PENNSTATE

College of Agricultural Sciences • Cooperative Extension

Regenerating Penn's Woods

Managing Competition, Deer, and Light:
Keys to Successful Forest Regeneration in Pennsylvania

Do you depend on a healthy forest?

Sure you do! We all depend on and benefit from a healthy, productive, viable forest.

To name a few ways:

- Forests clean our air, provide oxygen and utilize carbon dioxide.
- Forests protect and filter our water supplies.
- Forests are home to countless plants and animals.
- Forests are a vital part of the economy.
- Forests are a major source of employment.
- It is estimated that more that 5,000 products are made from the wood and other materials harvested in the forest.

Obviously, forests are one of our most precious natural resources. We are dependent on forests for the quality of life we enjoy. We ***use*** our forests to sustain life as we know it. Yes, we ***use*** our forests! Wisdom tells us that future generations, your children and theirs, will also need to use our forests for these same benefits.

If we are going to continue to use the forest we need to ensure that it is done in a sustainable manner. That is, we must be able to renew and regrow it. The science of "forestry" was developed to "sustain" our forests. It prescribes specific treatments designed to re-grow a new forest following a harvest. But, how do new forests grow and where do new young trees come from? Our forests can be planted but almost all of the new young forests in Pennsylvania grow naturally. New tree seedlings come from seeds dropped by the parent trees, cut stumps which re-sprout, and roots systems which send up new shoots called suckers. All of this is called forest regeneration. When forests regenerate properly the resource will be available for future generations.

Are Pennsylvania's forests regenerating?

In 1998, eighty five timber harvest sites were examined in Pennsylvania. The comprehensive study sought to determine if our current harvesting practices were producing "sustainable" outcomes. The study found that only **53% of the harvests were sustainable**, meaning that they would allow the forest to re-grow and be productive again. What was the problem with the other 47% of Pennsylvania's timber harvests? The most often identified concerns were:

- Failure to maintain good quality trees of valuable species
- Failure to establish adequate regeneration
- Failure to remove enough older trees to foster the growth of existing seedlings

Two of the three concerns listed above deal with failure in **regenerating** (or re-growing) our forests. Trees are being harvested without properly planning for their replacement. We cannot practice sustainable forestry if we continue to harvest trees without being able to grow new trees. We cannot practice sustainable forestry if we are not regenerating a healthy new forest that can grow for future generations.

"The predominant challenge for sustainable forestry in Pennsylvania is prompt reforestation with desirable tree species, species that will provide us future forest benefits."

Dr. Susan Stout
USDA Forest Service

What can *you* do?

The challenge is to continue using our forest resource without jeopardizing its health or its future. For forest management to be successful and for forest health and utilization to co-exist, it is essential that we all practice "sustainable" forestry. Landowners, loggers, and foresters all play key roles in a successful outcome and all must equally accept the responsibility of ensuring healthy forests for the future.

What is available to replace the trees that have been harvested?

The remainder of this publication is written to provide you with the tools you need to manage your forest in a sustainable manner, primarily dealing with the establishment of regeneration. After reading this publication, we hope you will view your role in managing your forest in a new way. We also hope you will take an active role in utilizing these key concepts that can help you ensure a future for ***your*** forest.

Combating the regeneration issue:

There are many factors that can have an effect on our ability to successfully regenerate Pennsylvania's forests. By far, the majority of regeneration in Penn's Woods is through natural regeneration. That is, regeneration that becomes established without planting trees. The current forest produces seedlings, stump sprouts, and root suckers that will ultimately become the future forest following a harvest. Regeneration is a process that will occur naturally under the right conditions. Unfortunately, "the right conditions" are often not met on many of our harvests. This section will take a close look at three factors that impact forest regeneration and introduce some practices that can be implemented to assist you in making your tree harvests sustainable. The three factors are **C**ompeting vegetation, **D**eer impact, and **L**ight (to the forest floor). This simple acronym, C-D-L, establishes a process to follow that will help you successfully regenerate your forest. Using C-D-L as a guide, new healthy forests can be established following a harvest.

Competing vegetation:

Competing vegetation are plants that interfere with the germination, and growth of valuable seedlings primarily by casting dense shade on the forest floor. A couple of factors favor the development of competing vegetation. These species tolerate shady understory conditions and are not highly preferred by deer. Some, like Japanese barberry, are also considered to be invasive meaning they spread widely and rapidly. Competing plants are similar to weeds in your garden, in other words, they can interfere with the establishment and growth of your future crop!

The most common types of competing plants found in Pennsylvania include hayscented and New York fern, some grasses, striped maple, ironwood, and American beech. Many other plants can be considered competing if they interfere with the growth and development of the seedlings you are trying to grow. Remember, there is only so much space, water, nutrients, and sunlight on any given acre of land. Whether you are growing corn, grass, or trees you need to make some choices about how you would like to fill that acre of land. You can let the weeds take over your garden, just like you can let trees of little value take over your forest.

If an area is stocked with competing vegetation valuable regeneration is not likely to develop.

Controlling competing vegetation in areas where they dominate the understory is **imperative** to successfully regenerate any harvested area.

Controlling competing vegetation is most often achieved through the use of herbicides registered for application in the forest. Extensive research and testing have resulted in herbicide recommendations or "prescriptions" for controlling most competing vegetation concerns. Many forestry organizations, both public and private, have experience with herbicide applications. They should be consulted for detailed recommendations on how to deal with your specific competing vegetation problem.

Prior to a timber harvest competing vegetation problems must be identified and treated.

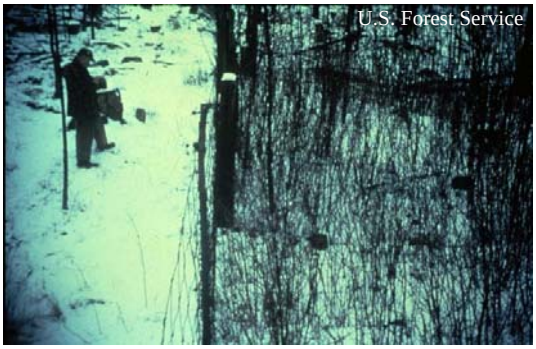
If a landowner is reluctant to use herbicides or a treatment is cost prohibitive, mechanical removal of competing vegetation may be an option. Typically, mechanical methods of controlling competing plants involve having the harvesting operator break off or cut the seedlings and saplings of the competing vegetation. Generally, this is not as effective as using chemicals since they may simply resprout. But, at least they will be set back and no longer have a significant height advantage over the more desirable seedlings.

Competing vegetation can prevent you from establishing diverse and valuable forest regeneration. If competing plants are present in an area that you propose to harvest and they are not treated, they may become your next crop. Instead of replenishing your forest, you may be converting it to a fern or grass field. To sustain your forests you must recognize and treat competing vegetation problems.

Deer impact:

Deer impact refers to the ability of deer to influence tree seedling numbers, species present, and height growth by selectively browsing on understory vegetation. In areas with high deer impact the number of seedlings is reduced, the species composition is often shifted to less valuable species, and the surviving seedlings are generally smaller. Research has shown that when deer population numbers exceed what the land is able to support they can have a **severe** impact on the ability of the forest to regenerate itself. In regions of the state where the habitat has been severely depleted from decades of over-browsing, deer can still have a high impact on the forest even with relatively few deer per square mile.

In many parts of Pennsylvania, deer numbers have exceeded what the habitat can support for decades. In fact, many residents of the state have never seen a healthy forest understory, void of the negative impacts of deer overabundance. Once deer begin to over-browse their habitat they reduce the forest's ability to support additional deer. In many areas deer numbers are not limited by hunting but by poor habitat conditions. The only way to increase the number of deer that the land can support is to temporarily reduce deer numbers still further in order for the habitat to recover. When the habitat improves, deer managers could gradually allow deer numbers to increase until they reach a level that provides a balance between the available habitat and deer populations.



Research has shown that high deer impact can inhibit forest regeneration.

Deer have the ability to completely change the types of vegetation found in the understory of the forest by selectively browsing their preferred species. Selective browsing can eliminate species they prefer or that are not resilient to browsing and favor less preferred and more resilient species. Deer food preferences will vary by region but in general species like oak, sugar maple, ash, and poplar are preferred over species like beech, birch, and cherry. Deer need on average seven pounds of browse per day for

seven months of the year. At an estimated deer population of 1.3 million deer in the state they have a tremendous ability to influence what grows (or doesn't grow) in the forest.

There are a number of indicators that landowners can use to assess whether the deer impact in their forest is high or low. Indicators of high deer impact include the presence of severely browsed seedlings, obvious browse lines, and forest floors dominated by species that deer avoid or that are resilient to browsing. Deer do not readily eat species like ferns, striped maple, beech, ironwood, mountain laurel, blueberry, and spicebush. As a result, we see these species dominating the forest floor in many areas. Forests with a carpet of dense fern are the result of high deer impact over the past few decades. Research has shown that fern density increases as deer impact increases.

Photo depicts an obvious "browse line". Browse lines are indicators of high deer impact.

Once the deer impact level has been determined landowners can then plan what measures to take in order to sustain their forest and provide for regeneration following a harvest. If the impact has been assessed as high, measures should be undertaken to reduce it even if a timber harvest is not planned for the immediate future. This can be accomplished by taking additional anterless deer during the hunting season. The Pennsylvania Game Commission has established the Deer Management Assistance Program (DMAP) which is designed to help landowners meet their deer harvest goals. The program allows hunters to harvest additional antlerless deer from a property during the regular hunting seasons. Some other tools available for landowners with high deer impact include fencing, installing seedling protectors, and applying deer repellants. Hunting is by far the most practical means of reducing deer impact. Areas with reduced deer impact will support healthy, diverse understories making your forest ready for future planned timber harvests.

"Attempting to raise more deer than the land can support has been the greatest mistake in the history of wildlife management in Pennsylvania."
Dr. Gary Alt
PA Game Commission

Light – to the forest floor:

Seedlings of different species have varying requirements for sunlight in which to germinate and grow. Therefore, the amount of sunlight reaching the forest floor plays a key role in determining which species of tree seedlings will be found there. This is referred to as their shade tolerance. Shade tolerance is defined as the level of light at which a tree species is best able to develop. Foresters generally separate species of trees into three classes of shade tolerance. These are intolerant of shade, intermediate, and tolerant of shade. All of which refer to the tree seedlings ability to germinate and grow in a given level of light.

Species	Shade Tolerance
Black Cherry	Intolerant
White Ash	Intolerant
Hickory	Intolerant
Yellow Poplar	Intolerant
N. Red Oak	Intermediate
White Oak	Intermediate
Basswood	Tolerant
Red Maple	Tolerant
Sugar Maple	Very Tolerant
A. Beech	Very Tolerant

Table of shade tolerance for common Pennsylvania tree species

Let's examine the shade tolerance classes of the three most valuable timber species based on the current market for timber. What we find is that they fall into three different classes of shade tolerance: black cherry – intolerant; northern red oak – intermediate; and sugar maple – tolerant. What this tells us is that if only a small amount

of sunlight is reaching the forest floor then it is unlikely that we will see seedlings of cherry and oak on the floor. It is important that you use the shade tolerances of your desirable species as the basis for deciding which type of harvest to perform. For example, if you want to manage a forest that will grow shade intolerants and intermediates like yellow poplar, white ash, black cherry, and oak you have to increase the amount of light to the forest floor in a way that provides for seed germination and growth of these species. Your harvesting activities **must** address the shade tolerances of the species you are managing for.

Foresters have developed harvesting systems that mimic the creation of openings created by natural disturbances. These systems are used to regenerate diverse, healthy forests. Harvesting systems practiced in Pennsylvania that will satisfy the light requirements of shade intolerant and intermediate species include: group selection, shelterwood, seed tree, and clearcutting. These are all viable options for regenerating desirable species like oak, cherry, maple, ash, and poplar.

Group selection harvests create a forest with groups of different aged trees. It is practiced by harvesting all trees larger than two inches in diameter from groups ranging in size from one to four acres scattered about your property. By scheduling group selection harvests at intervals of 10-20 years, periodic income can be provided and habitat diversity encouraged. This type of harvesting system may be desirable for aesthetic reasons since areas of large, mature trees are always retained and the size of the openings created are relatively small. The harvested groups are large enough to encourage the regeneration of shade intolerant species in the center of the opening and shade tolerant species along the edges.

Shelterwoods and seed tree cuts are performed in two stages. The first stage leaves about half the original number of trees per acre and provides an environment that is conducive for intolerant and intermediate seedling growth and development. Once regeneration is well established the remaining large trees are removed in a final harvest and the new forest is allowed to grow in full sunlight. Clearcutting should only be practiced on areas where adequate forest regeneration is already present on the forest floor. We call this type of regeneration "advanced regeneration." In this case, the next forest is already in place and simply needs to be given the chance.

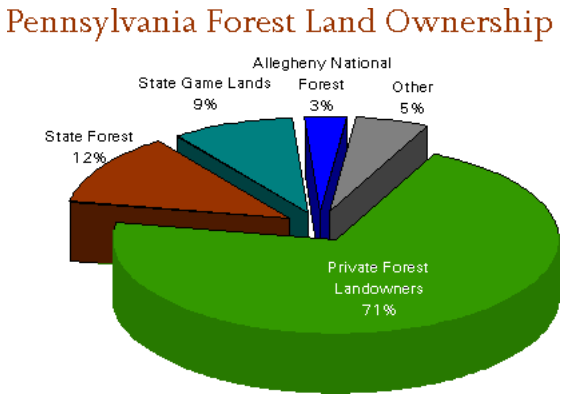
What are the costs?

Managing competition, deer, and light (**C**-D-L) certainly involves some investment of thought, time, and money. However, these factors are a **necessary** component of any successful and sustainable woodlot. In most cases, if we do not make the necessary investment in managing competing vegetation, deer, and light interactions, a forest will fail to regenerate following a timber harvest. This type of failure, on a state-wide level, will be devastating to our forests and many of the benefits we depend on every day will be lost.

Putting it into practice:

By controlling competing vegetation, reducing deer impacts, and taking into consideration the light requirements of the species of trees you are trying to grow, you will be successful in establishing and sustaining your piece of Penn's Woods. With a properly planned and executed forest management plan, all three of these factors C, D, and L are addressed. As good stewards of the resource, we must take these interactions into account.

C-D-L practices have become a major part of forest management on our public lands. If you spend any time at all on State Forest or State Gamelands, you have certainly seen deer exclosures (fences), herbicide treatments, clearcuts, shelterwoods, and other forest management practices that address C-D-L. Some large landowners, such as forest products companies, timber land investment organizations and Penn State University also implement these sustainable forestry practices. We all need to be implementing C-D-L practices!



Source: DCNR Bureau of Forestry

Our Commonwealth has a vast forest resource. There are 17 million acres of forest in our state. The amount of public forest is actually quite small compared to the amount owned by private citizens.

If you are a private forest landowner, it is imperative that **you** be concerned with the future of **your** forest. If we are going to be good stewards of our children's forest resources, we will need to be sure we are regenerating Penn's Woods. Because of our dependence on forest products for the quality of life we enjoy, we will continue to use our forests. Harvesting will likely be a part of the majority of private forests in Pennsylvania, but it is important that harvesting timber be part of a comprehensive, professional forest management plan. This type of plan will provide custom guidelines that should be followed during the management of your forest. These guidelines will certainly address C-D-L and other important aspects of sustainable forestry. Let's not ignore the needs of future generations and the needs of our future forest. Remember to plan! Remember to invest! Remember C-D-L! Regenerate Penn's Woods!

A sustainably managed forest:

The Competing vegetation on this site was sprayed with an herbicide prior to harvest. A fence was erected immediately after the harvest to exclude Deer. The harvesting method: a shelterwood, which allows the proper amount of Light to reach the forest floor, regenerating a new forest of valuable species.

If you control competing vegetation, reduce deer impacts, and take into consideration the light requirements of the species you are trying to regenerate, you will be successful in establishing and sustaining a new forest.

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