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)

For the purpose of this Sustainable Forest Management Plan, any reference to High Conservation Value Forest (FSC Principle 9) should also be interpreted to reference Forests with Exceptional Conservation Value (SFI Objective 4).

Each acre of Savage River State Forest is placed in a particular category depending upon the highest and best use for that site given its location and characteristics. 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.* However, 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

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

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 HCVF areas within this forest type that contain sensitive species. Management in these areas will be to protect and/or enhance that protected species. Some prescribed burning applications may be used in these forest types to manage for a particular species, such as 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

General Management areas are those sites not impacted by specific restrictions 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 Heritage Areas, 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 zone 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.

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 freshwater fisheries.

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 is only one small six acre patch 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 data set.
b) Each plan is sufficient to protect the special values identified for each area.

c) Field examination and monitoring reveals that the plan is being implemented properly and that the special values are, in fact, protected or enhanced as the plan indicated.

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 subsequent 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 Forest Harvesting Equipment

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

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

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

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

skidders, high floatation tires or other specialized equipment.

5.9 Chemical Use

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

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

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

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

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

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

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

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

5.10 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).

5.11 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).

5.11.1 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.

5.11.2 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.

5.12 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.

5.13 Forest Modeling

5.13.1 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.

5.13.2 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.

5.13.3 The Forest Planning Model

The Maryland DNR Forest Service and Vision Forestry (the 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 (Chapter 5) must also be 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.

5.14 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.

5.14.1 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.

5.14.2 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.

5.14.3 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.

5.15 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. SRSF is seeking forest management 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.

5.15.1 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. 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.

5.16 Forest Stewardship Council (FSC) – Guidelines & Principles

5.16.1 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.

5.16.2 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.

5.16.3 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) since they 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 should 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 should be encouraged to ensure maximum functions for denitrification, canopy diversity, woody debris, and nutrient uptake. Riparian forests should favor species that have been shown to effectively take up nutrients including: red oak, white oak, red maple, quaking aspen, ash, basswood, yellow poplar, dogwood, and black gum. Diversity in species and forest structure should be encouraged as a strategy to maintain forest function and resilience in the event of a major disturbance or new pest or pathogen. Many pests or pathogens are limited to certain types of species or tree condition, and disturbances, such as windstorms or fire, can affect different species to varying extents.

6.2.2 Vegetation Management

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 should be followed including:

1) Perpendicular alignment to riparian forest to minimize impact,
2) Utilizing temporary stream crossings when possible,
3) Adequate sizing of crossing to avoid affecting flow, 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 should be followed including:

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

6.4 Riparian Forest Buffer Delineation for High Conservation Value Forest

Riparian forest buffer establishment and layout on 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.

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 (see Appendix) 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.

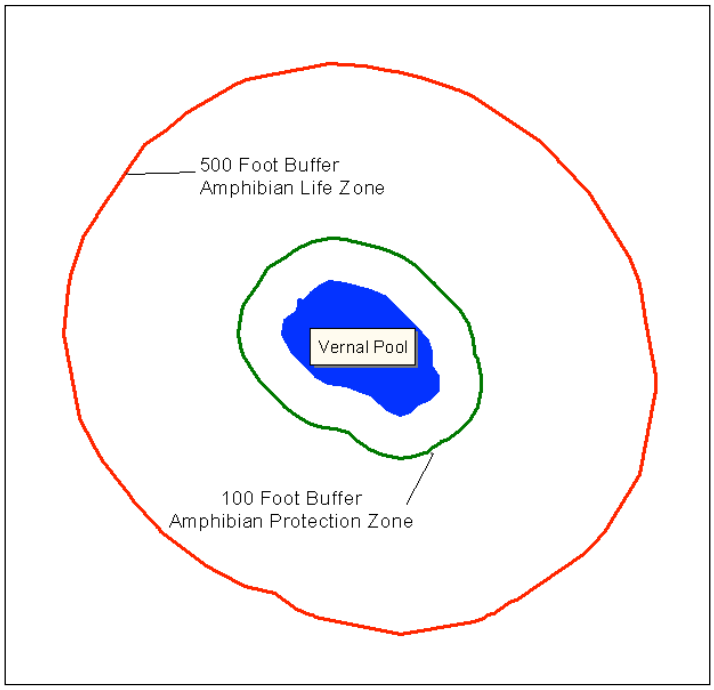


Figure 6.6.1: Amphibian buffer zone around a vernal pool

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.

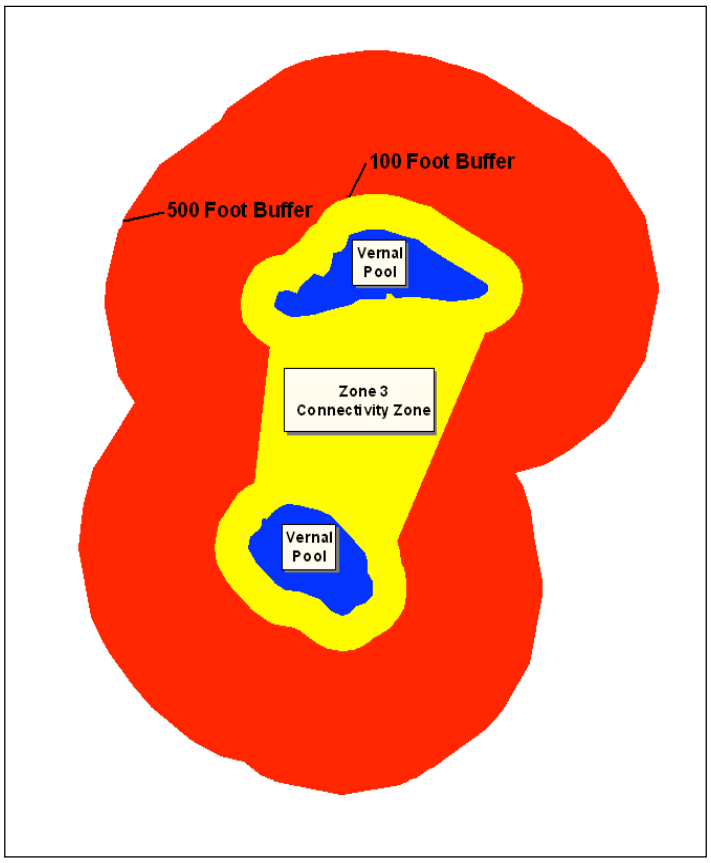


Figure 6.6.2: Vernal Pool connectivity zone for amphibian conservation

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 really encompasses the Zone 1 of each pond and connecting area). An inoperable area should be established between the two ponds that is the width of the diameter of the largest of the ponds.

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 area 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.

7.2.1 Ecologically Significant Areas

Expect updated information from the Heritage Service to correspond to map I.5

Callahan Swamp Secondary Protection Boundary – Compartment 37 – Frostburg 7.5' Quadrangle

General Description – Currently, all of Callahan Swamp is privately owned. From a natural area standpoint this large wetland is a top acquisition priority if the landowners ever wish to sell. This ESA represents a parcel of State Forest that would be included within a secondary protection boundary should this swamp ever become public land.

Mudlick Run ESA – Compartment 40 –Avilton 7.5' Quadrangle

General Description -- This area supports a number of rare plants, several of which are regionally rare and listed under our State Endangered Species Law. Another notable feature is an excellent riparian hemlock-northern hardwood forest along Mudlick Run. Portions of this area's natural setting have been compromised by road building and timber harvest. In particular, the road construction associated with a timber harvest in the northern section of this compartment completely changed the character of that area. This harvest was approved before the ESA concept was recognized in a subsequent management plan. The access road for the Savage River Lodge also has had an impact on this site's natural character. Activities associated with this lodge may have impacts in the future.

Poplar Lick/Wolf Swamp ESA – Compartment 15 & 16 – Avilton 7.5' Quadrangle

General Description – This ESA consists of two areas of an extensive wetland system that is separated by various tracts of private land. The most northern section (part of Wolf Swamp) supports several State-listed plants and animals. The prominent natural communities in this section of this extensive minerotrophic fen include grass/sedge swales interrupted by occasional beaver activity, shrub dominated bog, forested bog, and forested spring seeps.

The southern section, which is the larger of the two sections, is made up of the very southern end of Wolf Swamp, and the headwaters of Poplar Lick Run. A very interesting geomorphic feature known as the Eastern Continental Divide occurs between Wolf Swamp and 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. Open sphagnum bog checkered with shrub thickets, and red spruce/hemlock swamp make up the most significant cover types in the south end of Wolf Swamp. A number of uncommon, rare, and State-listed species occur here. Poplar Lick Run is predominantly hemlock-lined with occasional boggy openings.

Sections of the upland (to the southeast), which includes numerous small streams and springs which drain into Poplar Lick Run, were logged after this area was designated an ESA. The main argument for this logging was that the area was thinned prior to its ESA designation as an attempt to demonstrate uneven-aged management.

Big Laurel Run ESA – Compartment 17 – Grantsville 7.5' Quadrangle

General Description – This area is not included in the ESAs of the current management plan but is being proposed as an addition. This is primarily due to the presence of four species of rare plants that occur there. Two of these are State-listed and a third is proposed to be State-listed.

West Shale Woods – Compartment 17 – Grantsville 7.5' Quadrangle

General Description – This site supports a State-listed plant. Refining boundaries and other information are currently needed for this ESA.

Puzzley Run ESA – Compartment 3 – Grantsville 7.5' Quadrangle

General Description –Puzzley Run represents a relatively large tract of forest that has remained relatively undisturbed for nearly 100 years. Sections of this area are quite rich and support a high diversity of herbaceous flora, several of which are uncommon or rare. Several State-listed plants occur here. Although portions have been called "cove hardwoods", no other cove hardwoods on the State Forest are quite like those at Puzzley Run. This is primarily due to the more varied herbaceous layer here. For whatever reason, sections of this area are prone to severe winds resulting in a number of tree blow-downs. This results in an increased structural diversity that creates characteristics of a much older forest. As Puzzley Run ages, it will offer some of the finest examples of several forest community types, not only on Savage River State Forest, but in all of Maryland. The stream continues to exhibit excellent water quality, but sediment and erosion problems are not entirely absent. Illegal ATV use continues to be a management problem.

Amish Road ESA – Compartment 9 – Grantsville/Accident 7.5' Quadrangles

General Description – Highlights of this area included a high quality stream flowing through a mosaic of boggy openings, hemlock/red spruce swamp, and northern hardwoods. A decidedly northern fauna of bird-life and small mammals occurs here. An excellent natural open bog, known as Flanagan bog, occurs on private land near the upper end of this area, and is a high priority for conservation of acquisition.

Pine Swamp Pools ESA – Compartment 44 – Barton 7.5' Quadrangle

General Description – Currently, this ESA consists of a secondary protection zone for several very significant natural vernal pools. These pools are on adjacent private land and are a high priority for acquisition. Not only do these pools provide habitat for a variety of amphibians (including the Jefferson salamander) and invertebrates, but the organic sediments in these pools are very deep and represent a storehouse for analysis of thousands of years of pollen history.

This is a very valuable scientific resource waiting to be analyzed by someone. The pools are part of the Pine Swamp system, and Pine Swamp itself has been an acquisition priority for years.

Russell Road Pool ESA – Compartment 43 – Barton 7.5' Quadrangle

General Description – The primary feature of this site is a vernal pool that represents an excellent example of this natural community type. Along with wood frogs and spotted salamanders, this pool and surrounding forest support a modest population of Jefferson salamanders. Breeding sites for this salamander are very spotty on the landscape and populations are often quite small.

Upper Cucumber Hollow ESA – Compartment 43 – Barton 7.5' Quadrangle

General Description – The primary feature of this area is an outstanding example of a sandstone glade, a natural community type quite rare in Garrett County. Known as Jesse's Glade, it also provides habitat for a State rare animal. Currently, this is the finest example of this natural community known on SRSF.

Cucumber Hollow ESA – Compartment 43 – Barton 7.5' Quadrangle

General Description – This area features an older section of forest well on its way to becoming old growth. Portions of this ESA are structurally complex and someday will represent one of the finest tracts of old forest on Savage River.

Savage Ravines ESA – Compartments 33, 34, 35 & 36 – Barton 7.5' Quadrangle

General Description -- A large number of rare plants and animals, several of which are State-listed, occur within this relatively large ESA. Several parches of old forest can also be found within this site. Other features include excellent forest interior bird habit, and excellent habitat for creatures that need remote places such as black bears, bobcats, and timber rattlesnakes.

Mill Run ESA – Compartment 45 & 46 – Barton 7.5' Quadrangle

General Description – The primary features of this ESA include several sites for a State listed mammal, the long-tailed shrew. The primary site presents an outstanding example of the type of habitat this secretive mammal prefers. Also, a population of a State rare plant occurs within this ESA.

Big Savage/High Rock Wildland – Compartments 32, 48, 49, 50, 50A, 51, & 52 – Barton & Bittinger 7.5' Quadrangles

General Description – This area is made up of the very first wildland designated on SRSF and the more recently designated High Rock Wildland. Together they form a large tract that someday will become old growth forest. Several exemplary examples of certain natural community types occur within this area. Prime habitat for several State-listed and regionally rare animals is associated with these community types. A number of uncommon and rare plant species are also found within this area. Although Big Savage Wildland predates the formation of

the Natural Heritage Program, the High Rock Wildland was nominated by NHP as an ESA prior to its designation as a wildland. Together, these tracts of land present many excellent characteristics related to biodiversity conservation.

Coleman Hollow/South Savage Slope ESA – Compartment 50A & 51 – Barton & Bittinger 7.5' Quadrangles

General Description – This parcel of land is being nominated for ESA status because of the following characteristics; (1) The presence of patches of old growth forest, some of which are as old (and as extensive) as any so far identified on SRSF. (2) The presence of several State-listed species, including a number of important sites for the State Endangered Allegheny wood rat. These sites are part of a larger meta-population complex for this species. (3) To join with existing wildland to someday form a significant tract of old growth forest

Bear Pen Run Wildland – Compartments 30, 56, & 57 – Barton & Bittinger 7.5' Quadrangles

General Description – This area was nominated by Natural Heritage as an ESA before becoming a wildland. Several patches of old forest exist within this tract which will eventually all become old growth. Other features include excellent forest interior bird habitat, several sites for rare flora and fauna, and an excellent diversity of salamanders.

Middle Fork Wildland and East Middle Fork ESA – Compartments 54, 59, & 60 –Bittinger 7.5' Quadrangle

General Description – The Middle Fork Wildland was nominated as an ESA before becoming a wildland. It has excellent features associated with a relatively large tract of continuous forest such as outstanding forest interior bird habitat. There are several patches of old forest within this wildland and the streams harbor good salamander diversity. The East Middle Fork ESA is nominated primarily because of the occurrence of a State rare animal.

Upper Monroe Run and Whiskey Hollow ESAs – Compartments 63, 64, 66, 72, & 73 – Bittinger 7.5' Quadrangle

General Description – Both of these ESAs represent excellent examples of Allegheny Plateau salamander communities. The diversity of stream dwelling species is quite high and one site supports three species of *Plethodon*, including the valley & ridge salamander. This species encroaches onto the Allegheny Plateau and it is unusual to find it occurring sympatrically with the red-black salamander.

Little Bear Creek ESA – Compartments 10 & 11 – Accident 7.5' Quadrangle

General 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, and excellent populations of various salamander species associated with springs and small streams.

Negro Mountain Bog ESA – Compartment 12 – Accident 7.5' Quadrangle

General Description – This area represents the finest northern bog system on SRSF. Several rare species occur here, including some very unusual dragonflies. This ESA also provides outstanding cover habitat for black bears and other secretive animals. The bird fauna is also of special interest. The area south of this bog along the eastern flank of Negro Mountain is an important acquisition priority.

Bear Creek Springs ESA – Compartment 13 – McHenry 7.5' Quadrangle

General Description – The springs and swampy floodplain of this section of Bear Creek support a variety of unique vegetation, including a population of a State Threatened plant.

Warren's Beech Grove – Compartment Unknown – McHenry 7.5' Quadrangle

General 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, Warren Groves.

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.

Management zones (**1, 2 or 3**) within ESAs were delineated in Arc Map following definitions given below. The most appropriate forestry practices, given the ecological objectives, were developed for each ESA category and each zone. Included in this zonation was the DNR unit (Natural Heritage Program, Forest Service or both) responsible for implementation of management. The resulting ESA management zone boundaries and expanded stream buffers within ESAs were clipped in Arc Map so there were distinct, non-overlapping map units. ESAs were then clipped to Savage River State Forest (SRSF) boundaries, so the GIS product would only display management areas on SRSF. Additionally, outside of ESAs all stream buffers were clipped into non-overlapping map units within SRSF. Lastly, the entire multiple layer project was topologically cleaned and merged into a single layer. All acreages reported were derived from Xtools in Arc Map 9.3. Use of other area estimators may yield slightly different results

I. **Zone 1** contains RTE species and high quality natural communities plus buffer. This area is usually to be managed by Heritage, with site-specific restoration plans developed and implemented. However, at times Heritage will identify specific areas within Zone 1 where Forestry can conduct an economic harvest, typically on a "one-time only" basis. This zone should not be included in sustainable forestry acres

II. **Zone 2** was used to describe a secondary management area, i.e., "life zones" for amphibians (Semlitsch 1998). For the sake of this exercise, acreages derived from Zone 2 were not considered in computations of sustainable forestry acreage, as its management is

fairly restrictive, though limited sustainable forestry is possible. Forestry will be responsible for management of this zone with input from Heritage.

III. **Zone 3** was the remainder of the ESA not in Zones 1 or 2. Zone 3 was meant to be areas for rare species populations to expand into, once natural communities are restored. This zone will be managed sustainably and in perpetuity by Forestry with input from Heritage.

Throughout this section the term "native genotype" means source plant material that is indigenous to Garrett County. However, for species present throughout the state, sources from the state or mid-Atlantic region can be considered for planting stock, after consultation between Heritage, the Forest Manager and the State Nursery Manager.

7.4 Management Zone Definitions & Prescriptions by ESA Category & Zone

Caveat: The following ESA management prescriptions were developed for Chesapeake Forest. As the Prescriptive Management Zone layer is created for Savage River the ESA prescriptions are likely to be different. This is reflective of the current state of the forest. Chesapeake Forest is largely an industrial pine plantation whereas Savage River Forest has much more acreage of natural vegetation. Therefore, Savage River Forest is starting at a more ecologically desirable point than the Chesapeake Forest and thus management for each ESA type may be different.

7.5 Prescribed Burning within ESAs:

Some mechanical fire line construction may be necessary within Zones 1, 2, or 3 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:

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

7.7 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:

<u>Archeological study of the Western Maryland coal region: the prehistoric resources.</u>
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	19th, Early 20th?	GA 9C	DNR	K. Youngs and K. Leeper (MGS)	9/24/1980

			stand, 19th century farmstead					
18GA176	Field #312	Blue Lick Run Mill	grist mill, mill pond, tail race, possibly early 19th century	Historic Unknown	GA 9C	DNR	K. Youngs (MGS)	7/29/1980
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	early 20th	Early 20th	GA 9C	DNR	K. Youngs	6/26/1980

		Mill	century saw mill and lumber camp				(MGS)	
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.

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-crowed kinglet, blackburnian warbler, mourning warbler, Canada warbler, dark-eyed junco, purple finch, winter wren, goshawk, red-breasted nuthatch and Nashville warbler.

8.3 NON-GAME SMALL ANIMALS

Thirty-two species of small mammals may inhabit 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

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

8.9.3 Mink

The mink is a semi-aquatic member of the weasel family 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. Since official designation as a public use area in 1974, the Poplar Lick ORV trail in Savage River State Forest in Garrett County has seen steadily increasing use. The presence of the ORV trail along Poplar Lick 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	*Campostoma anomalum*	A	A	A	A
Rosyside dace	*Clinostomus funduloides*	C	C	C	C
Cutlips minnow	*Exoglossum maxillingua*	S	S	S	S
Common shiner	*Luxilus cornutus*	-	-	S	S
River chub	*Nocomis micropogon*	S	-	C	C
Blacknose dace	*Rhinichthys atratulus*	A	A	A	A
Longnose dace	*Rhinichthys cataractae*	A	A	A	A
Creek chub	*Semotilus atromaculatus*	C	C	-	C
White sucker	*Catostomus commersoni*	C	A	A	A
Northern hog sucker	*Hypentelium nigricans*	-	-	C	C
Yellow bullhead	*Ameiurus natalis*	-	-	S	-
Margined madtom	*Noturus insignis*	-	-	S	S
Rainbow trout	*Oncorhynchus mykiss*	S	C	C	C
Brown trout	*Salmo trutta*	S	S	S	S
Brook trout	*Salvelinus fontinalis*	C	C	C	S
Potomac sculpin	*Cottus girardi*	C	C	C	C
Blue Ridge sculpin	*Cottus caeruleomentum*	A	A	A	A
Rock bass	*Ambloplites rupestris*	-	-	C	C
Pumpkinseed	*Lepomis gibbosus*	S	-	-	S
Smallmouth bass	*Micropterus dolomieu*	-	-	-	S
Fantail darter	*Etheostoma flabellare*	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 in 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.**

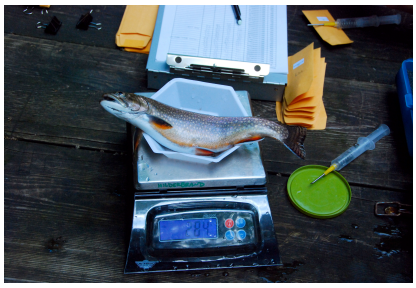
- **Open season: January 1 through December 31, inclusive.**

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	*Notemigonus crysoleucas*	S
Swallowtail shiner	*Notropis procne*	A
Bluntnose minnow	*Pimephales notatus*	S
White sucker	*Catostomus commersoni*	C
Yellow bullhead	*Ameiurus natalis*	C
Rainbow trout	*Oncorhynchus mykiss*	C
Brook trout	*Salvelinus fontinalis*	S
Rock bass	*Ambloplites rupestris*	A
Redbreast sunfish	*Lepomis auritus*	S
Green sunfish	*Lepomis cyanellus*	S
Pumpkinseed	*Lepomis gibbosus*	C
Bluegill	*Lepomis macrochirus*	A
Smallmouth bass	*Micropterus dolomieu*	C
Largemouth bass	*Micropterus salmoides*	A
Black crappie	*Pomoxis nigromaculatus*	C
Yellow perch	*Perca flavescens*	A
Walleye	*Sander vitreus*	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	*Rhinichthys atratulus*	Common
Longnose dace	*Rhinichthys cataractae*	Common
White sucker	*Catostomus commersoni*	Common
Rainbow trout	*Oncorhynchus mykiss*	Scarce
Brown trout	*Salmo trutta*	Abundant
Brook trout	*Salvelinus fontinalis*	Abundant
Potomac sculpin	*Cottus girardi*	Common
Blue Ridge sculpin	*Cottus caeruleomentum*	Abundant