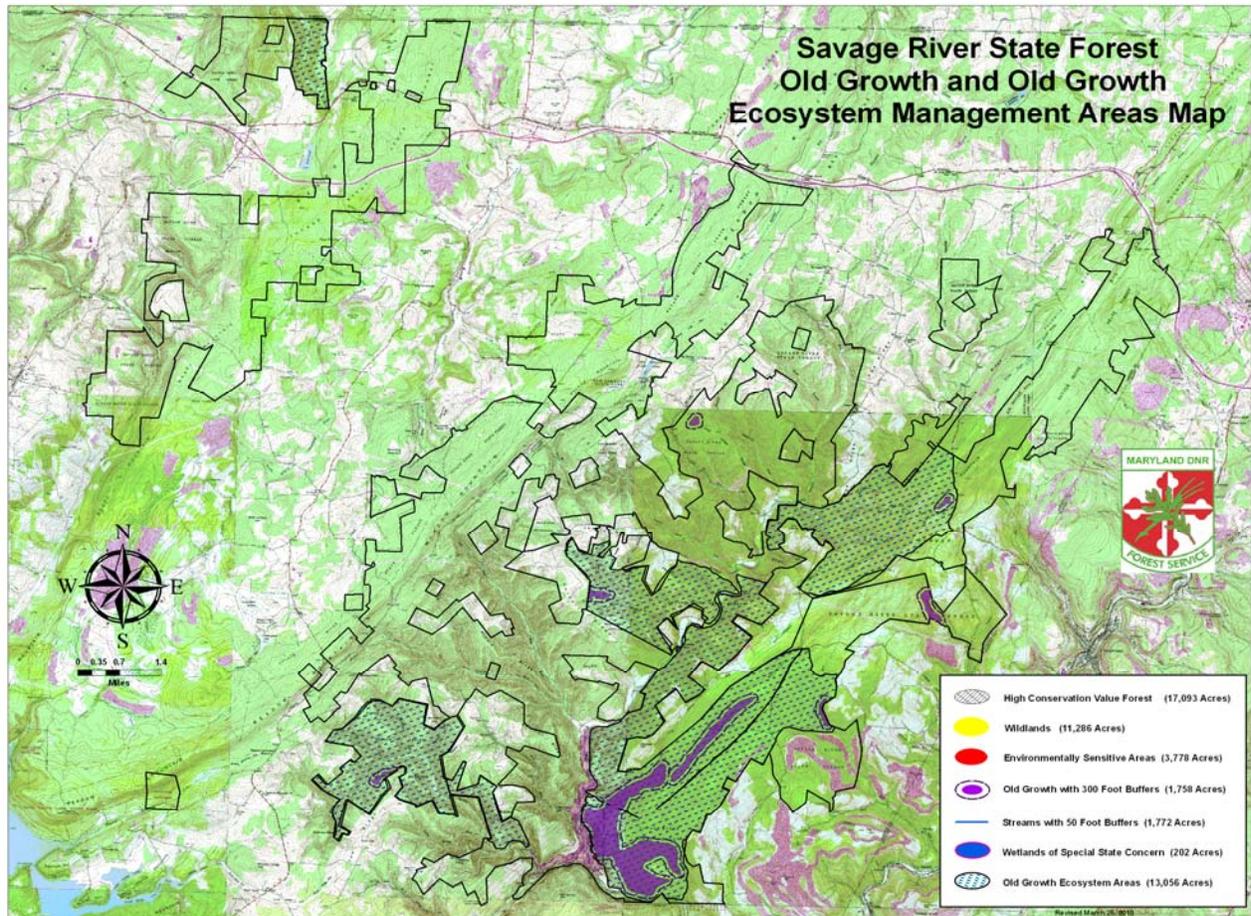


Figure I.1 - Old Growth and Old Growth Ecosystem Management Areas



Figure I.2 – Compartments on Savage River State Forest

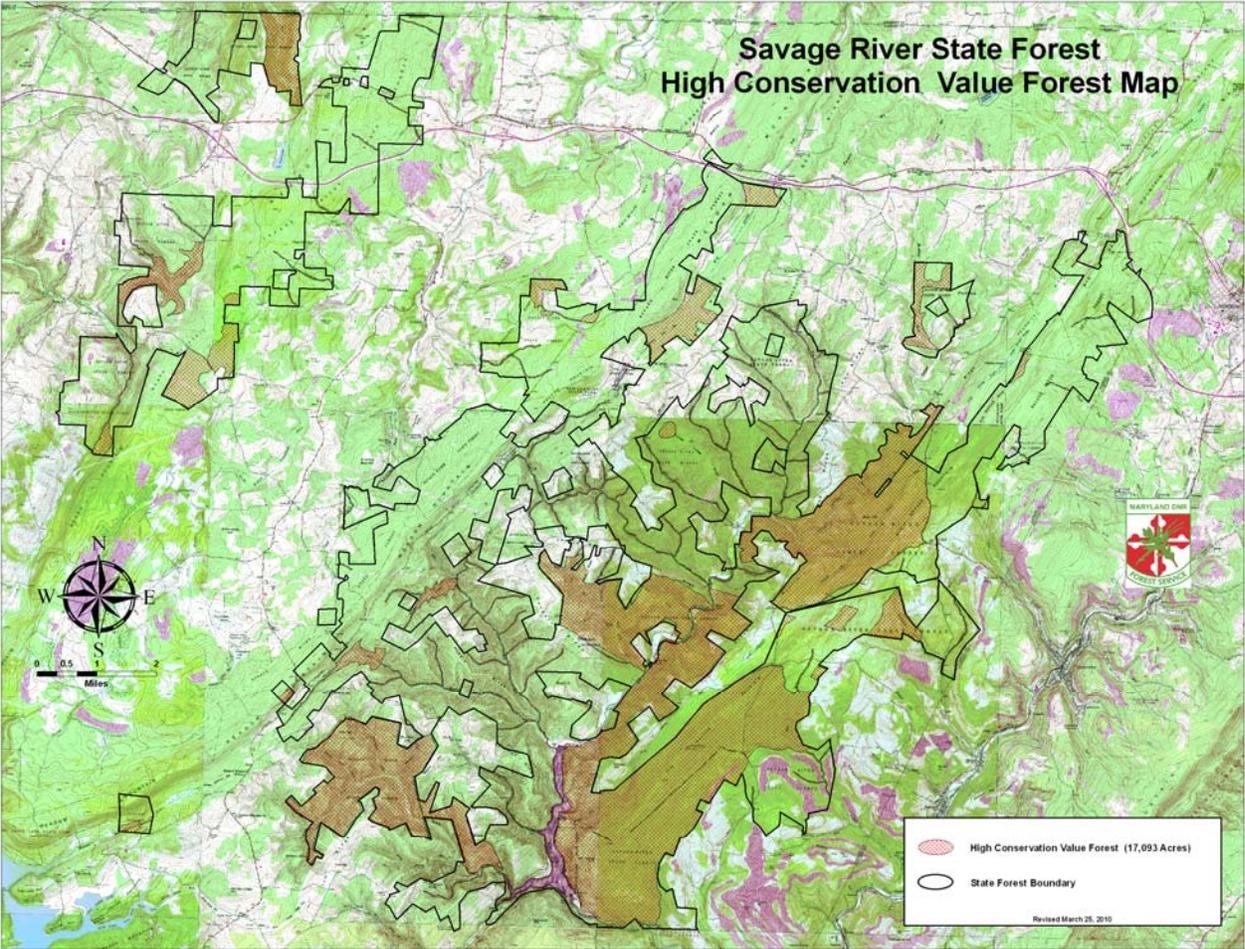


Figure I.3 – High Conservation Value Forests

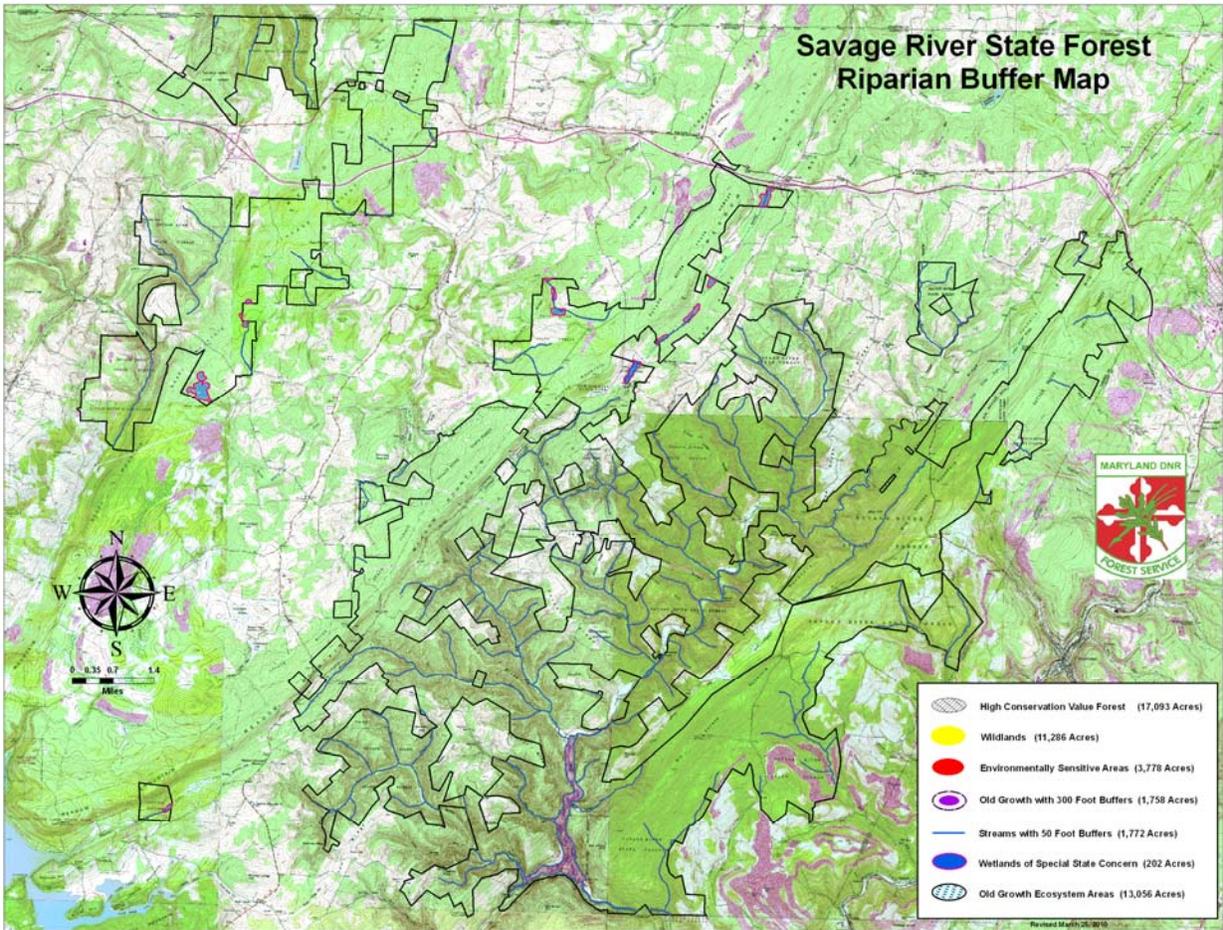


Figure I.4 – Riparian Buffers and Wetlands of Special State Concern

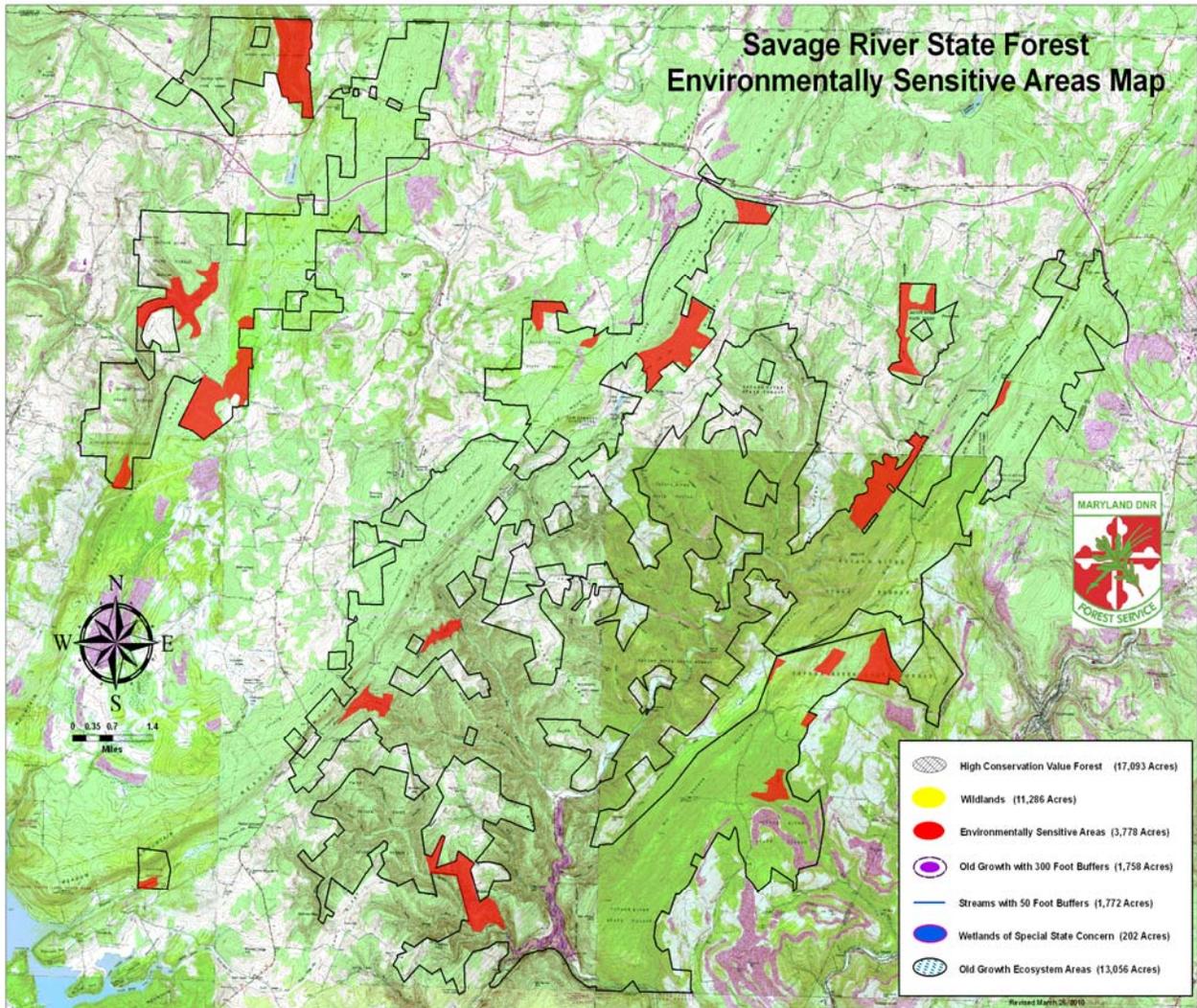


Figure I.5 – Environmentally Sensitive Areas

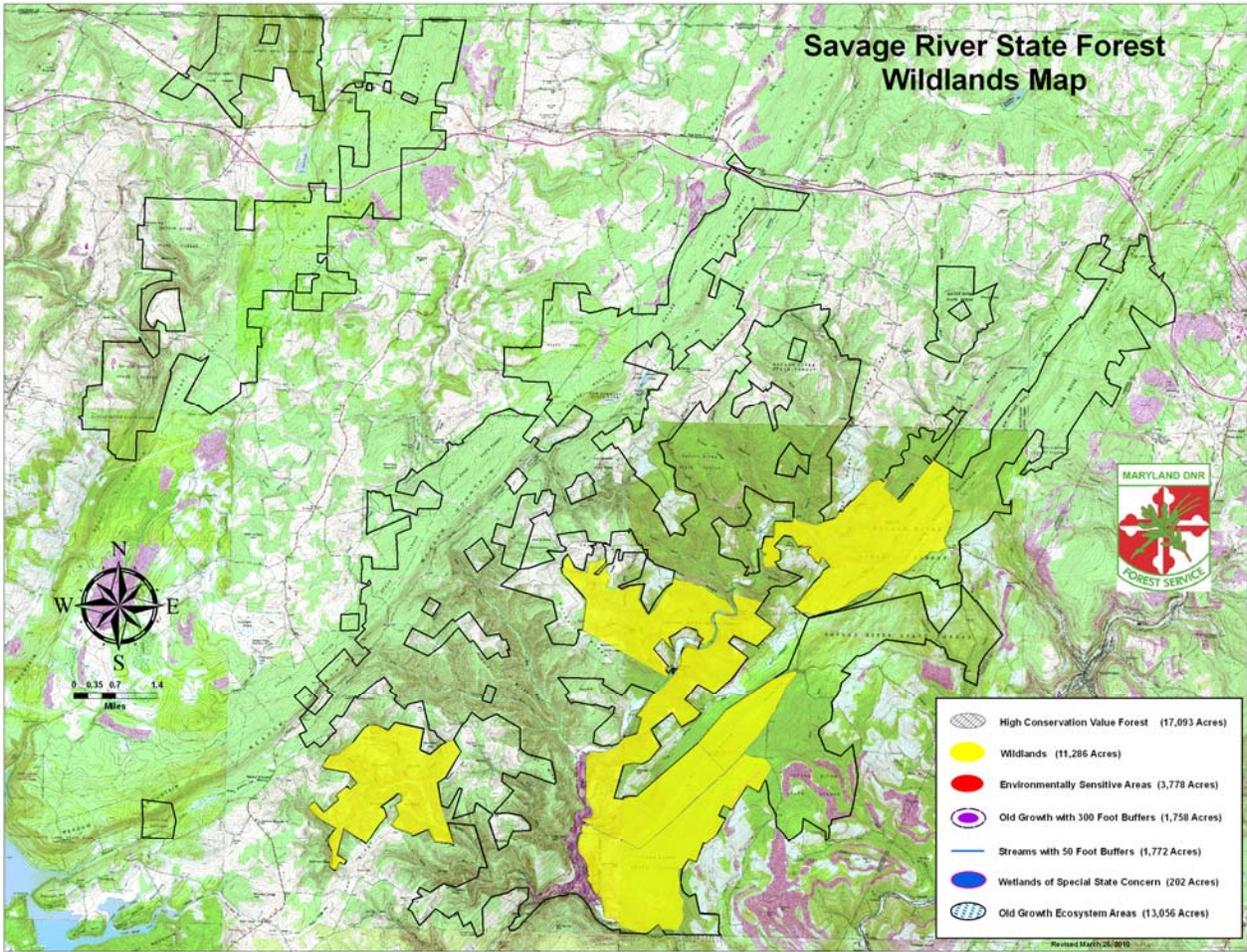


Figure I.6 – Wildlands on Savage River State Forest

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