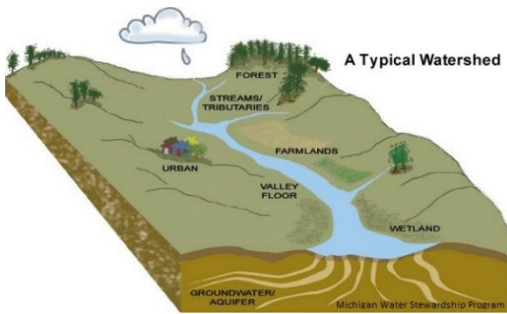


Manage Your Land for a Healthy Watershed: East Branch of the Antietam Landscape Scale Stewardship

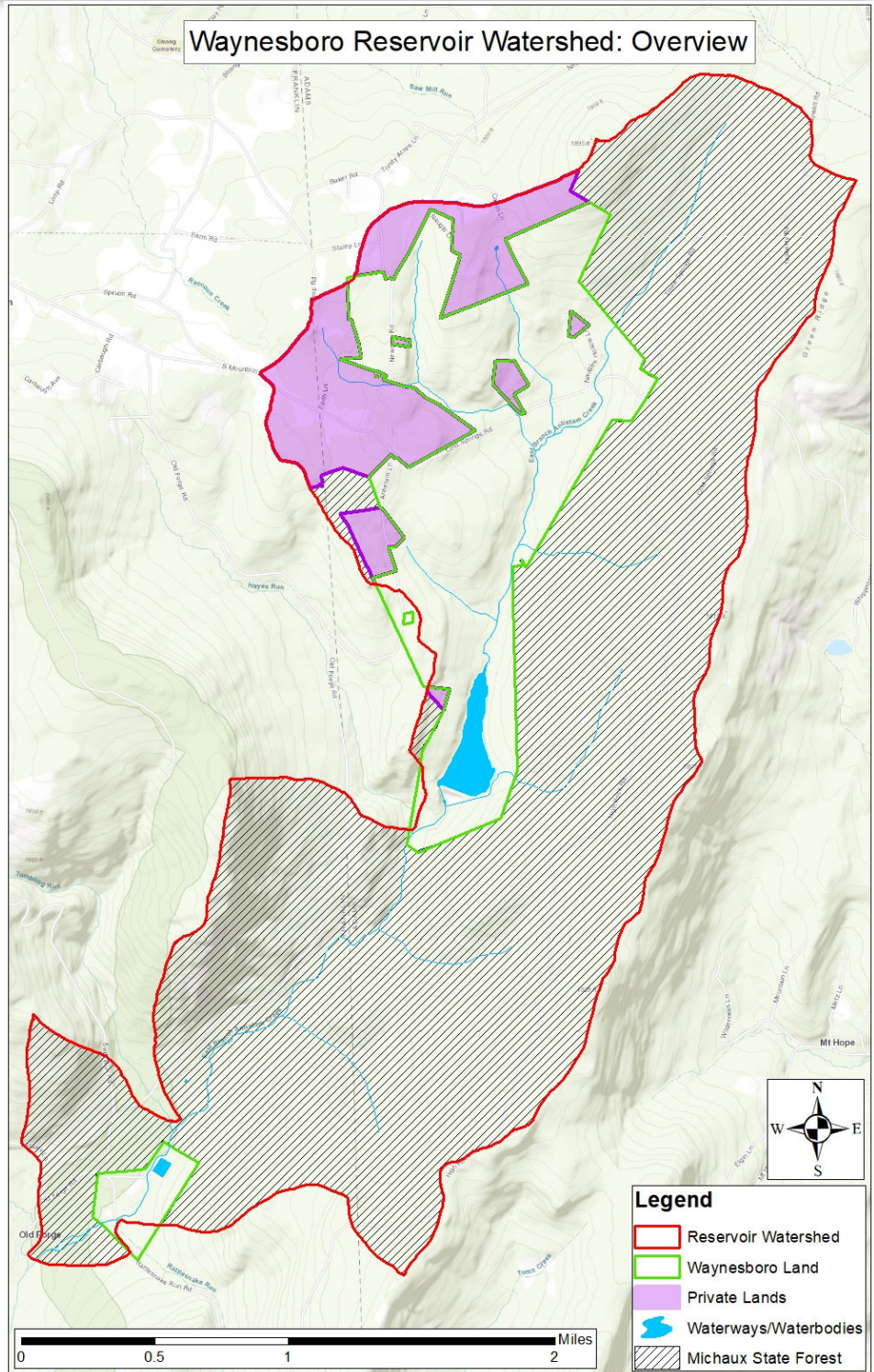
*Healthy Forests, Healthy Waters,
Healthy Communities*
Everyone Needs Clean Water

Did you know your land contributes water to over 10,000 people in Waynesboro, Pennsylvania? That's right, East Branch of the Antietam watershed feeds Waynesboro Reservoir, a drinking reservoir managed for people's taps.



"Michigan Watershed Maps." Michigan Water Stewardship Program, www.miwaterstewardship.org/

A watershed can be defined as the area where rain falls and flows to a specific point, meaning everyone lives in one. Watersheds can be drawn to be small, like East Branch of the Antietam, or very large capturing the entire Chesapeake Bay watershed. **Your forests help deliver clean water to people that depend on it.**



"The activity and the life that goes on in a watershed is all intertwined. And the water in the streams is just like the arteries in a body, it's the life fluid flowing through that particular area."

Dave Schreffler, Local Woodland Owner

Landscape Scale Planning

Working Towards Common Goals Together

The following Landscape Scale Plan aims to provide information about your land, surroundings, how it fits in the surrounding landscapes, and the natural benefits you reap from it. Do you enjoy deer hunting or wildlife viewing? How about fishing, hiking in the woods, or gardening? You can manage your land to create a healthier, more productive forest and deer herd, other types of wildlife habitat, and even put a bit of money in your pocket, all while feeding the reservoirs with clean water.



Much like how a person with a healthy immune system can better fend off a cold, waterway ecosystems surrounded by forests are healthier and thus more resilient to a variety threats.



Water's Incredible Journey

Movement of Water Through a Watershed

Here in the mountains and valleys of southcentral Pennsylvania, most of us have clean water available straight from our faucets. Before the water reaches our homes, businesses and schools, however, it begins as droplets of rain or other precipitation that embark on incredible journeys.

Many water droplets will splash straight onto the ground and promptly begin to flow over the landscape, perhaps meandering through crop fields and past the hooves of cattle; winding through residential lawns and schoolyards, not slowed much by short grass and hard-packed soil; or rolling down impenetrable driveways, streets and parking lots. Some water droplets will directly enter waterways, others will start as sheets of water, concentrating into rills and gullies, while others will get there by falling into a storm drain, where they will be rushed through a pipe and into a stream. These heavy flows can result in dangerous flooding and a hefty amount of harmful sediment and pollutants (oils, fertilizers, pesticides, nutrients, trash), picked up along the way by the water droplets.



Water's Incredible Journey (continued)

Still other water droplets will take more leisurely journeys to waterways. They might flow over farms, yards and the like as well, but then be intercepted before entering storm drains or waterways by areas of natural vegetation, like wetlands or forests. In such areas, the droplets' overland journey will be brought to a halt by lush plants and a feathery layer of dead tree leaves, twigs, and additional organic matter. Rain that falls directly over healthy forests will either be evaporated back into the atmosphere after colliding with the tree canopy or be slowed by tree leaves before falling to the absorbent forest floor.



Water reaching the forest floor trickles down through organic matter to the soil beneath, leaving behind deposits of sediment and pollutants from its travels. Roots grow into the soil, stabilize it, and add to the protective layers. A portion of the rain will be pulled back out of the soil by plants, while the rest will continue on, eventually arriving as clean water in underground aquifers. This underground water supports drinking water in shallow wells resurfaces as clean, consistently flowing surface water in local streams, ponds, and lakes.

What are the Conditions in East Branch of the Antietam Watershed?

See the Forest for the Trees

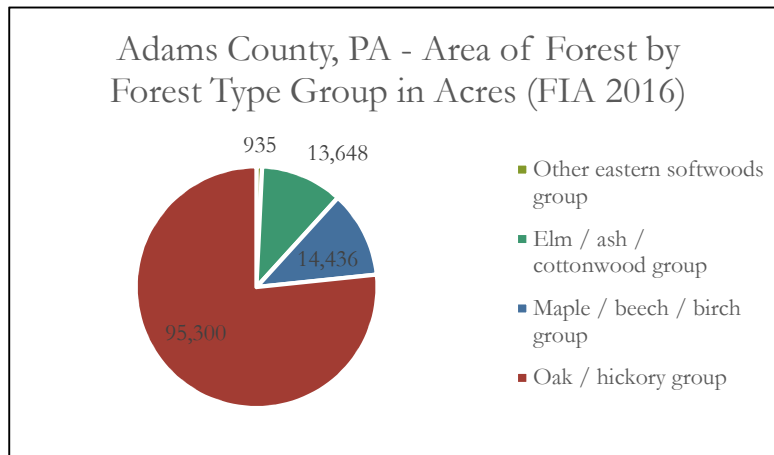
Looking at the types of land cover and ownership that make up the watershed is a good starting point to see how you and your woods play an active role in the health of the landscape. East Branch of the Antietam Watershed is 4,089.33 acres total but broken down into different types of ownership, of that, 3,760 acres (~92%) are conserved by public agencies (PA-DCNR BOF & Waynesboro Water Authority). The remaining ~8% is owned by private owners and families.

Waynesboro Reservoir Watershed: Land Cover Acreage & Percentage		
Landcover	Acres	Percent
Tree Canopy	3,851.38	94.2%
Shrubland/Low Vegetation	165.82	4.1%
Water	30.41	0.7%
Impervious Surfaces/Impervious Roads	16.25	0.4%
Barren	12.7	0.3%
Tree Canopy over Structures/Tree Canopy over Impervious Surfaces/Tree Canopy over Impervious Roads	9.47	0.2%
Structures	3.3	0.1%
Total	4,089.33	100.0%

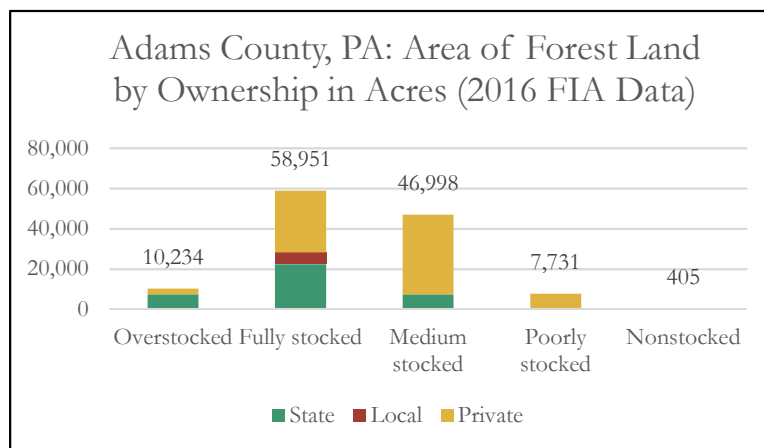
As the chart shows, much of the watershed acreage is forested and managed by public agencies. Those forest managers want what's best for the land. However, people that own farms, and urban/suburban homes are able to contribute to the healthy management of the watershed too.

By using the US Forest Service's Forest Inventory and Analysis (USFS-FIA) program data for Adams County, Pennsylvania as a generalization of the forest conditions in the watershed, we can see that the majority of the forest is classified as "Fully Stocked", meaning that the trees growing in the forest are adequate amount of space for light, water, and nutrients to continue growing well. Forests that are fully stocked can be actively managed to improve their quality and health while better aligning them with the goals of landmanagers.

We are fortunate to live in a region of the world that has a high biodiversity of both plants and animals. However, **many of the forests in our area are currently unhealthy** due to the impact of pests, diseases and undesirable plants. **Proper forest stewardship (care) is paramount** for creating and maintaining healthy forests that are filled with a variety of native, desirable species of plants and wildlife, and all of the inherent benefits that such forests provide.



Looking at the USFS-FLA 2016 dataset for Growing-Stock & Forest Types, there is a majority of Fully Stocked forest of oak/hickory composition in the county.



Oak/hickory forests are the most common forest type in the East Branch of the Antietam watershed while the second most common type is maple/beech/birch. Oak/hickory stands provide a wide variety of natural benefits. Both oaks and hickories provide “hard mast” acorns and nuts that many animals feed on, particularly in the winter months, while simultaneously providing superior water quality protection. However, maple/beech/birch forests are regenerating better in this area due to the loss of historic fire regimes, increased deer pressure, and invasive species. The younger, regenerating trees in these forests are usually red maple, white and Virginia pine, gums, and only a limited number of oaks. While a diversity of native species in forests increases forest resilience, keeping a strong component of oak/hickory is critical for maintaining our local wildlife populations through the winter and for more effective nutrient cycling. Many oaks are fire adapted, showing a strong resilience to fire at all ages, which allows oaks to outcompete other species that perish in fire. With the exclusion of fire from these systems by humans, fire adapted species have a difficult time regenerating. Active forest management is an alternative way to maintain some of our important native forests, including oak/hickory, as it takes the place of fire as the necessary disturbance.

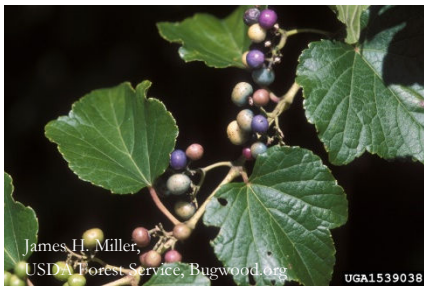


Green isn't Always Great

Not All Forests Are Healthy



Green is usually good, especially when there are many layers of green (leaves) to provide shade, clean air and healthy water. Nevertheless, green isn't always great. While even unhealthy forests provide some protection to water sources, healthy forests provide better filtration and protection, along with food and shelter for wildlife, carbon sequestration, clean air, increased property values, recreational opportunities, potential income, stimulus to the local economy and aesthetic beauty. Healthy forests are also much less likely than their unhealthy counterparts to succumb to natural disasters, such as pests or wildfires. Such catastrophic events usually lead to an abrupt loss of water protection and a sudden onslaught of sediment entering waterways. Thus, **healthy forests are sustainable**, meaning that they will be able to withstand biological and man-made pressures in order to provide the greatest benefit (in this case, primarily water source protection) for the greatest number (people, plants and animals) for the longest time.



James H. Miller,
USDA Forest Service, Bugwood.org

UGA1539038

What does a healthy forest look like? Healthy forests differ in species composition, age and appearance, but most contain a variety of native, non-invasive, desirable tree (and other plant) species arranged both vertically and horizontally-across the landscape. Native species are plants or animals that have co-evolved with other species in a region or ecosystem for hundreds or thousands of years. These species are generally non-

invasive, meaning their populations do not spread to the point of disturbing the balance of the ecosystem or impacting human health.

Of the species native to this area, there are those that are more desirable and less desirable. Desirable tree species vary slightly from property to property depending on the woodland owner's objectives, but generally they are species that have wildlife value, such as American beech and hackberry; exhibit colorful fall foliage, such as red maple and black gum; are valuable timber species, like black cherry and yellow poplar; or meet multiple objectives, like the Northern red oak and hickory. Moreover, desirable trees are usually vigorous and straight-growing. That being said, there's a place for "funky" trees too! Some interesting looking trees are desirable to property owners simply for their visual appeal.



Chipmunk by Debbie MacArthur



MD DNR VMS

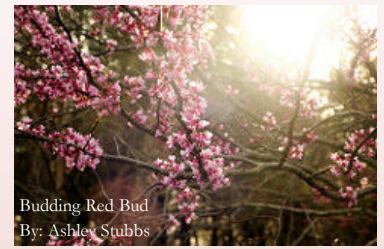


Ranger Elena Gilroy, Maryland Park Service



Robin's Egg Blue by Maggie Clingan

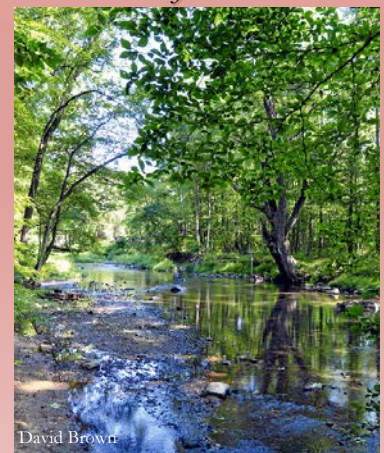
Having an assortment of trees, shrubs, vines and herbaceous plants is what makes a forest great wildlife habitat. A variety of plants provides wildlife with many places to perch, take shelter, create nests and hide from predators. A mixture of plant life also offers a diverse selection of leaves, berries and nuts for many different insects, birds and forest wildlife to eat. Collectively, the variation of plant and animal species living in a forest is referred to as its biodiversity.



Budding Red Bud
By: Ashley Stubbs

Typically, we think of a healthy forest as being an endless expanse of mature trees as far as the eye can see. However, healthy forests also include young trees that line town streets, sprawling trees that shade suburban backyards, young saplings that act as a riparian buffer along a small stream and wild-grown trees that co-exist as part of a small woodlot. Each tree is part of a larger forest network that functions to provide benefits in a watershed. Every young and old tree truly counts.

To find out how many benefits a single tree can provide, visit www.treebenefits.com.



David Brown

Green isn't Always Great (continued)

A forest with high biodiversity exhibits resiliency, another marker of a healthy forest. Such a forest is able to persist even if the population of one or more species of plant or animal is reduced by a pest or disease. This is because, in a forest with many species of plants and animals, substitute, or redundant, species are present to perform similar functions (i.e. food or shelter) in the forest ecosystem after encountering a forest disturbance. Conversely, forests with low biodiversity can be decimated by the arrival of just one disease or pest.



Though standing dead trees and trees, limbs, and leaves decomposing on the forest floor sometimes look messy to humans, **dead plant material is another important component of a healthy forest.** It serves as wildlife habitat, protects seedlings from deer browse, and is a source of nutrients that will be recycled back into the soil. Nutrient recycling can also happen when a small fire burns with low intensity through a forest, a natural occurrence in some ecosystems. However, if there is too much dead plant material, or “fuel,” in a forest and a wildfire

is sparked, either by natural or man-made causes, the wildfire can burn very hot. This can destroy or degrade the value of wildlife habitat, trees (both young and old), and the intricate forest soils and life within them. Keeping a forest sustainable and healthy is all about balance; a healthy forest maintains a balance of just enough dead plant material to be beneficial to the ecosystem, but not enough to severely damage the ecosystem if a wildfire is sparked in the area.



Manage Your Garden

Forest Management Revitalizes Forest Health

Forests are akin to gardens. A healthy garden has a balance of the right amounts of space, soil, water, sun, and nutrients, as well as beneficial insects and animals. A healthy garden requires keeping weed species in check so that they don't utilize all of the space and resources, thereby robbing the desirable plants of the necessary components. Additionally, a healthy garden must be protected from pests (both insects and mammals) and diseases that could destroy crops. An untended garden will soon become overgrown with both weeds and pests. In those ways, forests are very similar to a garden...just on a considerably larger scale and with substantially bigger crops! As opposed to a garden, however, where there are rows and rows of just a few species of plants, the goal in a healthy forest (as mentioned



previously) is to have a variety of tree species, along with an assortment of shrubs and herbaceous plants on the forest floor, spaced in such a way that each plant has plenty of space and resources. Just as your vegetables will be overcrowded and lackluster if you plant seeds too closely together, trees can become over crowded as well, which can lead to a decline of tree growth-rate and vigor.

Pests, diseases, and weeds in a forest “garden” are often non-native, invasive, and undesirable species; commonly just called “invasives.” Non-native species aren’t always invasive and undesirable (i.e. the honey bee), but many are. Non-native species usually get imported, either accidentally or on purpose, in shipments containing plants or wooden packing material from other countries. Once they are in the U.S., these interlopers hitch a ride from town-to-town and state-to-state with commercial freight, people hauling firewood, or homeowners purchasing and planting non-native plants in their landscapes.

When invasives reach an area, they are very successful in monopolizing local forest resources because they generally are fast-growing, have the ability to adapt to many light conditions, are often introduced to fragmented forested landscapes (landscaped gardens utilizing non-native plants provide plenty of new seed sources for new introductions to the area), and perhaps most importantly because they lack natural predators in the area.



Photograph by Josh Birnbaum, expressly for the National Association of State Foresters

Weeding the groundlayer and forest floor are particularly important because they contain the future of the forest. If the forest floor is bare or covered with plants that are blocking the light that nourishes potential tree seedlings, there won’t be many small trees to fill the gaps in the canopy and supply food for wildlife when larger trees die, either from natural or man-made causes. Conversely, if the forest floor is covered with a variety of tree seedlings that are ready to absorb sunlight and sprout up into the canopy when given the opportunity, life will continue to thrive in the healthy forest after the death of larger trees; in fact, the death of larger trees in a forest is part of a healthy forest lifecycle and natural succession. Cutting can further stimulate regrowth in many hardwoods, with more vigorous growth than from seedlings, a natural adaptation in response to storms and other natural disasters.

The Hemlock Woolly Adelgid, a non-native, invasive insect, is devastating Eastern hemlock forests in the U.S. These forests provide critical habitat for many species of wildlife, including aquatic species that live in the mountain streams kept cool by dense hemlock foliage.



Swallow Falls
By: Ranger AJ Preston

Another important forest species, the American chestnut, which was once a dominant tree species in the Eastern U.S., was all-but-eliminated from the U.S. by a disease imported on an ornamental chestnut tree from Japan in the early 1900’s. It is estimated that fewer than 100 American chestnut trees remain in their native U.S. range.

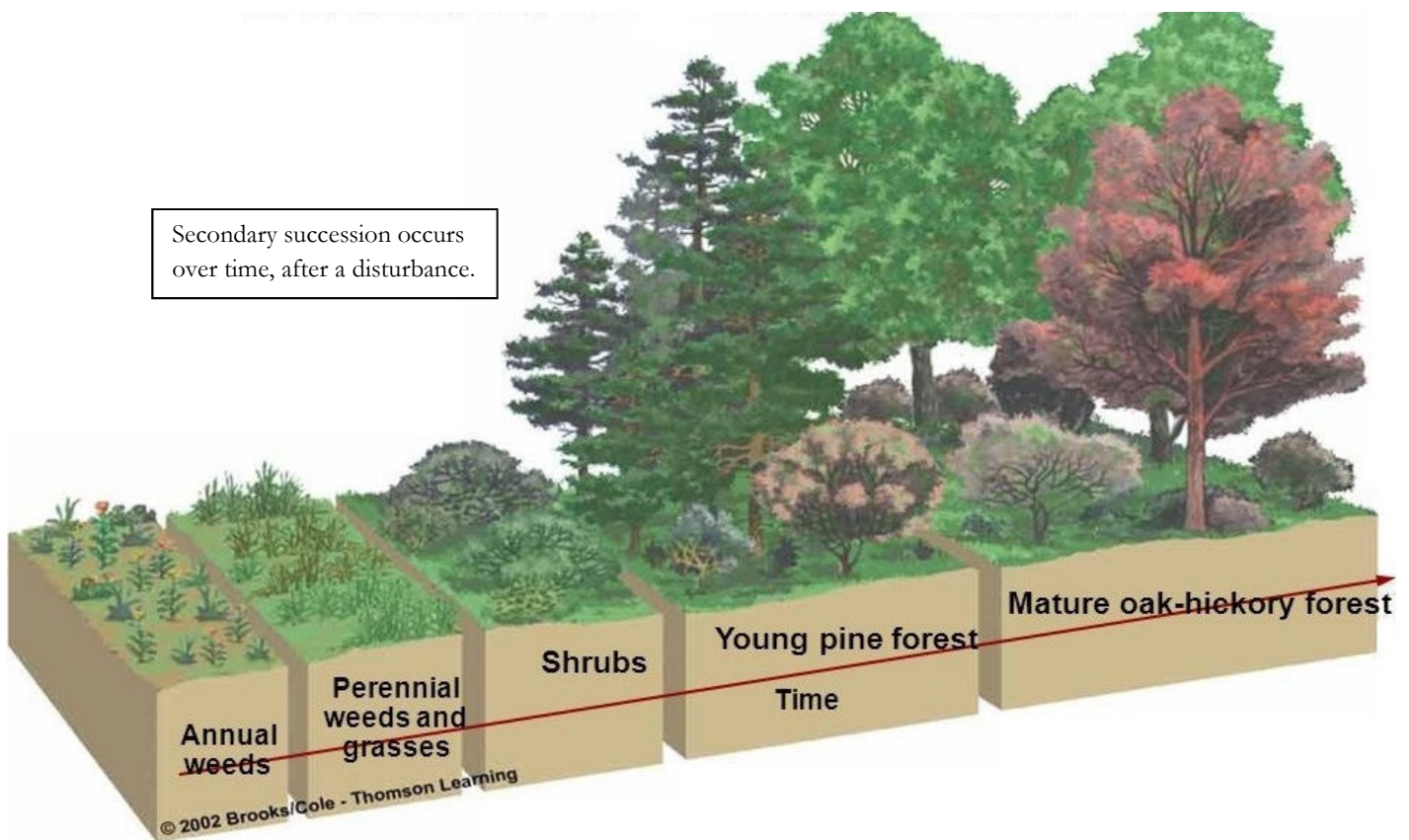


To find out more about invasive species, visit:

dnr.maryland.gov/invasives/Pages/default.aspx

Many of the forests in our local area are unhealthy because they have been either improperly managed or not managed at all in the recent past. High-grading is an improper management technique, sometimes called a diameter limit cut, which has been frequently used in the past. Put simply, high-grading is taking only the best and leaving the rest, often resulting in residual forests filled with invasives and/or undesirable, unhealthy trees. One of the best ways to “weed” an unhealthy forest is to harvest timber properly. Those smaller trees left from a high-grade, may be the same age, just less vigorous or well adapted, which means the poorest quality trees are left to seed in the next generation. In general, a proper timber sale will remove undesirable trees, along with some desirable ones, to make room for healthy trees to thrive. While harvesting, a properly conducted timber harvest will employ best management practices (BMPs), such as silt fencing, culverts and water bars, to protect precious soil and water resources in the area. It will also include management of invasive species, possibly through mechanical, chemical, or biological control methods. This will ensure that native, desirable regeneration species won’t have to compete with invasives for the light and nutrients that will immediately become available after the timber harvest.

A forest growing back from a disturbance like a forest fire or timber harvest is referred to as being in secondary succession, the steps of which are pictured below. This transition takes time and is composed of distinct steps that are variable across landscapes. These changes can be sped up or slowed down through well timed management practices.



Depending on the current health and type of a forest, few or many trees will be harvested using a variety of sustainable harvest practices. The selection of trees to be harvested should be decided using principals of silviculture, which is the art and science of managing forests, in conjunction with landowner goals. Not removing any trees is also a management technique. Issues are rarely cut and dry in forest management.

A managed forest is better adapted to climate change; it will be more resistant to disturbances, more resilient after disasters, and better able to cope with an uncertain climatic future.

Why Manage Forests?

Landowner Objectives Vary, a Healthy Forest is Usually One of Them

A forest is always changing. 30 years from now what do you want to see, or reap, from your forest? More wildlife opportunities, cleaner water for trout, healthier pollinator habitat, more trees, firewood, profit from a timber sale? All of these are good answers, and there are many more possibilities. Some people own forest to make income, some people own forest for a personal retreat, some people own forest simply because it is attached to their farm. Since it is your land, a forester will develop a plan to help you meet your goals. When you take the first step toward sustainably managing your woods, contacting a forester to help develop your Forest Management Plan, they will ask you questions. Your answers will guide the forester in the general direction of your goals and give their trained eye something to look for while they collect your forest inventory. Entering your woods with an idea of what you value or want to manage for will give the forester a starting point to develop your plan.

The forester will then take data and distill it into a written document summarizing what they saw. This will include things like species composition, age classes, signs of wildlife, forest productivity, a map of the different stands your forest breaks up into, and steps you can take in each stand to move towards your desired forest conditions.

The forest management is then up to you, though the forester will be there to help put you in touch with forest operators, supervise logging operations, assist in cost-share applications, and diagnose forest health problems that may occur down the road.

Whatever your reason for owning forest, knowing what you have and where you're going is important.

How do I actually meet my goals?

A few management tools in the forest landowners' tool box:



Regeneration & Site Preparation: Either natural regeneration or artificial regeneration can be used to re-establish stands. The method used is based on site surveys of regeneration within one year of harvest. Both



methods of regeneration will seek to reduce soil disturbance associated with site preparation practices. This will require careful harvest planning to encourage and achieve natural regeneration wherever possible. The forester is responsible for developing a site specific regeneration strategy outlining what practices will be used with each timber harvest plan. Pre and post-harvest data, as well as establishment surveys and BMP compliance (Best Management Practices) data will be collected and evaluated to measure the success of each regeneration project. There will likely be situations where artificial regeneration techniques would improve seedling growth and survival. These techniques include; prescribed fire, herbicides and or other less intensive mechanical prescriptions followed by a combination of natural regeneration and hand planting of seedlings.



Harvest Equipment: When planning a forest harvest, the forester 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.



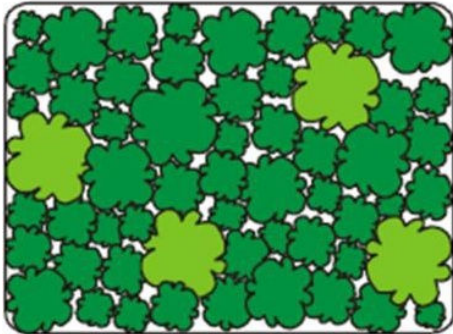
Timber Stand Improvement (TSI): A TSI is a form of density control that is used to concentrate growth on larger stems, to maintain an even distribution of trees across the site, and improve the composition to better align with landowner goals. It is usually done by hand crews.

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

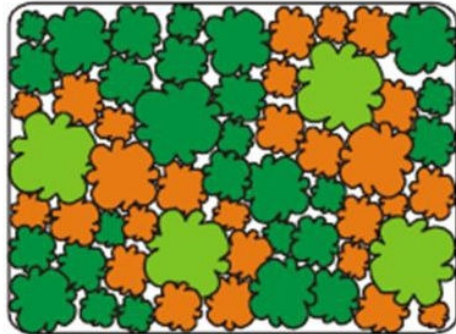
Vegetation Control: Control of competing hardwood and herbaceous vegetation may be used to enhance survival and growth of desired regeneration. This control may include prescribed fire, mechanical and/or chemical treatments. Chemical application for vegetation control can be done with no adverse environmental impact if label directions and best management practices are followed.

Crop Tree Release: A crop tree release is identifying the best trees in a forest and “releasing” them from competition by felling or girdling the immediately neighboring trees. This allows the identified crop trees to grow more freely and outcompete surrounding trees to meet landowner objectives. When a crop tree release is advised, about 30 crop trees per acre is sufficient.

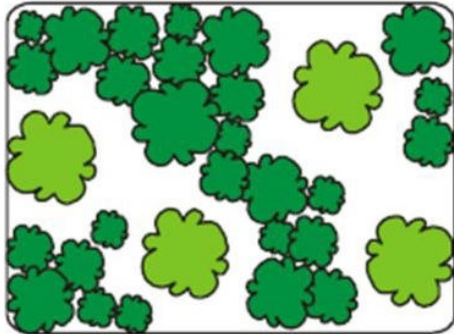
Crop Trees Selected



Cut Trees Marked



Cut Trees Removed



Perkey et al., 2011. U.S. Forest Service General Tech Report NRS-83.

My Land Plan has an excellent guide explaining many of the practices available to use:
[My Land Plan: Thinning Your Woods](#)

American Forest Foundation
My Land Plan
The woodland owner's resource

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Get Started!

How does it work?
My Land Plan is helping thousands of woodland owners get the most out of their property.

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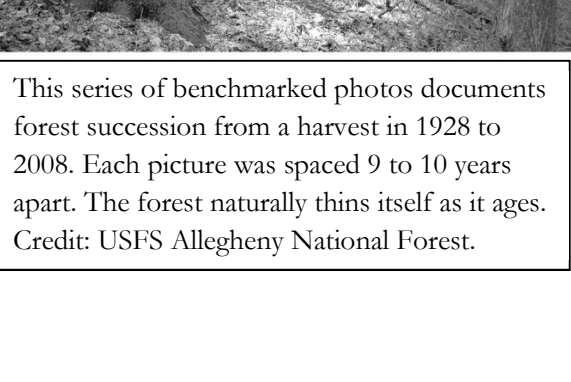
1928



1978



2008



This series of benchmarked photos documents forest succession from a harvest in 1928 to 2008. Each picture was spaced 9 to 10 years apart. The forest naturally thins itself as it ages. Credit: USFS Allegheny National Forest.

1968

Many Hands Make Light Work...and Healthy Water

Your Community is Working to Protect Healthy Forests and Clean Water-You Can Help!

Tree Farmers, state foresters and other concerned forest-owners in your area are taking the lead on providing clean water by sustainably managing their forests. [American Tree Farm System](#) provides affordable, internationally recognized certifications to family forests. Maintaining a sustainable certification is important because it tells users and buyers of wood products that they are supporting well managed forests.



However, maintaining healthy water and healthy forests takes the work and support of a whole community. **You can help!**

Some forest owners may think, “Forest management sounds too risky to me; it would be better for me to do nothing and let nature take its course.” However, “do nothing” shouldn’t be a forest owner’s choice of action unless their forest is in a state of optimal health. Given historic management and the constant onslaught of invasives, that is unlikely. Instead, forest owners should consult their management plan and then talk to their neighbors to see if they also have invasives that they would like to control or timber that they would like to harvest. It will be easier to keep invasives off of one property if they aren’t rampant on a neighboring property, and small, unattractive timber sales can be made attractive to buyers if grouped with other small sales in an area. Many hands make light work, and sometimes less drain on the pocketbook, so forest landowners should consider working together with neighboring landowners to better accomplish management.

Even if someone’s forest is currently healthy, they should still be walking in the forest and monitoring it for new threats.

Local Forests, Globally

Sustainable Forests Mean Renewable Resources & More Vibrant Local Communities

All of our actions affect our local forests and watersheds. If someone has ever owned a product made from wood or has used paper, toilet paper, facial tissues, film, cellophane, a wooden baseball bat, books, coffee filters, or countless other products, then their purchase has inspired the cutting of trees somewhere. They’ve already done something to influence forest management. Since we live in a global economy so international commerce is a large part of our daily lives, most of us have purchased products that originated somewhere other than their local region. Sustainability of global forests and trade has advanced significantly

NIMBY Fever Alert!!

Timber harvesting can incite NIMBY (Not In My Back Yard) Fever in a community. This fever is usually associated with an OOSOOM (Out Of Sight, Out Of Mind) infection.

Everyone uses forest products daily, but they don’t want timber harvesting happening in their backyard...or even yours. They prefer that timber harvesting be done elsewhere.

Side Effects of NIMBY Fever include:

- *promoting the harvesting of trees elsewhere, possibly in countries where inadequate or no best management practices are used to protect forest and water health*
- *encouraging the importation of wood and other forest products, thus increasing carbon footprint and possibly leading to introduction of invasives*
- *losing the chance to stimulate the local regional economy by creating local jobs*
- *missing opportunities to increase the health of waterways, improve wildlife habitat, and produce sustainable income*

The only known cure is supporting responsible, sustainable, proper timber harvesting in your local community!

in the past few decades but local forests often offer the most sustainably managed wood available without increased invasive species risk. You can directly support your local wood products industry by either harvesting timber or buying as many local products as possible. [Click here](#) to learn more about products made from Pennsylvania forests from the PA Forest Products Association.

Wood is good! Wood is renewable, unlike plastics and other materials made from fossil fuels, which often require extensive extraction processes. By purchasing wood products from local sources or from sustainably sourced harvests, such as Forest Stewardship Council, Sustainable Forestry Initiative, or American Tree Farm, you can reduce your carbon footprint and be part of the clean water and healthy forests solution!

Everyone in your community needs clean water, including you and your family, so be a part of the clean water and healthy forests solution!



Manage Your Land for Healthier Wildlife

Better Management Means Better Deer Habitat & Better Trout Fishing

A healthy, well stocked forest can produce more acorns and palatable food for deer than an overcrowded forest can. If the forest is overstocked, a thinning can get your stocking levels to the prime mast producing range. If you want to generate income from your land and increase the amount of deer on it, a commercial harvest will provide lots of regeneration for deer to eat. However, increasing the hunting pressure on a new harvest is a good way to hedge your bets on a healthy forest regenerating by enabling some trees to grow beyond deer browse height. More resources on how to manage your land for deer can be found at the:

[Tree Farmer Magazine September/October 2011 Issue](#)
[Pennsylvania Game Commission Food Plot Management](#)

You also can attract deer to your land by planting food plots. This involves planting a small portion of land, located in the interior of your forest away from streams, into crops that will provide food for deer when farm fields aren't producing. Some sweat equity in your woods, establishing a small food plot, can allow you to see more deer on your land, in all seasons.

Trout habitat has to be managed by everyone in the watershed and just because you don't live next to a stream doesn't mean you can't help, or hurt fishing in your favorite spot. Think like a rain drop, if rain travels through polluted areas, it will carry it to the stream. Practicing sound land management in the woods, on the farm, or even in your yard can reduce polluted runoff on the landscape, increase nutrient interception, create more shade, and cool water temperatures for the trout. [Managing Woodlands for Wisconsin's Coastal Trout Streams](#)



The horizontal structure of a healthy forest (think about connectivity of the forest from a bird's eye view) usually contains various successional stages, ages, and types of forests across the landscape. For example, one forest might include, in no particular order, a bog; an old field; a recent clearcut that is growing up in small saplings; a section of pole-sized trees; and

areas of large, old trees with snags interspersed. A forest with such a diverse forest structure is appealing to a variety of wildlife, especially species like wild turkeys that rely on various ages and types of forests to provide food and shelter throughout their lives.



Trout Need Trees...

Healthy Forests are Important to Aquatic Ecosystems

When skilled anglers want to catch natural brook trout, where do they go? To a sunny creek running through a treeless urban area or to a cold mountain stream densely shaded by trees? The latter, of course. These anglers probably know that watercourses replenished primarily by water from forested landscapes often contain more, and healthier, fish and other aquatic organisms than those that are fed by waters rushing off of non-forested landscapes.

Water from non-forested landscapes often contains sediments and pollutants, which can negatively affect fish and other aquatic organisms in numerous ways, including clogging their gills, smothering their nests, poisoning the aquatic food chain, and encouraging the growth of oxygen-depleting algae. The natural filtering action of forest soil helps to remove sediment and pollutants from water before they can reach waterways and cause harm. Also, the slow movement of water through the forest soil helps to regulate the amount of water entering waterways at one time, thus protecting aquatic organisms from extreme fluctuations in water temperature, flow, biochemistry and other parameters important to their health.

Forests provide shade to the water as well, which makes the water cooler and more abundant in dissolved oxygen, -two things that aquatic life, especially trout, depend on. Furthermore, when trees drop leaves, twigs, and branches into the water (detritus), it provides food and shelter for the numerous organisms that live on creek bottoms and in the shallow edges of lakes and ponds. These organisms, in turn, are food sources for fish and larger organisms living in the water, as well as for birds and other wildlife that forage near the stream, pond or lake. Thus, healthy forests are a vital component of healthy aquatic ecosystems. Put simply, healthy forests make water livable.

...and So Do We!

Healthy Forests Provide Clean Drinking Water

Across the world, communities get their water from either natural aquifers, accessed by wells, or surface freshwater. In developed areas, surface water is commonly stored in water supply lakes, called reservoirs, from which water is drawn and then re-directed to a water treatment plant, before being transported to residents. The extent of filtering and treatment that water needs to go through depends on the amount of pollutants in the water at the time of withdrawal and the available water treatment infrastructure in that area. The more pollutants, the more expensive it is to treat-and purchase-the water. By filtering the surface water prior to treatment, healthy forests make water more drinkable at a lower price.



What if I don't Own a Large Piece of Land?

Many Things can be done to the Lawn and Garden to Help Improve the Health and Diversity of the Watershed.

Even if you don't own forest, you can do something! First, find out about your local watershed and water source. Visit your water supply area and the forests that protect it. Thank a local tree farmer, and support them and other landowners who are managing their forests sustainably by buying locally. Show interest if the market doesn't exist yet. Thank, support, and join others throughout your community who are helping to protect your water through conservation practices such as: planting native trees and plants, establishing and maintaining riparian forest buffers, fencing livestock out of streams and rotating their pasture fields, utilizing crop farming best management practices, (such as no-till drilling and contour strip cropping), creating rain gardens and "no mow" lawns, conserving water through the use of low flow faucets and rain barrels, installing porous pavers, upgrading old septic systems that leak sewage into waterways, testing garden soil before applying nutrients, and protecting their land from ever being developed to a non-forest use through conservation easements.



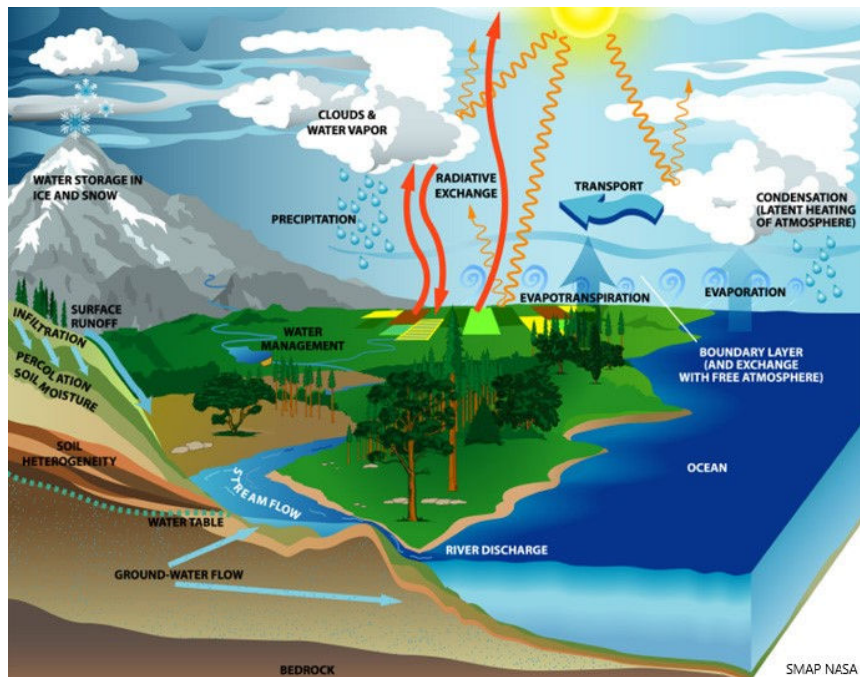
Simple actions around the home can also benefit the watershed, like leaving your grass clippings in your yard to decompose in place and return nutrients to the ground. Bagging and throwing away your yard clippings just leads to needing too much fertilizer to keep the grass looking green. So set your mower to mulching, leave the grass 3 to 4 inches high, follow the labels on fertilizers, and help the fish by enjoying your lush green lawn. See [Improper Mowing of Lawns Can Impact Water Quality](#) for more information.

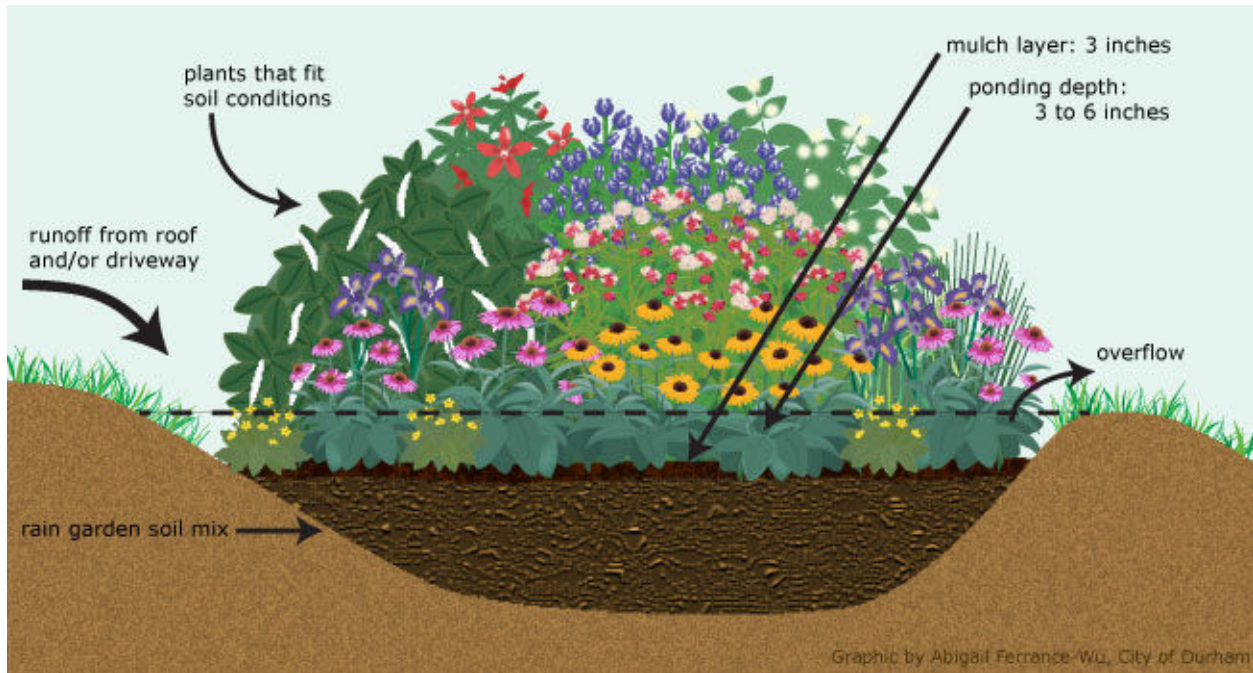


In your garden you can work to include native plants that provide more natural benefits than non-natives. It is important to provide habitat for pollinators since they help pollinate native species through their feeding. If you would like to invite more beautiful hummingbirds, butterflies, and songbirds to your garden; include more native flowering plants. In some cases, for species like butterflies and moths, many non-native plants do not provide sufficient food. Planting native species ensures abundant food sources for pollinators throughout the growing season. [US Fish & Wildlife Service Pollinator Garden](#)



When a rain drop hits the ground, the type of surface that raindrop hits is important. Is it landing in a healthy forest where it will be filtered by the roots and soil as it flows into an aquifer or stream? Or is it hitting a parking lot where it will roll along the pavement, pick-up the droplets of oil and sediment, and get sent to a stream via a gutter and storm drain? A strategically placed rain garden can capture and filter the polluted runoff from parking lots while providing a tiny suburban oasis for wildlife and pollinators. Giving water a chance to infiltrate into the soil is the best way to naturally remove pollutants. The soil in a rain garden provides great filtering ability, and is held in place by plant's roots preventing erosion. If you have the opportunity to filter the water from an impervious surface like a parking lot or driveway, compacted soil like those found on heavily used lawns and fields, you can do it while beautifying your neighborhood.





How Do I Build a Rain Garden?

If you have the ability to capture stormwater on your property, or can collaborate with a business or local government to work on a parking lot that collects water, building a rain garden is a great way to improve the watershed. The first step in creating a rain garden is to notch a curb or create a swale that will guide the water. Then, create a filtering basin; by digging out a small area capable of capturing the water. Amend the soil with lots of sand and organic material to encourage infiltration and backfill. Next, plant the area with appropriate native wetland perennials, shrubs, and trees. Even these young plants will hold the new fresh soil in place while beautifying the area. As the plants grow and establish in the basin, their roots will filter water and ease local flooding.

[EPA Guide to Installing a Rain Garden](#)

Why should I make a Rain Garden?

Catching water in a rain garden allows it to slowly filter into the ground. This means less rainwater is lost into our storm sewers which also means there is less flooding and erosion in our streams. What a beautiful way to improve the quality of water in our lakes and streams! Keeping water on site and letting it "perc" into the soil also means more water is available to recharge the water table underground.

What should I plant in a Rain Garden?

Native plants are a natural for this landscape application because they tolerate short periods of standing water, are drought tolerant, and their deep roots make it easy for water to move down into the soil.

Native plants are also great at:

- conserving soil and water,
- serving as non-polluting landscapes because they don't need fertilizers, pesticides, or herbicides,
- supporting a diversity of wildlife by improving their habitat,
- reducing long-term maintenance after plantings are established,
- lasting longer because they are winter hardy, drought tolerant, and are less prone to destructive insects and diseases.

When choosing which natives are best for your rain garden, consider height, wildlife attraction, flowering and sun/shade tolerance. Consult the included planting guides for sun and partial shade plant recommendations that attract birds and butterflies.

How to:

It's simple! Just follow these three easy steps:

1. Start by digging a 4-8" depression with gradually sloping sides as large in circumference as you like. (A good rule of thumb is to size your garden at 30 percent of the area of the roof from which it will be collecting water.) A 4-8" depth will allow water to be captured, but will dry between rain events.
2. Plant natives recommended in the plans below.
3. Add untreated, shredded hardwood mulch to a depth of 3" on all of the bare soil around the plants to prevent erosion while your natives are establishing.

Where should I place a Rain Garden?

It is important to locate your rain garden where it will collect the most amount of rainfall runoff possible. Placing your rain garden downhill from paved surfaces where water would naturally flow will maximize its ability to collect runoff.

Rain Gardens are versatile; they can be any size or shape imaginable. It is most practical to locate

your rain garden on level to moderate slopes. The most logical location for your rain garden is in an existing low spot in your yard. However, do not place your garden in an area where water currently ponds. Standing water shows you where the soil is slow to absorb water. The rain garden's function is to aid in water infiltration.

Be sure to place your rain garden at least 10 feet from buildings to keep water from seeping into and damaging the foundation.

Collecting rainfall from your rooftop is easy, too! Just place your garden where downspouts will drain into it, directing water with a shallow swale if necessary. You may also choose to drain your downspouts to your rain garden through a buried 4" plastic downspout extender like ones you can find at most home improvement stores.

TIP:

While your natives are establishing their roots, you'll need to water them about every other day. This should be done for the first two to three weeks, or until the plants show that they are growing and doing well. When your natives are established, they won't require any additional watering!

Check out the back cover for a key to the plants in these two gardens!



TIP:

Remember not to fertilize your natives. Fertilizer causes them to grow too tall and fall over. It also stimulates weed growth and creates competition for your natives.

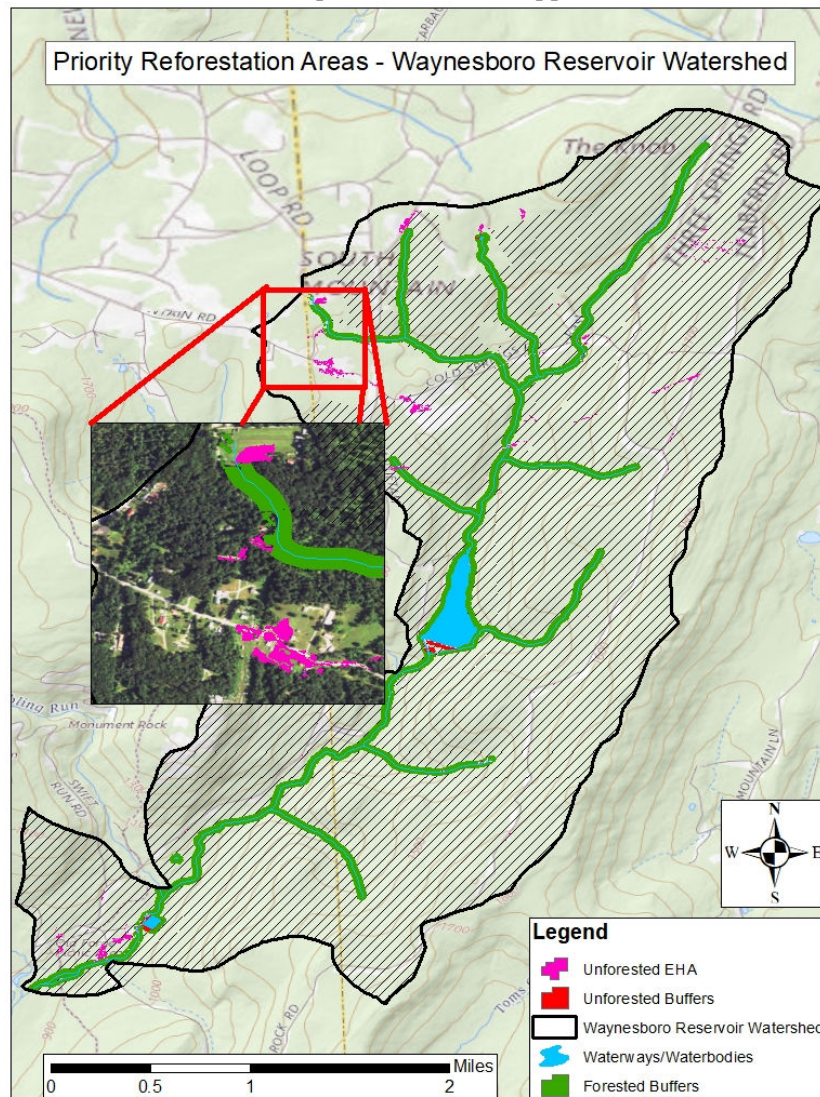
Restoration Drivers & Opportunities

Assistance Available to You

The Environmental Quality Incentives Program (EQIP) Many forest owners look at active management as a cost that doesn't pay dividends down the road. EQIP is a cost-share program administered by the Natural Resources Conservation Service that will reimburse landowners for qualifying practices on their land. Many practices like wildfire preparedness, forest improvements, thinnings, reforestation, invasive species control, and others are all qualifying practices in the program.



The following map shows restoration opportunities for watershed groups or concerned individuals that want to plant trees that will increase forest connectivity and improve water quality. Areas highlighted in the restoration priorities maps show areas that are not currently forested, adjacent to waterways, or considered an ecohydrologically active area (EHAs). These areas are important to restore because they are where the trees will be able to do the most good, or provide the most “bang for the buck”. This is because along a streams edge a tree’s roots hold soil in place the flowing stream and help water infiltrate into the ground before it reaches the stream. A zoomed in map is located in the appendix.



Each of the highlighted areas has the potential to support a high value tree planting that will help capture and filter water while also helping to increase the connectivity of the wildlife habitat in the watershed.

Long-Term Protection

Keep Forest in Forest

Many people that own forestland don't have a plan for succession, or how they would want their land to be inherited and protected for future generations. The following programs are opportunities to ensure peace of mind and to keep forests growing.

The Forest Legacy Program (FLP) is a nationally competitive "willing seller, willing buyer" program aimed at permanently protecting forest from conversion to non-forest uses. The FLP is cooperatively administered by the USDA

Forest Service and participating states. An interested forest owner will approach the Forest Legacy Program Coordinator, in this case for Pennsylvania and offer to sell a conservation easement on their land as a "fee simple purchase" at fair market value. The State will then work with the landowner to develop a nationally competitive application and if the process goes well, the land will be permanently protected. Up to 75% of funding for the purchase can come from the federal government, the remaining percentage is picked up by state, local government, or other organizations.

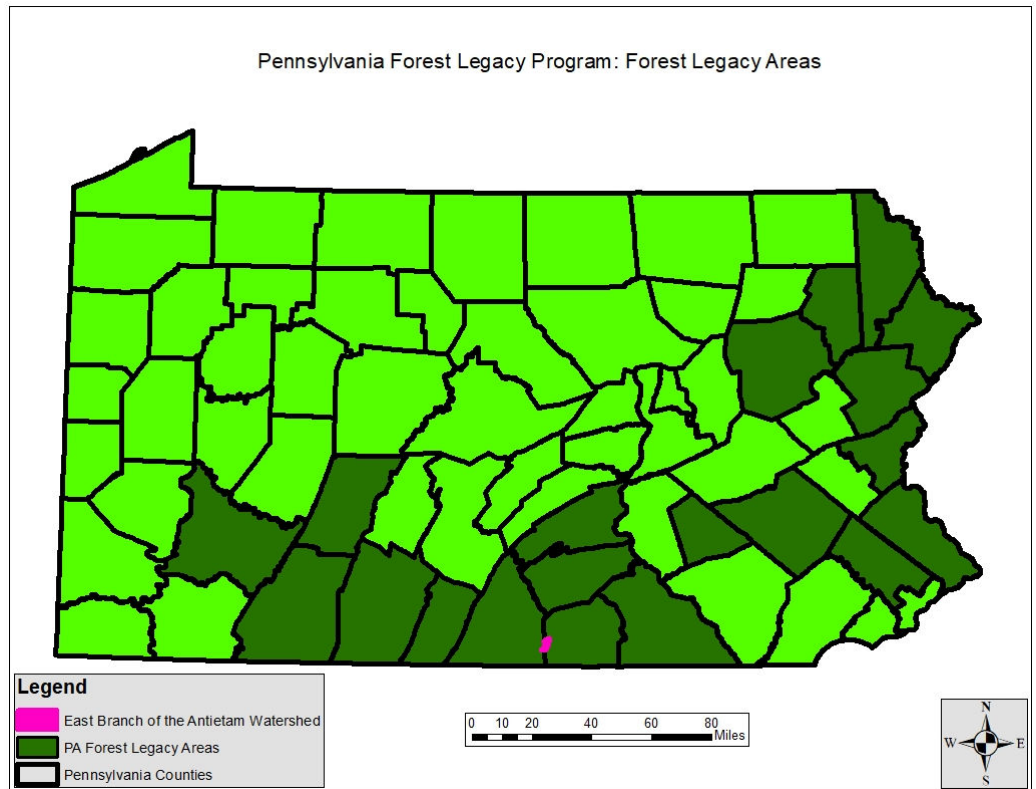
PA Clean & Green

The Pennsylvania Clean and Green program is a tax program to help reduce the assessed rate of forests. Instead of paying taxes on market rates, the forest will be taxed at current use; forest. This is a great program that allows family forests to stay in the family by reducing tax pressures. Learn more at [PA Clean & Green](#)

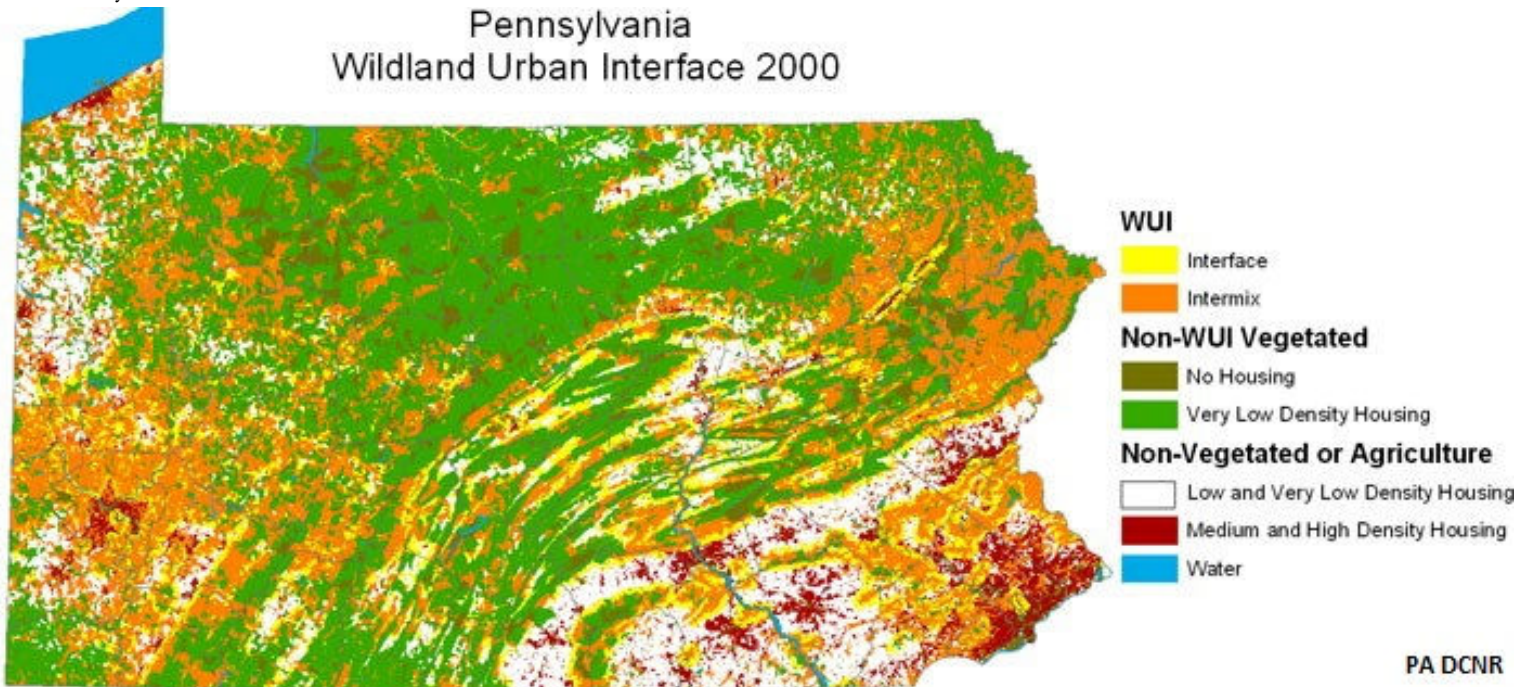
Wildfire Resilience

An Ounce of Prevention is Worth a Pound of Cure

Forests in this area were historically managed by both intentional and natural wildfires. For millennia, the forest evolved to support species of plants that depended on the cyclical burnings that would recycle nutrients into the soil, create canopy gaps, and clear out understory vegetation causing a flush of new growth later in the growing season. For the last 100+ years fires have been actively suppressed leading to a shift in the species composition of the region's forest. Formerly dominant species that were "fire adapted" have not been given the assistance that a low intensity wildfire had afforded them for generations before. This has led to a forest composition that appears to, be less productive for wildlife, since many of the non-fire adapted species produce fewer natural benefits when compared to the majority of fire adapted species.



As people have increasingly sought woodland retreats, or have moved into the woods entirely, a new problem has arisen; wildland urban interface (WUI). The WUI is where valuable infrastructure like housing abuts vegetated areas, allowing for much easier ignition of structures from wildfires. Homeowners in the WUI appreciate the privacy afforded by thick forest near the house. However, this appreciation of nature and privacy can lead to problems when a wildfire burns near the house or community.



One way to help alleviate WUI issues is to practice Firewise landscaping or become a “Firewise Community.” By following the Firewise tips below you can minimize risk to your house and forest from the devastating effects of uncontrolled wildfire. For more information visit [PA DCNR Firewise](#) or [MD DNR Firewise](#)

- Practice Firewise landscaping
 - Clear vegetation touching house
 - If you own a house in the woods, manage the forest to keep a fire on the ground and helpful rather than destructive.
 - Keep your access roads clear for quick suppression

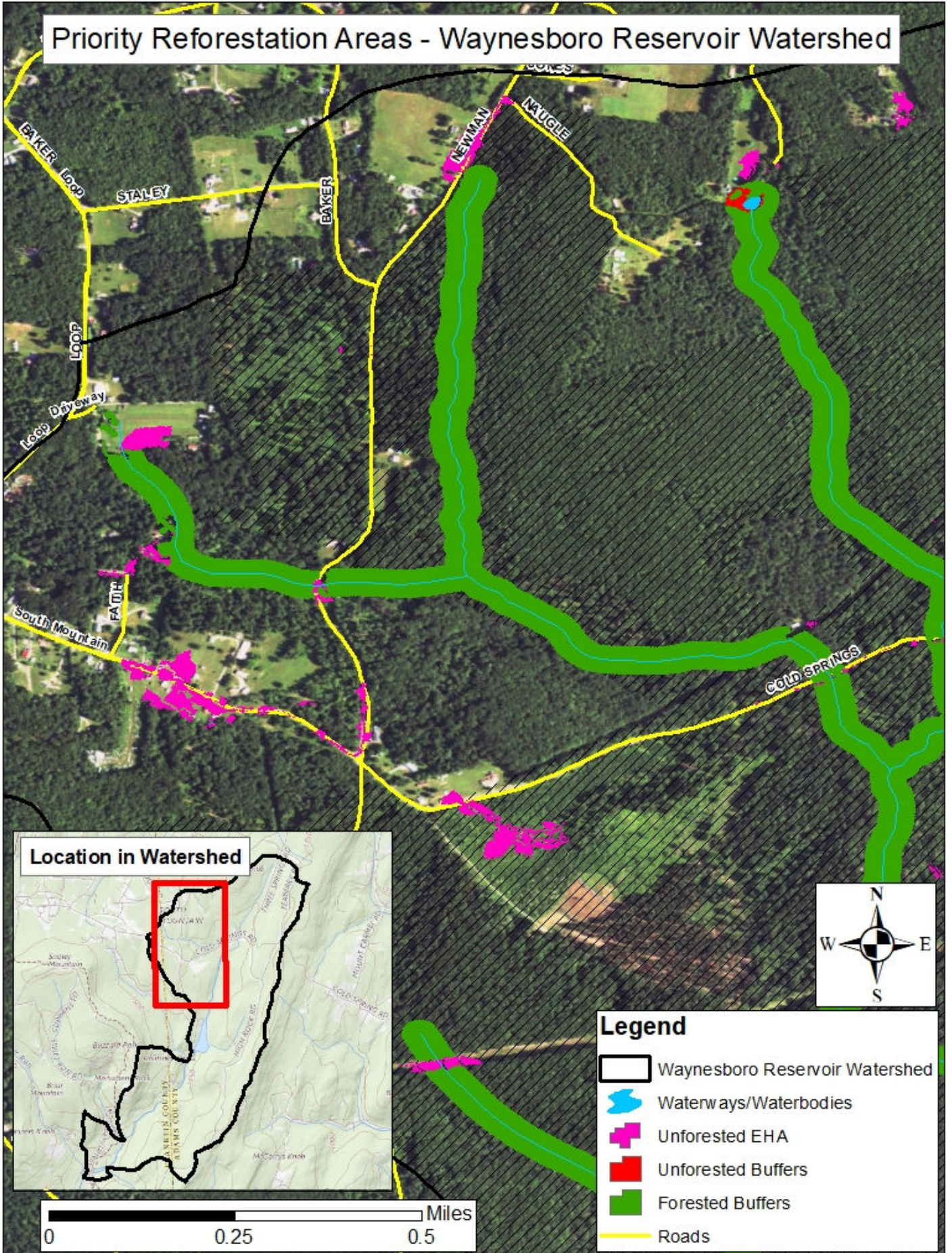


Managing your woods to maximize your enjoyment is as big, or as little, a commitment as you're able to do. Letting the forest simply continue to grow is important since there are species that depend on old-growth forest, while more involved management can be rewarding in that it promotes habitats that are declining in the mid-Atlantic. The first step is calling your local forester to talk with a professional about what your forest currently looks like and what you want it to look like in the future. Contact your local forester at:



Maryland Forest Service

Priority Reforestation Areas - Waynesboro Reservoir Watershed



Maryland Forest Service

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The Mission of the Maryland Department of Natural Resources

The Department of Natural Resources preserves, protects, enhances and restores Maryland's natural resources for the wise use and enjoyment of all citizens.

Maryland Forest Service Mission

To restore, manage, and protect Maryland's trees, forests, and forested ecosystems to sustain our natural resources and connect people to the land.

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