

Best Management Practices

Introduction

The Best Management Practices that follow are divided into three components of forest management: planning, forest operations, and forest values. Planning is essential for successful forest operations and the protection of forest values.

Aerial photographs and county soil surveys are two useful and recommended tools to help landowners and natural resource professionals plan forest management activities. Aerial photographs are available for viewing from Bureau of Forestry county service foresters and at county offices of the Farm Service Agency (FSA, formerly ASCS). You can order your own copies of aerial photographs through FSA offices. County soil surveys are available at county offices of the Natural Resources Conservation Service (NRCS, formerly SCS).

Forest operations include regeneration and tending. Without successful regeneration, the future of the forest is jeopardized. In Pennsylvania, forest regeneration is a critical issue. Tending focuses on the stand—the residual stand as well as the effects of insects, diseases, and fire—and on site quality maintenance, which includes soil productivity and water resources.

Forest values, in addition to the timber, soil, and water resources addressed under forest operations, include aesthetics, wildlife habitats, species of special concern, and unique habitats.

All three components of good forest management emphasize the future of the forest. Landowners must understand that they have the ultimate responsibility for what happens on their land. They also must understand that the effects of their activities can extend beyond their property boundaries. The first step in managing forestland with a stewardship ethic is to develop a working relationship with those who can help you. For landowners, that means working with at least one natural resource professional, such as a forester, wildlife specialist, botanist, or ecologist. For natural resource professionals, it means establishing an interdisciplinary network of colleagues. Forest landowners, natural resource professionals, and timber harvesters all should follow BMPs when planning and implementing land-management activities, and be aware of the short- and long-term effects of those activities.

As stewards, we gather the knowledge of a forest that we need to evaluate both the short-term and long-term consequences of our actions. That knowledge helps us make responsible choices and trade-offs among the alternatives, weighing immediate financial gain against long-term financial and environmental benefits and costs.

Accommodating a variety of wildlife and plant species requires providing them with a variety of suitable growing conditions. Normal forest management operations can be used to develop a mix of age classes and stand structures, and this mixture may contribute to the desired variety of habitats. When landowner goals emphasize particular species, the mixture of stand types and age classes on the landscape will be dictated by the

needs of those species. Both for variety and for particular species, additional special actions can and should be incorporated into the overall plan.

When management plans call for a harvesting operation, special attention to water resources is essential. Water resources are most susceptible to off-site impacts. Heavy sediment loads can travel for miles and adversely affect fish habitat, stream vegetation, and human uses far downstream. Changes in forest cover near streams can cause changes in water temperature, which may result in changes in aquatic plant and animal habitat.

Timber harvesting can result in a major change to the appearance of the harvested area. Frequently this change, especially in areas highly visible to neighbors or the general public, creates opposition to timber harvesting. Landowners and harvesters can modify the operation to minimize the impact of harvesting on the physical appearance of the area. The parties involved need to understand that lower *stumpage* values or lower return to the harvester may result from the modification.

There are other trade-offs that landowners, resource professionals, and harvesters must consider when planning forest management strategies. Improving appearance by removing snags and *cavity trees* may lower wildlife values. On the other hand, retaining snags, dead trees, and cavity trees, while improving wildlife values, may provide operational hazards for the harvester and make it more difficult to operate safely. Familiarity with BMPs can help us recognize the trade-offs and make intelligent decisions about forest management activities.

BMPs are universally accepted activities that have positive effects or minimize negative effects on the forest ecosystem. Their impacts can be limited to individual stands or spread over multiple ownerships. Some BMPs are multipurpose. For example, *buffer strips* along streams designed to control sedimentation can also serve as wildlife travel corridors, result in habitat diversity, and maintain stream water temperature and nutrient levels. The BMPs in this publication are organized to take you through the full range of forest management activities that follow.

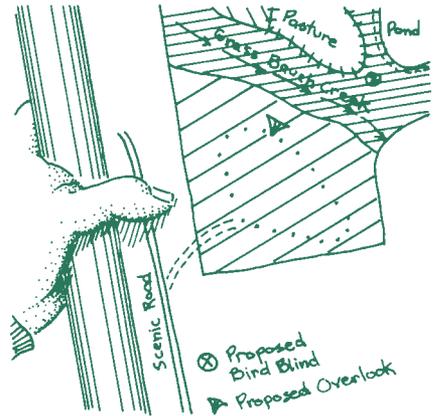
The BMPs provide the basics—minimal acceptable standards—of good forest management, although some landowners may choose to do more. By becoming familiar with the BMPs and using them as a guideline for both short-term and long-term forest management activities, each of us who holds some responsibility for the future of Pennsylvania's forests can become a better steward and contribute to a bright future for Penn's Woods.

Please note that the considerations and concerns, as well as the BMP strategies to address them, are merely a checklist. More detailed information is available in the publications listed at the end of each forest resource management component.

Planning

Objective: To optimize short-term and long-term benefits of forest management activities through adequate planning.

Issue: Management activities undertaken without planning can produce undesirable environmental, economic, and aesthetic consequences.



Considerations and Concerns:

1. Many private landowners are not aware of the values available from their forestland.
2. Many private landowners do not define what they want from their forestland.
3. Many private landowners do not involve resource professionals in forest management planning.
4. Forest management activities, particularly harvesting, are often undertaken for short-term gain, without thought for the forest's future. (See Figure 1, page 8, and sidebar, page 15.)

BMPs:

1. Inventory resources on the property, including general plant/tree communities, water resources (*streams, spring seeps, wetlands, vernal ponds*), soils, and unique areas (*endangered, threatened, or rare species habitat, rock outcroppings, notable views*).
 - a. Initially inventory at a level of detail necessary to address preliminary goals and objectives.
 - b. Later conduct a more detailed analysis to meet specific landowner operational needs, such as harvesting.
 - c. Be aware of how the resources on the property fit in with the surrounding landscape.
2. Landowner, working with a natural resource professional, should identify preliminary goals and objectives.
3. Mark and maintain property boundary lines. (See Regulations Affecting Forest Management: Timber Trespass Law.)
4. Develop realistic goals and objectives based on the resource inventory and available landowner time and finances. Be as specific as possible when enumerating objectives (e.g., does "managing for wildlife" mean creating habitat for a wide variety of wildlife or concentrating on habitat requirements for one or two species).

5. Consider the effects of planned activities on surrounding properties.
6. Create a written management plan based on the resource inventory and landowner objectives. Include a map showing stands or management units and a timetable for completion of recommended activities.

For Additional Information:

Fajvan, Mary Ann. *Pennsylvania Woodlands No. 9: Developing a Woodland Management Plan*. College of Agricultural Sciences Penn State Cooperative Extension, University Park, Pa.

Finley, James C. *Pennsylvania Woodlands No. 3: Resource Evaluation*. College of Agricultural Sciences Penn State Cooperative Extension, University Park, Pa.

Forest Advisory Services. *Directory of Consulting and Industrial Foresters*. DCNR Bureau of Forestry, Harrisburg, Pa.

Forest Advisory Services. *Forest Districts, District and County Service Foresters*. DCNR Bureau of Forestry, Harrisburg, Pa.

Harvey, Helene and James C. Finley. *Forest Stewardship Bulletin No. 6: Planning Your Forest's Future*. DCNR Bureau of Forestry, Harrisburg, Pa.

Jones, Stephen B. and Roe S. Cochran. *Pennsylvania Woodlands No. 11: Managing Your Woodlot with the Help of a Consulting Forester*. College of Agricultural Sciences Penn State Cooperative Extension, University Park, Pa.

Pennsylvania Forest Stewardship Program. *Directory of Resource Professionals Available to Write Forest Stewardship Plans*. DCNR Bureau of Forestry, Harrisburg, Pa.

Forest operations

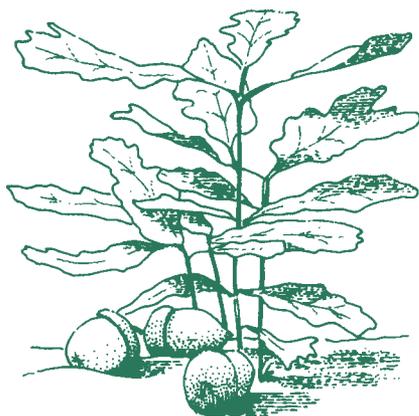
REGENERATION AND RENEWAL

Objective: To ensure that the forest of the future is a productive forest.

Issue: Timber is being harvested without regard for forest regeneration and renewal.

Considerations and Concerns:

1. Pennsylvania's forests are maturing; harvesting should lead to renewal.
2. Preharvest assessment of advanced regeneration and potential problems will minimize the possibility of regeneration failure.
3. Deer are having a major impact on forest regeneration.
4. Pennsylvania forests lack advanced regeneration of desirable species.
5. Once seed sources of desirable species are gone, it is difficult to reproduce a productive forest for the future.



BMPs:

1. Assess advanced regeneration, seed sources for postharvest regeneration, and potential stump and root sprouting.
2. Assess and, if necessary, control competing vegetation such as ferns, grasses, and other undesirable *understory* tree and shrub species.
3. Assess and, if necessary, control the potential loss of seed, seedlings, and sprouts to deer and other wildlife.
4. Provide for regeneration each time harvests are made under the uneven-aged system.
5. Consider the biological requirements of the species you want to regenerate, whether by natural reproduction or planting.

For Additional Information:

Bihun, Yuri, James C. Finley, Stephen B. Jones, and Ellen Roane. *Forest Stewardship Bulletin No. 7: Timber Harvesting: An Essential Tool of Forest Stewardship*. DCNR Bureau of Forestry, Harrisburg, Pa.

Gingrich, Samuel F. and Benjamin A. Roach. 1968. *Even-aged Silviculture for Upland Central Hardwoods*. Agriculture Handbook 355. USDA Forest Service Northeastern Forest Experiment Station, Radnor, Pa.

Grace, James R. *Pennsylvania Woodlands No. 8: Principles of Silviculture*. College of Agricultural Sciences Penn State Cooperative Extension, University Park, Pa.

Grace, James R. *Pennsylvania Woodlands No. 10: Hardwood Management for Economic Return*. College of Agricultural Sciences Penn State Cooperative Extension, University Park, Pa.

Marquis, David A. and Ronnie Brenneman. 1981. *The Impact of Deer on Forest Vegetation in Pennsylvania*. Gen. Tech. Rep. NE-65. USDA Forest Service Northeastern Forest Experiment Station, Radnor, Pa.

Marquis, David A., Richard L. Ernst, and Susan L. Stout. *Prescribing Silvicultural Treatments in Hardwood Stands of the Alleghenies*. Gen. Tech. Rep. NE-96. USDA Forest Service Northeastern Forest Experiment Station, Radnor, Pa.

Perkey, Arlyn W., Brenda L. Wilkins, and H. Clay Smith. *Crop Tree Management in Eastern Hardwoods*. (NA-TP-19-93). USDA Forest Service, Northeastern Area State and Private Forestry, Morgantown, W. Va.

Forest operations

TENDING

Stand—residual stand protection



Objective: To minimize the negative impacts of management activities on vegetation remaining on the site.

Issue: The stand that will remain after intermediate treatments is subject to damage or degradation during forest management operations.

Considerations and Concerns:

1. Intermediate treatments should leave the forest in better condition than it was in before the activity was undertaken.
2. Careless operation of equipment results in damaged trees.
3. Proper planning can minimize the chances of damaging or degrading the residual stand.

BMPs:

1. Focus on protection of the residual stand rather than on the trees being removed.
2. During intermediate operations, retain seed source of species needed to achieve long-term management objectives.
3. Avoid intermediate cuttings that may increase interfering plant communities, such as grasses and ferns, or be prepared to treat interfering vegetation before the regeneration cut.

4. Design and lay out *skid trails* and *skid roads* to minimize damage by avoiding residual trees and using *bumper trees* to protect them from skidding damage.
5. Exercise special care when harvesting trees during the growing season (usually between April and August), when residual trees are most susceptible to felling and skidding damage.
6. Identify and mark unique vegetation to be protected.
7. Ensure that a stand compatible with long-term management objectives remains after intermediate treatments. Instead of selecting for cutting, select for retention:
 - a. species adapted to the site
 - b. trees not likely to develop *epicormic branching* from exposure to increased sunlight
 - c. properly spaced trees
8. Avoid high-grading (page 15).

For Additional Information:

Gingrich, Samuel F. and Benjamin A. Roach. 1968. *Even-aged Silviculture for Upland Central Hardwoods*. Agriculture Handbook 355. USDA Forest Service Northeastern Forest Experiment Station, Radnor, Pa.

Grace, James R. *Pennsylvania Woodlands No. 10: Hardwood Management for Economic Return*. College of Agricultural Sciences Penn State Cooperative Extension, University Park, Pa.

Marquis, David A. and Ronnie Brenneman. 1981. *The Impact of Deer on Forest Vegetation in Pennsylvania*. Gen. Tech. Rep. NE-65. USDA Forest Service Northeastern Forest Experiment Station, Radnor, Pa.

Marquis, David A., Richard L. Ernst, and Susan L. Stout. *Prescribing Silvicultural Treatments in Hardwood Stands of the Alleghenies*. Gen. Tech. Rep. NE-96. USDA Forest Service Northeastern Forest Experiment Station, Radnor, Pa.

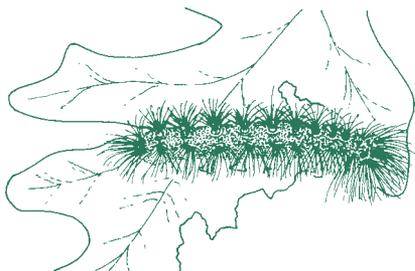
Perkey, Arlyn W., Brenda L. Wilkins, and H. Clay Smith. *Crop Tree Management in Eastern Hardwoods*. (NA-TP-19-93). USDA Forest Service, Northeastern Area State and Private Forestry, Morgantown, W.Va.

Forest operations

TENDING

Stand—insects, diseases, and fire

Objective: To minimize the adverse impacts on forest resources from insects, diseases, and fire.



Issue: Insects, diseases, and fire can make it difficult to accomplish forest management goals and objectives.

Considerations and Concerns:

1. Most landowners and some resource professionals fail to recognize the effects of insects and diseases on forests.
2. Proper management can minimize the impacts of insects and diseases.
3. Landowner objectives may have to be modified to deal with insects and diseases.

BMPs:

1. Monitor insect and disease populations.
2. Take appropriate control measures when insects or diseases are likely to prevent the accomplishment of landowner goals and objectives.
3. Consider increasing species diversity, changing species composition, or changing stand structure to minimize susceptibility to insect and disease attack.
4. Maintain access roads to facilitate fire control.
5. Consider a timber harvest to salvage dead and dying trees.

For Additional Information:

National Acid Precipitation Assessment Program. *Diagnosing Injury to Eastern Forest Trees*. USDA Forest Service, Forest Pest Management, Atlanta, Ga., and Penn State Department of Plant Pathology, University Park, Pa.

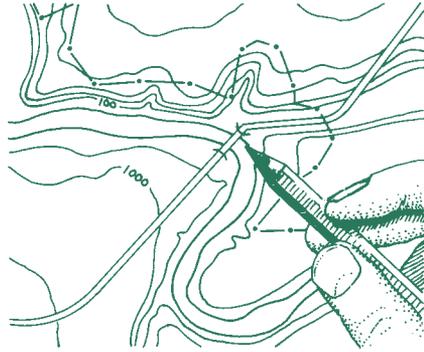
Forest operations

TENDING

Site quality protection— productivity

Objective: To protect the ability of the soil to sustain desired plant and animal communities.

Issue: Operations at the wrong location and during inappropriate weather can damage soil structure and lower *site quality*.



Considerations and Concerns:

1. Current equipment makes it possible to move large volumes of timber in all kinds of weather and soil conditions.
2. Careful removal of forest products can be the key to having a productive forest in the future.
3. Soil compaction inhibits regeneration.
4. Deep ruts can damage roots, which can lead to decay, stain, reduced growth, and mortality.

BMPs:

1. Minimize soil compaction and rutting by matching operating techniques, season of operation, and equipment to soil types and moisture levels.
2. Use soil surveys, topographic maps, and on-site evaluations as guides when planning *log landing*, *skid road*, and *haul road* locations.
3. Modify landing and road locations to reflect actual soil, *parent material*, and topographic conditions.
4. Keep landing and road network at minimum size necessary to remove harvested timber efficiently.
5. Do not contaminate soils with fuels, lubricants, and other chemicals.

For Additional Information:

Brown, Darlene B., ed. 1993. *Best Management Practices for Silvicultural Activities in Pennsylvania's Forest Wetlands*. College of Agricultural Sciences Penn State Cooperative Extension, University Park, Pa.

DEP Bureau of Land and Water Conservation, Cambria County Conservation District, and College of Agricultural Sciences Penn State Cooperative Extension. *Controlling Erosion and Sedimentation from Timber Harvesting Operations*. 1992. College of Agricultural Sciences Penn State Cooperative Extension, University Park, Pa.

Forest operations

TENDING

Site quality protection—water resources



Objective: To minimize the movement of soil into water resources during forest management operations.

Issue: Erosion and sedimentation from forest management activities can affect water quality.

Considerations and Concerns:

1. Operations that affect soil and water are regulated by law. (See Regulations Affecting Forest Management Activities: Environmental Regulations.)
2. Small changes in the operation can eliminate many of the negative impacts.
3. Forested wetlands are often difficult to identify, especially during dry seasons.

BMPs:

1. Comply with all provisions of Chapter 102 and Chapter 105 of the Clean Streams Law and the Dam Safety and Encroachments Act, respectively. (See Regulations Affecting Forest Management Activities: Environmental Regulations.)
2. Design roads to shed surface water quickly.
3. Design roads and landings to prevent or divert surface water flow.
4. Avoid locating roads and landings on *seasonally wet* soils.
5. Consider slope when laying out roads and landings.
6. Provide adequate riparian buffers between disturbed areas, such as roads or landings, and streams or wetlands.

7. Bridges and culverts are the preferred methods of crossing *intermittent* and *perennial* streams. When *fords* are used for truck crossings, stabilize the bottom with clean rock.
8. Cross wetlands only when absolutely necessary.
9. If forest operations necessitate taking heavy equipment into wetlands, conduct those operations, whenever possible, during the driest periods or when the wet area is solidly frozen.
10. Do not skid through water courses or spring seeps.
11. Do not contaminate water bodies and soil with forest management chemicals and petroleum products.
12. Retire the road network properly at the completion of operations.

For Additional Information:

Brown, Darlene B, ed. 1993. *Best Management Practices for Silvicultural Activities in Pennsylvania's Forest Wetlands*. College of Agricultural Sciences Penn State Cooperative Extension, University Park, Pa.

DEP Bureau of Land and Water Conservation, Cambria County Conservation District, and College of Agricultural Sciences Penn State Cooperative Extension. *Controlling Erosion and Sedimentation from Timber Harvesting Operations*. 1992. College of Agricultural Sciences Penn State Cooperative Extension, University Park, Pa.

Welsch, David J. 1991. *Riparian Forest Buffers: Function and Design for Protection and Enhancement of Water Resources*. NA-PR-07-91. USDA Forest Service, Northeastern Area State and Private Forestry, Radnor, Pa.