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CHAPTER I

GENERAL GUIDELINES

I. Management Objectives

A. To promote and establish and maintain desired landscape conditions.

The timber harvest scheduling model prescribes desirable landscape conditions by promoting a balanced forest age-class distribution while also ensuring areas of older forest (extended rotations) and age diversity within forest communities. In most forest districts, it will take approximately 140 years to develop a balanced age-class distribution given the current age structure of the state forest and the Bureau of Forestry's (BOF) planning objectives. Implementing the timber harvest allocation goals is an indication of progress towards this goal. A continuous forest inventory program helps monitor the forest's age structure, forest community mixtures, habitat diversity, structural diversity, and other forest characteristics.

B. To maintain and develop naturally reproducing forest communities.

Act 18, Section 319 (2) (c)—created dedicated funds for the BOF to use for regenerating the forest on state forest lands. These funds shall be used in a wise manner to:

1. Ensure natural regeneration

2. Develop artificial regeneration in sites that lack a seed source (overstory mortality), and

3. Rehabilitate sites that have previously failed to regenerate to a viable forest condition.

The 20-year post harvest summaries report stocking, species composition, diameter distributions of reproduced stands, helps analyze changing forest conditions, and evaluate past practices.

C. To provide economic and social benefits through a sustained yield of forest products.

The timber harvest allocation goals project a consistent and sustainable harvest of wood volume. The timber harvest allocation model constrains the flow of harvested volume between adjacent 10-year planning periods. For most district plans, the total wood volume harvested does not decrease by more than 1% from one 10-year period to the next and does not increase from one period to the next by more than 10%.

D. To determine appropriate, sustainable timber harvest levels.

Sustainability concerns are addressed in the timber harvest allocation model through consistent supply of wood volumes, stable projection of harvest revenues, sustained workloads over time, and habitat diversification. The current age structure of the state forest is unregulated because there is a large, disproportionate amount of acreage in the 60 to 100 year age-classes, and relatively little acreage in other age classes. This structure cannot be sustained over the long term. The BOF is targeting a balanced age-class distribution converting the forest into a more regulated and sustainable state.

E. To demonstrate and promote silvicultural practices that sustains ecological and economic forest values.

Timber sales must be done in a sustainable, ecological and economic responsible manner. This means that every effort should be made to ensure that the next rotation should be as or more desirable in composition, achieving both the economic and ecological stand points. Pre-harvest, harvest, and post harvest practices should be employed to promote and protect natural regeneration that achieves this goal, and artificial planting should only be used a last resort after other options have been explored. Economics must be considered and below costs timber operations are strongly discouraged unless a sound ecological reason exists. Ecological include but are not limited to promoting rare plants or tree species, or encouraging habitat that supports rare or endangered species. In these instances ecological goals will have an intrinsic value greater than monetary values and a course of action taken to promote rare species or rare landscape conditions may be considered.

II. General Rules and Regulations

A. A thorough knowledge of the district's resource plan and silviculture manual is necessary for the implementation of sound silvicultural practices to achieve state-wide and district specific goals. Variances from the goals established in the resource plan or in the silviculture manual will require written waivers from the Silviculture Section, the planning section and in some instances, the State Forester.

B. The Silviculture Section will be responsible for approving, coordinating and overseeing all secretary sales (Sales sold on an FMT-7 and in excess of $10,000 minimum bid value) and ensure that districts maintain a sound scientific and data based approach to silvicultural activities on the landscape in a sustainable manner.

C. The Silviculture Section in conjunction with a state-wide regeneration committee will oversee and coordinate the wise, ethical and scientific use of the regeneration fund to ensure a healthy forest and promote forest regeneration and diversity within the constraints of district and state-wide resource objectives.

D. The Silviculture Section must approve all timber sales in values of excess of $10,000 for "green" sales and $20,000 for "salvage" sales. Written approval must be obtained from the Silviculture Section Chief before sale

marking can commence for sales of excess of these values. Sale of live timber under $10,000 or Salvage sales less than $20,000 may be sold on an FMT-4 District Contract and are subject to competitive bidding procedures cover under the "District Contract" portion of this manual. Timber sold in values less than $3,000 may be sold directly, and negotiated to any party on an FMT-15 permit, with out bidding.

FM-T-4

$20,000 limit for salvage of dead timber or right-of-way timber
$10,000 limit for all other timber
$3000 or more - Sealed Bids required
$1000 to $3000 - Verbal or written attempt to solicit bids from at least three prospective bidders
Less than $1000 - May be sold without bidding at not less than fair market value

FM-T-15

$3000 limit
$500 0r greater - Must be signed by District Forester

E. In order to secure permission to conduct timber sales, management foresters must submit a timber sale proposal for each sale area, through and with the approval of their District Forester. Proposals are required for **all** secretary sales and any district contracts which will **produce a silvicultural treatment and/or are tracked by the harvest allocation model.** Sale proposals should contain the following elements, at minimum:

1. A current stand analysis which reflects the current stand conditions for each separate, individual and non-contiguous treatment type within the sale area. The most recent edition of SILVAH is the recommended program for achieving a standard analysis and prescription. Other programs and prescription writers may be used after consulting with the Silviculture Section to determine their validity. Deviations from the resulting prescription must be justified in detail in the sale proposal and approved by the Silviculture Section;

2. A map of the sale area. The boundary of each sale must be surveyed using GPS equipment. The surveys must break out acreage per treatment, where applicable, as well as total sale area. Sale boundaries should be irregular in shape and blend among terrain and stand types as much as possible to help aesthetically feather the sale into the landscape;

3. A current (date of run within one calendar year of date on proposal) PNDI (Pennsylvania Natural Diversity Index) review. No management activities may proceed unless the review produced no species of concern. In searches that produce species of concern, consultation with the Bureau's Ecological Services section for avoidance and mitigation measures will be necessary prior to approval;

4. A site-specific soils analysis; and

5. Any miscellaneous correspondence relating to sale-specific issues which may arise, such as PHMC reviews, notifications to forest leased camp owners, notifications for Oil and Gas Leased Tract operators, notifications to natural gas, oil or electric right-of-ways, etc.

F. When timber is marketable for more than one product, it is to be sold as the product with the higher value.

G. No more than one operator shall be active on a timber sale at one time. No more than one operator shall use a haul road at any one time. This may be waived by the district forester. The joint use of state forest roads by timber sale operators or other contractors should be avoided whenever possible. In some districts this is an unavoidable situation, and when damage occurs to a road used jointly between operators, the District Forester shall use their judgment to decide who is responsible for what repairs on the road.

H. No trees may be felled until they have been properly marked and paid for.

I. All training and experience of a Forester culminates in the practice of timber resource management. Only professional foresters, those individuals working in the Civil Service Classification of "Forester", may set up and prescribe silviculture treatments, and administer timber sales with the exception of dead and damaged trees sold by an FMT-15 (wood cutting permit), and prescribe regeneration fund projects. However forest technicians trained in BOF resource guidelines and policies may perform any field or office work associated with timber sales, regeneration projects or any other resource management related activity as long as they are under the supervision of a forester, assistant district forester, or district forester. The supervising forester will assume ALL responsibility for seeing the work is done correctly, accurately, and professionally by the forest technician.

J. Potential timber sales, barring response to naturally occurring disturbance events, are initially identified as part of the compartment exam process. Scouting is the next step in setting up timber sales and regeneration projects. Proper scouting will allow a forester to avoid costly mistakes and to save valuable time in marking and an administration. It will also allow a forester to gain a thorough knowledge of the landscape where a proposed treatment is to be placed and decide how best the sale objectives will fit in with the overall landscape objectives.

K. The purpose of scouting is to determine what stands will receive silviculture treatments. Also in the scouting phase, economic feasibility of logging, block boundaries, skid and haul road layout, access, and the cost/benefit of any treatments should all be weighed to determine the validity of any management activities. These activities should be in agreement with landscape, district, and statewide objectives.

L. All regeneration fund projects must be submitted via an FMT-34 form, submitted to the regeneration database and approved by the Silviculture Section and the Regeneration Committee before any project can be implemented.

III. Allocation

In 2003, the BOF developed a timber harvest allocation model for each forest district in partnership with The Pennsylvania State University, School of Forest Resources. The timber allocation model determines 10-year (decade-level) harvesting goals for each district, as well as the state forest system as a whole. These goals are further broken down by forest type, site class, stocking level, and treatment. Annual allocation goals for each District are subsequently derived from the 10-year goals. Annual goals are operationally useful for keeping the BOF on track with the decade-level goals. Salvage acres are not scheduled in the model because it is impossible to predict how much natural disturbance will occur in the future. Salvage areas are tracked only if they result in a traditional silvicultural treatment, such as a salvage-improvement, salvage-shelterwood, salvage-overstory removal, etc.

The timber harvest allocation model addresses sustainability concerns by prescribing a consistent supply of wood volumes, providing a stable projection of harvest revenues, estimating workloads over time and ensuring habitat diversification. The current age structure of the state forest is unregulated, with an excess of acres in the 60- to 100-year age classes and relatively little acreage in younger ages. This structure is not ideal towards fulfilling the Bureau's goal of providing a sustained flow of forest products and ecological values over the long term. The desired future condition is a balanced age-class distribution, resulting in a more regulated and sustainable state in our commercial landbase.

The harvest allocation model should help prevent past practices that focused on the best sites while neglecting projects and treatments in fair to poor sites. The current model prescribes an even distribution of cuts across all types in a district. Although annual harvest may vary, the average by forest type and site class acres harvested should be targeted to achieve the 10--year harvest goal within type, site, and stocking classes. While the model focuses on regeneration acres, it may be necessary at times to exceed annual goals in order to bank stands in a shelterwood or some other preparatory cut in order to have enough acres ready for annual overstory removal cuts. Each district should evaluate their own needs for the amount of shelterwood acres that are necessary to achieve goals. Tracking the percentage of overstory removals that require shelterwood over time, should allow for accurate adjustments to assumptions utilized in running the model and subsequently to allocation goals for the length of the ten-year planning cycle.

The harvest allocation tool is merely that; a tool to help with planning of timber sales and annual operating plans. It does not, and should not supersede or replace sound professional judgment, experience, and knowledge of the district. It is not intended to restrict a district in flexibility of action. Deviation from the annual harvest goals may occur in the event of large salvage operations, where it is very necessary to remove timber of value prior to degradation. Large salvage events will require deviations from the projected harvesting plan. In these cases the district should contact the Planning and Silviculture Sections to discuss the necessity of re-running the model for their district. In addition any problems a district may foresee in meeting harvest goals should be addressed to the Planning and Silviculture sections for a possible adjustment in the district harvesting model. Large land acquisitions will require new harvest projections as well. Allocation goals are available in each district resource plan available on intraforestry.
http://intraforestry/silviculture/reports/06+HarvestGoals.pdf

IV. Landscape Examinations

Compartments will be used as the base land area for Landscape Narratives and Management. Several compartments or parts of compartments may make up a Landscape. This is to examine a specific ecosystem and its management objectives on a landscape wide basis. It is here that specific use goals such as timber management, watershed management, wildlife species management, aesthetics, and management for species of concerns should all be set and defined for each landscape. 1/15th of all compartments should be examined each year. As much as possible, compartments should be scheduled to capture single landscapes, instead of several compartments scattered across several landscapes. Individual Landscape narratives should be written upon completion of all compartment exams with in it.

Compartment exams are important in planning, timing, and location of timber sales. Site class and species in each landscape should define specific regeneration management goals. The level of successful regeneration for timber sales can be measured against the landscape goal for each stand to see if the objectives were met. Areas with regeneration, mortality, inhibiting vegetation, and deer impact should all be recorded at the landscape and compartment levels and used to aid planning. Species of concern and wildlife concerns should also be factored into the location and planning of timber sales.

Compartment exams should also be used to update stand typing and typing maps. Procedures, forms, and manuals for landscape exams can be found on the intraforestry web site at: **http://intraforestry/planning/planning.aspx**

V. Zoning Classifications (explanation of timber typing)

Understanding the districts typing layer is important when planning timber sales and conducting compartment exams. The BOF uses a 6-digit designation for the typing of stands. An example is the MAR22C stand classification. This would be a multiple use, Red Oak, Site class “2“, Size Class “2”, Commercial stand. Below is a brief explanation of how to interpret these codes.

The first letter being used is to describe the management zone of the specific stand. Major classification that effect resource management include but are not limited to: “M” being multiple use, “B” are stands that are buffering a landscape feature and “L” being limited. Limited use means a site has some sort of limitation that may restrict its use due to physical features. These factors include but are not limited to excessive slope, wet areas, lack of accessibility, and rocky terrain. It has nothing to due with commerciality of the timber in the stand. Buffer stands can be both functional, such as those used to protect streams, or aesthetic, such as those used to protect the scenic quality of trails or roads. Buffers vary dependent upon the feature and its sensitivity being protected. “M” stands are those stands where many management activities may take place and where most of the even aged stand management and silvicultural activities will occur.

The second and third letters in a stand designation are the description of the forest type or land use. Currently there are over 37 different forest type or land use designations. For practicing foresters review the typing manual for familiarity of the more common timber types in your specific district. There is a link for the typing manual available on the intraforestry web site at http://intraforestry/planning/planning.aspx

The fourth letter in a stand classification is the site class. Site classes are numbered 1 (the best), 2, and 3 (the poorest site classification). Bureau of Forestry Site classes are calculated as follows:

A. Site 1. Dominant and co-dominant trees have a projected merchantable main stem of > 50 feet at maturity (> three 16-foot logs). Total tree heights average > 80 feet at maturity.

B. Site 2. Dominant and co-dominant trees have a projected merchantable main stem of 30-40 feet at maturity (2-2½ 16-foot logs). Total tree heights average > 65 feet but < 80 feet at maturity.

C. Site 3. Dominant and co-dominant trees have a projected main stem less than 30 feet at maturity (< two 16-foot logs). Pitch pine and white pine may yield 30+ feet of projected main stem at maturity (two 16-foot logs). Total tree heights average < 65 feet at maturity.

Size class and stocking is covered in the fifth letter of the designation. 1 through 4 represent a fully stocked stand of varying sizes, while 5 though 8 represent the same sizes but stands that are under stocked. Size classes 1 and 5 represent large sawtimber stands, size classes 2 and 6 small sawtimber stands, 3 and 7 pole stands, and 4 and 8 sapling stage or smaller. Below are the diameter classifications for differing size classes:

1 Majority of the dominant and co-dominant trees are > 18” Dbh and > 50% stocked.
2 Majority of the dominant and co-dominant trees are12-18” Dbh and > 50% stocked.
3 Majority of the dominant and co-dominant trees are 6-12” Dbh and > 50% stocked.
4 Majority of dominant and co-dominant trees are < 6” Dbh and > 50% stocked.
5 Majority of the dominant and co-dominant trees are > 18” Dbh and < 50% stocked.
6 Majority of the dominant and co-dominant trees are12-18” Dbh and < 50% stocked.
7 Majority of the dominant and co-dominant trees are 6-12” Dbh and < 50% stocked.
8 Majority of dominant and co-dominant trees are < 6” Dbh and < 50% stocked.

The last letter in the designation is either “N” or “C”. “C” designations are commercial stands that posses enough value and wood volume to be operable for timber sale operations. “N” designations are noncommercial stands that either do not posses enough volume or monetary value to be considered merchantable, or are located in areas restricted to sale operations. These areas include natural areas, wild areas, some trail buffers, special resources, or areas where aesthetics are the highly regarded.

Below are some examples of typing classifications:

1. MCC32C would be a (M)multiple use, red maple stand type (letter classification from the typing manual) site class 3, size class 2 (C)commercial stand.

2. MAR22C would be a (M)multiple use, red oak stand type (letter classification from typing manual) site class 2, size class 2 (C)commercial stand.

3. BDD13N would be a (B) buffer, aspen stand type, site class 1, size class 3, (N) non-commercial stand. It is possible the stand may be non-commercial due to insufficient volume or because it may be in an area where timber operations are not permitted.

4. LAD22C would be a (L) limited dry oak, site class, 2 size class 2 (C) commercial stand. The pairing of the L & C zones often means a sale is commercial but the site may not be operable due to steep slope, or limited access. There are no restrictions on conducting sales on these sites, but often it means extreme operability measures such as air lifting logs, or extensive road work are required.

VI. Silviculture Definitions

It is necessary when prescribing treatments that a set of uniform and consistent definitions should be used. When prescribing silvicultural treatments the following definitions should be used for consistency.

A. Crop Tree—An intermediate treatment in which the focus is on specific "crop trees," as many as 50 to 60 per acre, which will be carried forth to the final harvest. Crop trees are usually freed from competition by removing trees on three or less sides that are suppressing or touching their crowns. This is done to effect a desirable change in species composition, accelerate growth and/or to increase a tree's survivability to the final harvest. This is performed in stands that are past the sapling stage and before final harvest. This treatment is performed relatively early in the rotation (20-50 yrs) and usually before trees are of economic size.

B. Improvement Cutting—An intermediate treatment (after establishment of the new stand and prior to final harvest) is conducted to remove trees that will improve residual stand composition and improve residual tree quality, improve residual tree quality and where the intention of the harvest is not to establish natural regeneration. The goal of this treatment is to expedite growth of higher quality trees by allowing more light and nutrients to residual trees by reducing competition. This is a non-reproductive treatment and the stand's residual basal area should be at least B level stocking or greater.

The difference between this and a crop tree treatment, is that this type of treatment is performed later in the rotation and through a commercial sale.

C. Shelterwood — The attempted establishment of a new, cohort of natural regeneration from the partial

removal of the overstory. A shelterwood harvest may be a single treatment or be done in a series of shelterwood cuts to ensure that adequate seed source is retained and light levels are manipulated to allow the establishment or promotion of a target species or group of species. The essential characteristic is that the new stand is being established naturally or artificially under the overstory or the "shelter" of the original stand. The characteristic difference between this cut and a seed tree cut is that a relatively contiguous canopy is retained (approximately ≥40 BA) and most often species regenerated under this system are moderate to shade tolerant species. Once advanced regeneration is established, the overstory is removed.

Goals of a Shelterwood

1. A preparatory cutting designed to foster the potential seed producers, with additional trees retained to meet the Bureau's reservation guidelines.

2. Controlling light levels within the stand to allow specific species of new seedlings to become established with additional trees retained to meet the Bureau's reservation guidelines.

D. **Seed Tree Cut —** The attempted establishment of a new, essentially even-aged, stand from the partial removal of the overstory. Scattered genetically superior trees are retained for seed production and seedling establishment, while removing most of the overstory. Usually less than 40 BA is retained to allow almost full exposure of a site to sunlight. Species that are shade intolerant and wind dispersed usually benefit under this type of cut. Once advanced regeneration is established the seed trees are removed.

E. **Overstory Removal —** The complete removal of the overstory to release established advanced regeneration. The differentiating factor between this cut and a "clear cut," is that advanced regeneration is present and established with at least 50% stocking of the site. On State Forest Lands, residuals are required to remain on all overstory removals. 10-20 square feet of basal area per acre must be retained. Overstory removals on State Forest Lands are referred to as "Overstory Removals with Residuals".

F. **Clearcut —** The complete removal of the overstory, in the absence of advance regeneration. Regeneration may be dependent on natural seed, either banked or wind dispersed, root suckers, stump sprouts or from artificial plantings. The differentiating factor that sets this cut apart from an overstory removal is that less than 50% of the site is stocked with adequate advanced regeneration and relies is seedlings or sprouts that will become established after the cut. Clearcuts, as in overstory removals on State Forest Lands, 10-20 square feet of basal are must be reserved per acre. Clearcuts on State Forest Lands are referred to as Clearcuts with Residuals.

G. **Two-Aged Harvest —** The final overstory removal or clearcut in a stand in which a significant portion of the stand will be retained until the next rotation. Usually 20 to 30 square feet of BA is retained in oak stands and 10 –

20 BA in northern hardwood stands. The residual stand is not removed upon successful regeneration, but instead carried as an older age class (creating two distinct age classes on the same site) well into the next rotation, and usually removed before the next age class reaches maturity.

H. **Two-Aged Shelterwood —** This treatment is a preparatory cut for a two aged harvest. A shelterwood treatment or treatments performed in a stand to establish or promote advanced regeneration, once there is seedling establishment a two-aged harvest will occur.

I. **Single Tree Selection —** A harvest in which the desired goal is to create an all-aged stand by removing a uniform number of trees from each age class in an uneven-aged stand or size class in an even-aged stand. This leaves an inverse j-shaped curve for diameter distribution, creating space for the establishment of new seedlings and increased growth of remaining trees.

J. **Group Selection—**A treatment in which the desired outcome is to create an uneven-aged or all-aged stand structure over time, by performing small group overstory removals or clearcuts, creating patches or groups of younger trees. Through time, the entire stand is removed in groups (3 or 4 harvests spaced 20–30 years apart) creating patches of several age classes through out the stand. The rule of thumb is twice the height of the standing trees for openings and smaller opening for more shade tolerant species, and larger openings for more shade intolerant regeneration.

K. **Salvage Harvest —** A harvest conducted strictly as a salvage operation in which only dead and dying trees are harvested while they still retain a degree of economic value, or in conjunction with other treatments in which the goal is both economic salvage and a silvicultural goal such as salvage-overstory removal, salvage-shelterwood, salvage-improvement, etc. Sales in which 20% or more of the volume being removed is dead or dying should be classified as salvage, or salvage along with any other treatment being implemented.

VII. PA Natural Disturbance Regimes

A. Introduction

When evaluating stands, and prescriptions, disturbance history both natural and man-made, must be taken into account as to “why’s” and “how’s” the current stand developed into its current state. This same thought to disturbance is the reason our forests have developed as they have on a particular site and should be duplicated as closely as possible to develop similar natural stands. Both small scale and large scale disturbances have influenced the development of our eastern forests.

B. Disturbances

Wind, more than any other natural disturbance, has affected almost all timber types across the state of Pennsylvania. Both blowdown events and the absence of these events have influenced the type of species that grow on any given site. According to researchers at Harvard University small scale wind disturbances are the most common. In a study conducted it was found that "relatively small-scale disturbance predominates were chosen in several old-growth mesic forests in the eastern United States. Canopy openings covered 9.5% of total land area. New gaps were formed at an average of 1% of total land area per year; old gap area closed at a similar rate primarily by sapling height growth." This type of disturbance can be best achieved with single tree selection, and in some of the larger gaps through group selection. This type of disturbance will best be suited for stands where un-evenaged management and shade tolerant species are the primary focus.

More moderate disturbances occurred at less frequent intervals of approximately 20-30 years. In a study conducted at it was found that white pine and quercus species were recruited in small numbers in gap openings created by wind and/or fire. In many ways this can be duplicated through group selection of ½ to 1 acre openings. This is most important for shade intolerant species, and species of moderate shade tolerance.

Larger openings such as overstory removals and clear cuts are based on larger, rarer catastrophic events. Mostly wind and fire had shaped the North American Forests prior to European Settlement on a large scale. The effect of catastrophic winds on a forested landscape in central Massachusetts was examined to investigate the factors controlling the geographic pattern of damage. The study area, Tom Swamp Tract, also in Harvard Forest, comprises a valley and adjoining hill slopes supporting second-growth hardwood and conifer stands. Much of the study used records and maps that were analyzed cartographically with a geographic information system (GIS). Forest damage was distributed fairly evenly among different damage classes ranging from no damage to more than 75% of stems broken or uprooted. Damage exhibited a continuum ranging from minor damage of individual trees to extensive blow-down of broad areas of forest. It is believed that Pinus and Quercus were maintained in this stand during the 18th and 19th centuries by periodic disturbance, in particular fire, which would have eliminated later successional species.

According to dendrochronology work done by Dr. Abrams at Penn State, fire shaped much of our oak-hickory-chestnut forests prior to European settlement. Native Americans used fire on a wide spread basis to improve visibility around villages, reestablish rubus for berry production, and use in driving wild game for huntng. In some instances, research has shown that fires may have covered or spread to two or three counties in scope.

Large catastrophic events are still effecting our forests and species composition and it can be seen in several larger events in the past 20 years. The 8,000 acres of blowdown that occurred on the Michaux State Forest in 1993, the tornado in the Tionesta Scenic Area in the late 1990's and the Two-rock Run Fire that burned 10,000 acres in the Sproul State Forest, are but a few examples of continuing large scale disturbances. Frequency to these events occurs about every 100-1,000 years. Islands and individual trees should be retained, since rarely are 100% of the stems laid down in a blow down or killed in a fire. Patches of the original stand always remain and our cutting practices should reflect this in overstory removals and clear-cuts.

When looking at Pennsylvania Forests, one of the largest disturbances of all has done more to shape our current overstory than any other: European Settlement. Exploitation in the early part of the last century resulted in

almost all of Pennsylvania's forest being cut and large catastrophic fires followed. In the almost complete absence of deer, an even-aged forest of pioneer and shade intolerant species developed resulting in forests that are almost all with-in 30 years of age across the state. As result, pitch pine and oak hickory types exist where white pine may have been in pre-colonial settlement. On the plateau, cherry and red maple occupy sites that stumps and historical records suggest was dominated by hemlock and beech.

Introduced pathogens and insects have also changed the composition of our forests. Gypsy Moth has reduced the oak component in many stands, beech scale complex has reduced beech to an understory thicket in many places, and hemlock wooly adelgid is eliminating an extremely important species for cold water fishery protection. In almost all cases, another species has moved to occupy the niche abandoned by a previously more prolific species. Chestnut Blight eliminated the American Chestnut as a viable component of the ecosystem, and it is estimated that Chestnut oak has moved to occupy much of the site American Chestnut once dominated, yet it is estimated by Dr. Abrams, that chestnut oak have only occupied 1% of the pre- colonial forests.

C. Other Factors

The absence of disturbance has also affected the natural regeneration processes of our Pennsylvania Forests. In the mid 1900's in an effort to protect small deer herds, doe hunting was eliminated resulting in an artificial inflation of the population. At the same time, total fire suppression was instituted. This has resulted in species that were once small components of the landscape to become more dominant in the understory. Species that are not extremely palatable to wildlife and are not suited to a fire regime such as black gum, red maple and striped maple now grow densely in much of our understory forests. In some cases the situation is so extreme that many forests lack a shrub layer altogether. Due to this "unnatural condition", foresters must sometimes resort to "unnatural techniques" such as deer fencing to protect desirable regeneration and rare plants, and herbicide to reduce competition from species that historically did not dominate our forests.

D. Management Implications

Although, we can never go back to pre-colonial conditions, our management plan seeks to rectify some of the current out-of-balance dynamics. The even aged condition created by the past era of exploitation by balancing the age classes across all types and all stands. A forester should first consider what the best end result for the stand is as it pertains to the context of the management plan and the landscape exam, and then deem what management practice bests fits to achieve that end. As much as possible, this should mimic natural disturbances. Cutting should be used to replicate mortality created by wind throw, fire, or insect outbreaks. Also, fire has been reintroduced as a viable, "natural" management tool. This can be used to great effect on the existing understory. Often this will involve the larger even-aged cuts, but spread across the landscape by time and space to create various age classes. Often management will involve the larger even-aged cuts, but spread across the landscape by time and space to create various age classes throughout. This is due to uneven aged cutting being more difficult to implement due to economies of scale, and more difficult to regenerate due to deer pressures and the sheer

intensity it would take to be in a stand every 5 or 10 years. Emphasis should be on diversifying the stand and movement from a monoculture that may have resulted from previous man-made catastrophic events.

Below is a chart displaying frequency and events in relation to size of disturbance. These are examples that should be incorporated when making landscape based decisions for stands and reasons for possible stand development. It is a reason why something may have happened and a timber type developing where it did. These disturbances should be mimicked as much as possible in the appropriate timber type when planning silviculture operations.

Disturbance Event	Size	Frequency	Forest Type	Treatment that mimics event
Wind (small scale)	Single tree to several acre patch openings	10-30 years	Northern hardwood climax species/hemlock/white pine	Single Tree Selection/Group Selection
Fire (light intensity)	Single tree to 1 acre patch openings	10-30 years	white pine/ oak-hickory	Single Tree Selection/Group Selection
Tornado	25-1000 Acres	100-1000 years	Oak-hickory/northern hardwood early successional species/hard pine/white pine	Seed tree/overstory removal/clear-cut
Wind (Large)	25-8000 Acres	100-1000 years	Oak-hickory/northern hardwood early successional species/hard pine/white pine/yellow poplar	Seed tree/overstory removal/clear-cut
Fire (Large intensity)	30-10,000 Acres	100-1000 years	Oak-hickory/northern hardwood early successional species/hard pine/white pine	Seed tree/overstory removal/clear-cut
Native Insect Outbreak (light mortality-canopy gaps)	10,000-100,000 Acres+	100-1000 years	Northern hardwood climax species/hemlock/white pine	Single Tree Selection/Group Selection
Native Insect outbreaks (Heavy mortaility/ wide spread canopy removal)	10,000-100,000Acres+	100-1000 years	Oak-hickory/northern hardwood early successional species/hard pine/white pine/yellow poplar	Seed tree/overstory removal/clear-cut

VIII. Even-aged Management: Reproduction Cuts and Methods

A. Nearly all of Pennsylvania's State Forest land base consists of second-growth forests established as a result of wide spread timber and charcoaling industries of the late 1800's and early 1900's. As a result, most of the forest types are even-aged. In addition many of the desirable tree species found currently in our forests, both from a timber and a wildlife perspective, regenerate best in full sunlight conditions. Perpetuation of our current timber types is most effectively accomplished through the use of even-aged management strategies. Most of the goals set forth in the harvest allocation model will be achieved through the practice of even-aged management. Stands typed M&C, or L&C may be treated with even-aged methods. Reproduction cuts are those cuts designed to replace an older age class stand with a younger one. This includes overstory removals, clear cuts and seed tree cuts.

Reproduction cuts should be applied along the priorities listed below. Ideally, these cuts should fall with in the constraints of the harvest allocation model and occur within targeted acreages for types and site classes to be cut. Widespread deviations from the harvest allocation model should be avoided unless district wide salvage events, significant changes in typing, land acquisitions or natural disturbance require a flexible course of action.

1. Stands that have suffered significant mortality due to insects, disease, fire, wind, drought, or other environmental stresses that result in an understocked condition after salvage operations should be given highest priority. Where it is economically feasible to do so, salvage operations should have precedence over other stands as time is of the essence in both recovering the maximum value and establishing regeneration before an undesirable stand condition develops. If it is possible to regenerate these stands naturally, regeneration harvests should be planned to remove the overstory and release regeneration to sustain a naturally reproducing forest. Shelterwood or seed tree cuts should be the second option if in the professional judgment of the forester enough vitality and seed source exist in the overstory to establish regeneration. If enough seed source does not exist to regenerate the stand, artificial means (planting or direct seeding) may be necessary to establish regeneration in the stand.

2. Stands that fall within the harvest allocation model schedule for regeneration and have adequate naturally occurring regeneration should be given a high priority. Taking advantage of areas with adequate regeneration that are in line with harvest goals should be done. Areas with established regeneration don't require the investment associated with trying to develop regeneration. Areas of existing regeneration of adequate stocking levels tend to be ephemeral; therefore they should be taken advantage of before the opportunity is lost.

3. Stands that fall within the harvest allocation model and are low quality sawtimber. Immature stands that do not have adequate acceptable growing stock should be moved towards regeneration and stand re-establishment.

4. Stands that are over mature and fall within the harvest allocation model should be moved towards a regeneration sequence or harvest. Maturity is defined by SILVAH as stands that have a mean stand diameter of 18 inches or greater.

5. Tree condition and vigor has declined in stands with adequate acceptable growing stock where improvement harvesting will most likely not result in increased growth or yield. Tree core samples will be the best indication of the annual yield and growth of a stand and this data should be included in a proposal where this reason is the governing motivation for stand regeneration.

6. Stands that do not fall into the above categories, but are needed to reach harvest allocation or landscape and compartment goals. The objective of establishing a balanced age class system with in our state forests and in the interest of sustainable yields warrants that some stands may be cut before reaching maturity. This should only be the case if stands meeting the previous criteria have been exhausted.

B. Reproduction cuts should be made irregular in shape, greater than 10 acres in size, should not isolate small pockets of standing timber that will be too small to manage in the future, and should not exceed 70 acres in size (50 acres for districts 19, 4 and 1). Permission to exceed acreage limits may be granted by the Planning Section Chief with sufficient written explanation for exceeding the acreage limit. These may include but are not limited to salvage operations, the need to expand sale size to make remote sales valuable enough to carry road costs, the need to keep from isolating small pockets of standing timber, or to take advantage of exceptional regeneration that may exceed the boundaries of acreage size limits.

Even-aged cuts result in most of the overstory being removed. Reservation guidelines should be adhered to, and are mentioned in the reservations guidelines heading later in this section. To proceed with a reproduction even-aged cut, at least one of the following objectives must be deemed attainable to proceed.

1. Ample advanced regeneration of *desirable* species and condition is already present. Desirable regeneration will be defined in compartment exams for each individual forest type and site class within the compartment. When a stand posses 70 percent stocking for desirable advanced reproduction, sprout potential, and saplings or a combination thereof: then the stand possesses enough regeneration for the overstory to be removed with reasonable chance of success. This is based on the required amount of stocking for SILVAH to qualify a site as fully stocked.

2. There is a high probability that desirable regeneration will become established immediately following the removal of the overstory, either from the soil seed bank or sprouts. Shelterwood and seed tree cuts can be used to establish regeneration in areas where regeneration is lacking.

3. The stand has degraded to the point due to mortality, insect or disease infestations, age, fire or any other

natural disturbance where adequate seed source is lacking and removal of the overstory is warranted for salvage purposes. In this case, if desirable regeneration is lacking and/or not expected, artificial methods should be strongly considered to regenerate the stand. Artificial supplemental planting may also augment natural regeneration if it is present but is not enough to produce a fully stocked stand naturally.

C. Inhibiting Factors and use of the Regeneration Fund: Many stands to be reproduced will have some sort of inhibiting factor that will work against the establishment of what a forester deems as desirable regeneration for the site. These may include deer browsing, inhibiting vegetation, exotic invasive vegetation, lack of seed source, mortality, thick duff, and site limitations such as too wet or too dry. A plan to deal with these mitigating factors must be a part of any silviculutre treatment in which stand regeneration is the goal.

The BOF maintains a regeneration fund where 10% of all sale receipts are reserved for regeneration treatments designed to offset these mitigating factors. The regeneration fund provide a wide range of tools to accomplish this, such as contract fencing to exclude deer from sale areas, contract herbicide application to combat inhibiting or invasive vegetation, contract tree planting to plant areas with poor seed source, as well as tools to do such as back pack sprayers, herbicides, royer attachments for skid steers and drip torches, among other things, to accomplish in-house projects. This is by no means a comprehensive list of the possibilities offered by the regeneration fund; more comprehensive guidance on the types and appropriate use of these tools are covered later within the “regeneration guidelines” portion of the manual.

When developing stand level goals, a forester must be observant to what is around him or her, and record this information to help set goals for the site. A better understanding of the factors that affect any goal in a negative way, will lead to a more realistic plan and expectation of what can be done on a site. In some cases, these factors may add up to making it impossible to achieve the desired outcome. Methods for calculating some of these factors are covered more in depth under the sale analysis portion of this manual. A thorough study of the site must be done, and on occasion research as well into certain exotic plants and competing vegetation to understand what the consequence will be of any action.

A forester must works towards developing an eye for knowing upon which sites an investment of money will result in desired outcomes and upon which sites will similar investment result in a lesson in futility and a waste of funds. Again, a wise use of the funds we are entrusted with, balanced with good stewardship of the resource is a must! Just about anything can be done to achieve a desired objective, but there is a point where it becomes cost prohibitive.

All regeneration fund projects must be submitted via FMT-34 to the electronic database, and reviewed by the Silviculture Section. This will be done on a fiscal year basis, and all projects approved are effective from July 1st of one calendar year to June 30th of the next. All projects approved but not completed, yet still regarded as necessary by the District, will be resubmitted as a new project for the following year. All projects should be

submitted for approval by April 1st prior to the fiscal year they are to be completed. Due to the limited nature of these funds, in most years not all projects will be funded, and the district should prioritize these in sequential order before submitting them; number 1 being the top priority project in that district for a given year. Currently the Bureau of Forestry is working on a decision to matrix to help prioritize projects statewide when regeneration funds are low.

IX. Regenerating Oak Stands

Nothing has caused more widespread debate in the BOF's silviculture practices than the how's and why's for regenerating oak stands and what is proper procedure and the definition of success. Despite varying opinions, it can generally be agreed upon by all that oak stands require much time, patience and to a degree flexibility and creativity to regenerate. Thought should be given to the practicality of regenerating oak on a site before attempting to regenerate it. Oak stands are defined as those within the AR, AD and AH timber types.

Oak regeneration should not be attempted if it is deemed that the site is less conducive to growing oak and site conversion to another desirable species more suited to the site is likely to result. If regenerating a site to an oak stand is a desired objective, at least 50% of the site should be dominated by oak regeneration and should be the target of the final regeneration composition. The reason being that conventional thinking requires at least 40 BA of sawtimber oak is required to perpetuate oak on the site through natural regeneration. Less than 40 basal area to the acre will make it difficult to regenerate oak in the following rotation.

If you are in a landscape where oak stands are abundant, it may be wise to convert a few stands to other timber types. Stands that are different in composition and contain a mix of species often fair better in gypsy moth outbreaks and suffer less mortality. This is something to consider helping offset district wide salvage events that occur in large gypsy moth/drought stress years.

On the other end of the equation, if there are only a handful of oak stands in a particular landscape, perhaps more expense is justified in trying to maintain oak on the landscape from a wildlife and diversity sense. In short, the means must be justifiable. In an oak dominated landscape, it is more difficult to justify considerable sums of money per acre to regenerate oak sites where the value of the resulting stand will not cover the cost of the practice or justify such an investment. Yet the same stand from an ecological stand point may warrant such an investment if oak stands are rare upon the landscape. Common sense and professional judgment should be applied and substantiated with landscape goals and objectives. The BOF does not manage for profit, yet we are stewards of both the funds and the natural resource entrusted to us, and a wise balance must be maintained and considered before pursuing management activities.

Due to relatively slow initial height growth of oak seedlings, any competing vegetation that is currently on site and undesirable should be dealt with to allow oak regeneration to develop. Herbicide, burning, or mowing are some of the

acceptable ways to control competing vegetation. Thought should be given to the detrimental effects any of these treatments might have on desired regeneration.

SILVAH 6.01 is the standard analysis tool and must be submitted with each treatment proposal for oak stands. Regeneration should be tabulated on the oak spreadsheet available from the silviculture section. Deviations from SILVAH prescriptions should be justified in detail within the sale proposal. The Pennsylvania State University oak assessment worksheet may be used to back-up reasons for deviating from SILVAH.

Shelterwood cuts for oak regeneration should remove one third of the BA, thinning from below. Removal of low shade is essential for the successful establishment of oak regeneration. Removing one third of the canopy also retains much high canopy and high shade which prevents the establishment of competition that prefers higher light levels.

In stands where oak makes up less than 40 BA of the sawtimber, and subsequently not enough to provide seed source, it is recommended that many of the oaks be cut to provide stump sprouts for the next stand, and/or larger dominants and co-dominants be retained to provide mast into the next rotation. This is due to the 40 BA/A sawtimber threshold required to regenerate oak stands, and attempting to regenerate oak from seed probably will not achieve the desired result.

X. Allegheny and Northern Hardwood Regeneration

Allegheny and Northern hardwood regeneration provide many desirable options that are absent from oak management. The variety of desirable species regenerate encompassed by these groupings of species regenerate in a variety of different ways and often gives the manager several options. The SILVAH program, developed by the United States Forest Service Northeastern Forest Experimental Station in Kane, PA is an excellent tool for choosing prescriptions for northern hardwood stands and should be used in all silvicultural treatments of Allegheny or Northern hardwood stands. Unlike oak SILVAH, which is relatively new, SILVAH for Allegheny and northern hardwoods is based on decades of research from Kane and many nearby locales on the Allegheny Plateau. It is essentially home-grown knowledge for the region. Many times, land managers find the prescriptions produced by SILVAH to be acceptable and directly applicable, although deviations from SILVAH are permissible through written justification approved in writing by the Chief of the Silviculture Section.

When it comes to Allegheny and northern hardwood regeneration, several districts have had success over past decades by clear cutting and stirring up the soil base through logging operations. The increased light level and soil disturbances have often led to mixed northern hardwood forests with desirable regeneration. Other districts have used shelterwood techniques to establish regeneration prior to removal of the overstory. The best course of action is to base silviculture decisions on prior knowledge of “what works” at the district level coupled with the research that has been incorporated into SILVAH prescriptions.

In choosing species to target for promotion in a stand for regeneration, there must be knowledge of the silvics and the species interaction within the site. This is true not only for those species you wish to regenerate, but also for species, which may compete and benefit from your treatments. A good mix of species is often the best approach. As they say in stock investment; "you must balance your portfolio" and the same is true in good stand composition. Black cherry has been the best species from a monetary value stand point, yet cherry monocultures promote the spread of black knot, result in relatively poorly formed stems and tend to provide less ecological value to the wildlife species which utilize the forest relative to mixed stands. Research at Kane has demonstrated that cherry performs best when it is held to 40-50% of the stand composition, a thought to keep in mind when regenerating cherry stands. Red maple may be a good species in some northern districts to favor and grow into well-formed, desirable commercial trees; in southern districts, however, red maple often grows into poorly formed stems which rob growing space from other species. Beech has developed many problems with the onset of beech bark disease and should only be saved and regenerated if it is disease free (in most areas is no longer suitable even for mast production). These, as well as many other local considerations must be taken into account by foresters when developing regeneration strategies for Allegheny and northern hardwood stands.

In large areas of the state, many Allegheny and northern hardwood stands require some sort of vegetation control. This may be a result of previous stand entries, beech and hard maple decline, or the legacy effects of the large herds of deer that inhabited much of the northern range of these species for decades. Many favorable species of trees and shrubs were eliminated from the understory leaving undesirable species to create understory monocultures of striped maple, beech brush and/or fern. Often, these interfering species occur in such density that they require control prior to any desirable regeneration becoming established. Further recommendations for treatment of interfering species can be found in the regeneration guidelines.

XI. Regenerating Other Stand Types

Invariably if you manage a resource long enough you will come across a stand type that does not fit the scope of SILVAH. The most notable of these stand types include aspen and conifers. Research has been done on these types of stands, but there are some types where little or no research has been done at all. When designing prescriptions for stands that fall outside the scope of SILVAH, a forester should rely on their professional knowledge and experience. The Silviculture Section is also available for resources and assistance when dealing with these types. The Silviculture Section has a decision flow chart for conifer management. This system works similar to the SILVAH decision chart process. It is based on research, as well as on the ground field observations on sales actually completed by the BOF. This system is a good start and through feed back and use, a further refinement will be made in the future. To see the conifer decision flow chart, go to the following link: http://intraforestry/silviculture/Conifer_Management.pdf

XII. Intermediate Treatments in Even-aged Stands

The purpose of intermediate treatments in even-aged stands is to improve species composition, release desirable trees, control spacing, and shorten the overall stand rotation. Thinnings and improvement cuts work best in younger stands where trees will show response to more available nutrients and light through improved growth and vigor. This

increased growth rate may shorten the rotation length if the stand was left otherwise untended. Older more mature trees are slower to respond. Due to the older condition of much of the stands in our State Forest Lands, the instances to practice improvement cutting will be limited. However, the opportunity to apply improvement cuttings to some of the earliest clear cuts will be coming in the next few years. Some of these stands were cut in the mid 1960's and will soon be approaching the 50-60 year range. Crop-tree thinnings are a pre-commercial option for younger stands where timber has not yet reached a commercial size.

A. Priorities when marking improvement cuts

The purpose as stated above for improvement cuts is to leave the stand better then when it was first entered and to "improve it" for the future. When marking improvement cuts, remember to keep species diversity in mind and not remove any one species from the stand completely while trying to retain as many high value stems as possible for timber and the benefit of wildlife species. Optimal growing should be thinned down to a 70% relative density or no more than 1/3 of the initial BA removed from the stand. SILVAH is capable of producing prescriptions for improvement cuttings. Shade on remaining boles is important to keep latent buds from sprouting and degrading with limbs and knots. This is reason enough to remove no more than 1/3 of the stands initial basal area. Marking guidelines should focus on removing trees in the following manner.

1. Cull or rotten trees should be removed, as long as this number does not drop below an average of 3 potential den trees per acre. Although these trees take up valuable growing space and will never be worth sawtimber prices, they provide a potential wildlife habitat that may be more valuable as future den trees. Trees that already exhibit den potential should definitely be left in the residual stand.

2. Trees that exhibit decline and dieback.

3. Poorly formed trees that will make poor sawtimber.

4. Low value trees that are competing or overtopping rare or uncommon species.

5. Trees that will make the lowest grade sawlogs.

6. Multiple stems on a single stump

7. Proper Tree spacing

8. Trees in direct competition with a residual

B. Crop tree thinning

Crop tree thinning is done for many of the same reasons as improvement cuts but at a much younger, pre-commercial age. The primary reason for entering a stand in the pre-commercial stage versus waiting until merchantable volume can be extracted is to alter the species composition of the stand prior to the most desirable stems losing positions of competitive advantage.

No more than 50 crop trees should be selected per acre and a crown-touch release should be used, cutting all trees that touch the crown on a crop tree on three out of four sides. Co-dominant and intermediate trees should be the focus of crown-touch release treatments. Trees in the dominant stage will most likely be in the stand at the time of commercial thinning and most likely already enjoys dominance over it closest competitors. Cutting around dominant trees is most likely a waste of resources as well as attempting to release suppressed trees that most likely will be overtopped again by canopy closure.

Research from West Virginia also suggests that unless a future species shift is achieved there is little monetary value in crop tree releases. Swapping one red oak tree for another hardly makes sense. However if that same red oak was to be over taken and crowded out by a red maple, and the crown touch release reverses that situation, than this is the situation you would look to correct through crop tree projects. This should be judged on a stand level basis. If the stand will be predominantly a desired species in the future little benefit can be gained from crop tree management. But if that same stand is going to be something undesirable in the future and a crop tree release will leave a more desirable species composition, then it may be money and time well spent. Crop tree release should be carefully considered in management of oak stands on higher quality sites, as it may often represent the most practical and cost-effective means of ensuring regenerating oak occupies a significant position in the overstory of the future stand where competition is greater.

XIII. Buffer Management

Buffers are managed differently than even-aged stands. There are many reasons for zoning areas as buffer zones in our management plan. The reasons include aesthetics, water, or resource protection. Some buffers are no management zones, and others require at least a partial canopy be maintained. Aesthetics should be considered along forest roads, and near leased forest camp sites. Typing maps, landscape exams and district resource plans should be consulted to determine the nature of a buffer, and if it is commercial or non-commercial (no cut). Because of their complexities, buffers for riparian areas are covered under the “Water Resources” of this manual. The ultimate goal of a mature buffer stand should be regeneration of the stand while maintaining aesthetics. Herbicide treatments and fencing may be necessary to achieve this. When uneven age silvicultural techniques are used (e.g., individual tree selection or group selection), canopy openings are less than 2.5 acres. Below are the general management practices and silvicultural systems for buffers that are designed for aesthetics.

A. Two-aged management

Two-aged management is a relatively new practice in the BOF. It was approved due to the evidence presented by research that uneven-aged management for oak species and many northern hardwood species does not work well in the even-aged stand condition in many of our state forests. Uneven-aged management in many of these stands results in decreased yields and the loss of shade intolerant species that define and are beneficial for these forest types both from a timber, ecological, and wildlife stand point.

Two-aged management is essentially an overstory removal with a higher residual of basal area reserved throughout the stand. Usually 20 to 30 square feet of the overstory should remain in oak stands and 10-20 square feet in northern hardwood stands. The higher light intensities in these stands are conducive to regenerating shade intolerant and moderate species. All the careful planning that goes into establishing an even-aged stand will most likely be necessary and is acceptable to perform in two-aged buffers.

The same objectives defined in even-aged reproduction cuts should be met prior to doing a two-aged cut. A shelterwood or seed tree cut may be necessary to establish regeneration prior to performing the final two-aged cut. Due to the similarity of residual basal area a two aged cut and a seed tree cut may be one in the same, and accomplish both objectives at the same time. In buffer stands this cut is referred to as a two-aged harvest. Given the fact that many buffers are in high visibility areas, it is perhaps even more necessary to establish regeneration more quickly than in even-aged stands.

B. Uneven-aged management

Uneven-aged management is the more traditional method for treating buffer stands. In the even-aged conditions of our forests this usually means moving a stand to a condition where multiple age classes are represented. True uneven-aged management is intensive, and textbook practice often calls for doing a harvest every 15 or 20 years. In many of our stands this is not practical. . Many districts do not have the time, resources or the proper species composition of desirable, shade-tolerant species to devote to treat significant portions of their buffer acreage in this manner. Of the many challenges posed to our forest by insects and disease, it is interesting to note that many of them (beech bark/nectria complex, hemlock wooly adelgid, elongate hemlock scale and sugar maple decline) threaten the three species most important to conducting uneven-aged management in Pennsylvania. For these reasons the instances where uneven-aged management should and can be practiced will be small.

It should be understood, that uneven-aged management is not discouraged in favor of two-aged management. However, some criteria should be considered. Stands with a high percentage of desirable shade tolerant species either as a seed source and/or present in a seedling/sapling layer would make excellent uneven-aged stands. An inverse j-shaped diameter distribution should be strived for when marking these stands to facilitate the development of these shade tolerant species. Candidate stands for conversion to an uneven-aged class distribution should also be relatively free of interfering vegetation, which would pose a barrier to natural

regeneration and require frequent herbicide applications to mitigate. These stands will work well in a cutting cycle that leaves a high residual canopy and an intensive cutting interval of 15 to 20 years.

In stands where aesthetics are of a sensitive nature and the proper species composition, understory condition and forest health considerations are present, uneven-aged management should be considered and as much effort as possible should be made to enhance the desirable shade tolerants that are present. The retention of a healthy canopy may be far more important than lumber production. Promoting younger shade tolerants is the best way to move towards establishing an all age class distribution on a site.

SILVAH contains a program in which prescriptions can be produced for marking an unevenaged (or all age) stand. This prescription should be followed and should produce the reverse "J" distribution curve for diameter classes and insure that proper diameter distribution of all classes is represented. The Silvah prescription should also recommend the optimal Basal Area per acre for the proper relative density for the particular stand.

C. Group Selection

Group selection is an alternative to two aged cutting when highly sensitive aesthetics are involved. This method allows for management of shade intolerant species while retaining an intact canopy for aesthetic reasons. Typical group selections should focus to put 1/3 of stand acreage into openings. For example, in a 21 acre stand, 7 acres of openings should be present. These openings should be large enough to allow sufficient sunlight for shade intolerant species. Research from the Monongahela National Forest suggests that opening size radius should be twice the height of existing canopy. A good rule of thumb is to figure an opening size ranging from a 1/2 acre to 1 acre, but must not exceed 2.5 acres.

Patches and openings can be concentrated on areas where advanced regeneration is present. The idea with group selection is that once the first set of openings becomes established in a stand and advances to the pole class stage, a second set of openings can be created. In this way, a constant canopy is preserved over the site through out the rotation. A set number of years before re-entry are not important. Subsequent entries should be conducted with adjacent or nearby logging opportunities, and as conditions on the ground allow.

Attached is a list of areas with aesthetic buffers and their management constraints. Stream buffers are covered in the water resources portion of the manual:

1. **State Park and State Forest Picnic Areas**: All areas within park boundaries are excluded from timber management activities except when permission has been granted by the Director of the Bureau of State Parks. Picnic areas (State Forest or State Park) and high use areas within parks (near state forest boundaries) will have a 300 foot two-aged or uneven-aged aesthetic buffer placed around them. Any even-aged management outside this buffer will have to be done in a manner so that at no time more than ½ of the

surrounding perimeter of a picnic area or park is cut at anyone time. Two-aged, Shelterwood for Two-aged, uneven aged and group selection cuts are permitted within these kinds of buffers.

2. **Leased Campsites**: A 150 foot buffer will be placed around all State Forest leased campsite buildings. Logging is not permitted on the lease itself unless permission is given in writing by the lessee. Two-aged, Shelterwood for Two-aged, uneven aged and group selection cuts are permitted within these kind of buffers. Camp lessees should be notified in writing of adjoining timber sales and the correspondence included with the proposal

3. **Roads**: All federal and state highways, township roads and Class I State Forest Roads open to public travel will have a 300 foot buffer on either side of the road. Two-aged, Shelterwood for Two-aged, uneven-aged and group selection cuts are permitted within these kinds of buffers.

4. **Special Use Areas**: Special use areas such as organizational camps, state forest monuments and natural areas will have a 600 foot buffer placed around them. Two-aged, Shelterwood for Two-aged, uneven-aged and group selection cuts are permitted within these kinds of buffers.

5. **Trails**: National Scenic Trails such as the Appalachian Trail or other National Scenic Trails yet to be established will have a 200 foot no cut buffer on either side of the trail. Only cutting for human safety will be permitted within this zone. State Forest Hiking Trails such as the Loyalsock Trail will have a 100 foot no cut buffer on either side of the trail. Notification of any proposed cutting that borders these trails must be made to the organization responsible for the maintenance on the subject trail. Some organizations have memorandums of understanding that allow some harvesting with in established buffers. Below is a list of trails and mileage in respective districts.

National Trails	**Forest District Location & Mileage**
Appalachian National Scenic Trail	Michaux State Forest = 37 miles Weiser State Forest = 4 miles Delaware State Forest = 6 miles
North Country National Scenic Trail	Clear Creek State Forest = 1 mile
Laurel Highlands National Scenic Trail (Potomac Heritage NST)	Forbes State Forest = 12 miles

State Forest Hiking Trails	**Forest District Location & Mileage**
Baker Trail	
	Clear Creek State Forest = (1 mile)
(noted & included above as North Country National Scenic Trail)	
Black Forest Trail	Tiadaghton State Forest = 42 miles
Bucktail Path	Elk State Forest = 34 miles
Chuck Keiper Trail	Sproul State Forest = 50 miles
Donut Hole Trail	Sproul State Forest = 90 miles
Golden Eagle Trail	Tiadaghton State Forest = 9 miles
John B. Saylor Memorial Trail	Gallitzin State Forest = 18 miles
Lost Turkey Trail	Gallitzin State Forest = 9 miles
Loyalsock Trail	Loyalsock State Forest = 48 miles
Mid State Trail	Buchanan State Forest = 15 miles Rothrock State Forest = 43 miles Bald Eagle State Forest = 53 miles Tiadaghton State Forest = 56 miles Tioga State Forest = 17 miles
Old Loggers Path	Loyalsock State Forest = 27 miles
Pinchot Trail	Lackawanna State Forest = 23 miles
Quehanna Trail	Moshannon State Forest = 58 miles Elk State Forest = 17 miles
Rocky Knob Trail	Michaux State Forest = 4 miles
Susquehannock Trail	Susquehannock State Forest = 83 miles

Thunder Swamp Trail	Delaware State Forest = 26 miles
Tuscarora Trail	Buchanan State Forest = 15 miles Tuscarora State Forest = 23 miles
West Rim Trail	Tioga State Forest = 30 miles

6. **Sensitive Areas**: In addition to the established buffer zones certain areas of State Forest Land near high use areas such as parks, reservoirs, or scenic drives can be designated for uneven-aged management where aesthetic values override other resource use. Two-aged, uneven-aged and group selection cuts are permitted within these kinds of buffers.

The District Forester may request a variance to the above buffers by submitting a fully justified written request to the Chief of the Planning Division, requested through the Silviculture Section. Requests to conduct even-aged management with in these buffer zones will be considered for salvage cuts, areas not in view of public roads or institutions, or in areas where exceptional regeneration exists and full stand stocking will likely be achieved in a relatively short time.

XIV. Salvage Operations

When known mortality events take place in a district, every effort should be made to determine the value of the affected stand or group of stands. If sufficient value exists that would be lost through future degradation and decay, the stand is impacted to the point it will not recover to a full or nearly full stocking condition through its subsequent growth, access is not cost prohibitive and there is a reasonable expectation that harvesting activities will not be the cause of further mortality among the residual stand, then salvage operations may be an appropriate course of action.

Salvage-improvements in some situations may actually predispose the residual stand to increased mortality in which case good intentions may result in undesirable results. Things like root compaction, skid damage, and felling damage may increase stress on already stressed trees to the point of mortality. Professional judgment should be used to determine if an area is worth salvaging or walking away from. Do not underestimate a timber stands' ability to recover from small to mid-scale mortality events, particularly in younger stands which had previously been exhibiting signs of good vigor. Doing nothing sometimes may be the best course of action when considering time and economics. In areas where mortality has encompassed 10% to 30% of the basal area, effort should be made to determine if salvage operations are wise and feasible.

When possible, salvage operations should be tied to a silviculture prescription. The forester must determine if the residual stand should be retained or if a regeneration cut or series of cuts and treatments are necessary. Residual tree

health should be assessed, along with the site quality of the stand, the age of the stand and its' development, the quality of the live residual stand, the vitality and distribution of the seed source, surviving species composition, and the potential for logging-induced mortality. In areas where mortality encompasses over 30% of the basal area, salvage improvements are not practical and regeneration of the stand would be a more appropriate course of action. If sufficient advanced regeneration is available, it is possible to move directly to a salvage-overstory removal treatment. In situations where sufficient advanced regeneration is not present, a salvage-shelterwood sequence often is the best way possible to initiate advanced regeneration within the stand. It is important to capitalize on surviving seed source whenever possible to regenerate a stand. Often times in salvage operations, the forester will find themselves stuck between not having enough advanced regeneration to remove the overstory, yet not being able to retain enough of a live overstory to maintain a shelterwood level. This situation results in the implementation of a salvage-seed tree or salvaged two-aged prescription, depending upon the future intentions regarding removal of the residual component. Stands in this condition often will be good candidates for artificial regeneration treatments through plantings.

No matter what the course of action may be, the more quickly after a mortality event an attempt to develop regeneration the better. The more time between mortality events and the higher light intensities from gaps in the canopy result in a higher probability of undesirable or invasive species becoming established, assuming such a condition was not pre-existing. These undesirable species will have to be dealt with in turn, and in some cases may be cost prohibitive to treat. Delaying planting operations which may need to be performed will only hamper efforts to put artificial regeneration in a competitive state. From the financial point of view, stumpage prices paid for dead timber historically decline 30-50% in the first year following the mortality event, and greater than 50 percent in subsequent years. Such precipitous drops in stumpage value quickly erode the possibility of conducting above-cost salvage harvests in all but the most valuable stands, and become a drain on future regeneration project funding years as rehabilitation projects.

Salvage-only operations are situations where only dead timber is removed and the level and pattern of removal does not result in a silvicultural treatment as previously described in this section. Salvage-only operations will not be counted towards district harvest goals, on the premise that the residual stand remains the stand which will occupy the site for years to come, and subsequently remains the focus of management.

There occurs instances on acreages where no silvicultural treatment was applied for various reasons due to such things as lack of bidders, below-cost sale, or exceeding the operational capacity of the District, etc. However, the resulting situation has changed the character of the stand in relation to the harvest allocation model. Essentially the stand has been rotated, or is on the path to being rotated to a new age class. On a small scale fluctuations in stand types can be captured through typing and modifying the acreage inputs for the harvest allocation model. The district should conduct business as usual along allocation guidelines until the end of the ten-year period, at which time the model will be adjusted. However, Salvage which occurs on a significant enough scale can impact the harvest allocation model in that annual harvest levels for the District may very well exceed those derived from the ten-year goals. When the amount of salvage exceeds 25% of the M and C acreage within the District, the District should make arrangements with the planning and silviculutre sections to readjust the harvest allocation model.

XV. Reservation Guidelines

In every final reproduction cut (overstory removal, clear cut, two-aged cut) various trees should be reserved for the future stand. Residual selections may be made a mix between single-tree and clump reservations, with most of the sale area being occupied by single-tree selections. The trees should be reserved both for superior genetic, species, and structural diversity. Across the entire stand area 10 to 20 square feet per acre should be maintained in overstory removals and clear cuts. 20-40 BA to the acre should be reserved in all two aged stands. Harvest openings with no retention are limited to 10 acres. (See Appendix B Reservation Guidelines: http://intraforestry/silviculture/silv_manual.aspx)

A. Genetic Diversity

When saving trees of genetic superiority you want trees of superior form and health. It is hoped that the retention of these trees will provide the most desired seed and genetic input into the next stand. This is done to improve the structure and health of the species within the stand and to improve survivability related to insect and disease effects. Field indicators of genetically superior trees are those representatives of the species on that site which exhibit good form and vigor. This does not guarantee capturing a special genetic adaptation for a given site that will benefit the species, but it does increase the odds in favor of that goal. It is hoped that a landscape wide approach to reserving trees of superior stock and health, in each stand, will enhance a species ability to thrive on a wide range of sites and site conditions within the landscape, thus creating true genetic diversity through the aggregation of silvicultural treatments with in landscapes and whole forests.

B. Species Diversity

An effort should be made to retain species of all types that are currently in the stand. This retains a seed source and ensures that some under represented or rare species may be carried forward into the next stand. This helps diversify the stand and gives future mangers options for management as well, especially with wind dispersed species. The more diverse a stand is the more it can withstand wholesale mortality due to insect or disease problems.

C. Structural Diversity

Structural diversity refers to many things, including tree form, vertical structure, and horizontal structure of dead, woody, and live material. Preferred residuals include cavity trees, even those with small cavities. This aids the nesting abilities for many songbirds and insects. Vertical structure is best maintained through the reservation of “islands.” When an island approach is used, the whole canopy structure can be retained from top to bottom without the disturbance of log skidding, which may remove the lower levels of that structure. Some islands can be clumped together and some isolated to create varying conditions. In addition to islands, individual trees should be retained throughout the stand based on the previously mentioned genetic and species principles. Also, leaving

islands will provide greater survivability against wind throw and "burn out." Although no concrete evidence has been provided, some theorize that leaving islands may also aid beneficial mycorrhizae that might otherwise burn out in full sunlit soil situations. For these reasons "islands" are strongly encouraged.

Islands reserved in tenth acre patches should in theory reserve 10 BA per acre where original stand composition is 100 BA to the acre. The same is true with 1/5 acre Islands to reserve 20 BA to the acre. Island size would have to be adjusted to a larger radius for stands with less BA to capture the 10-20 square feet reservation, or Islands can be made smaller in more dense stands with higher initial BA. Islands work well to protect snags and den trees. Residual BA/A within islands will of course be the same as that found in the residual stand; however, it is important to note that the BA/A within an island must be viewed in context of the overall residual BA/A goal for the treatment. Islands work well to protect snags and den trees. Trees reserved in a 37 foot radius from a den tree or snag will make good 1/10 acre islands. It is often adventitious to distribute island reserves throughout sale areas as reservations around stand features of significant conservation value, such as spring seeps, vernal ponds, ephemeral streams, conifer thickets, rock outcroppings, anthropogenic features such as collier huts or charcoal hearths, or the occurrence of relatively uncommon species within the stand, among other considerations. This creates a natural, random pattern across the stand. Some locations may have 2 or 3 Islands per acre, or one very large cluster or island, while others may have none. Nature does not appear in well spaced even distribution, and neither should your reserve trees.

Dead snags are encouraged for retention for woodpeckers, cavity-nesting birds and wood boring insects. Additional snags can be made through the girdling of live trees that are to be retained. A good strategy for retaining snags would be to center islands around them to protect them from being toppled in logging operations. It must be noted that snag retention is at odds with OSHA regulations covering logging operations. A possible solution is to reserve dead snags, but allow the loggers to cut them for safety reasons, but do not allow them to skid the felled tree. Reserving these downed trees to remain on site will discourage the cutting of snags for additional volume, but will allow the flexibility to mitigate legitimate safety concerns. Additionally, large down logs ought to be left for shelter for amphibians and reptiles, most notably salamanders.

XVI. Wildlife Habitat

Timber operations by their very nature provide early successional habitat, and species that prefer this habitat benefit greatly. Species diversity per acre is never higher at any point in a stands life cycle than during the early successional stage. It is hoped that through balancing the age class structure, species that prefer all age classes will benefit from our forest management. Reservation guidelines are designed to provide differences in canopy structure to benefit a wide variety of bird life.

Foresters are encouraged to seize on opportunities to expand and improve wildlife habitats. These include reserving snags and den trees as part of the reservation guidelines, and to make additional snags where they are lacking though the

girdling of some additional trees. An assortment of islands and single trees should be reserved to promote structural diversity.

Landing retirement should be done with wildlife in mind as well. Limbs and cutoffs along with rocks (free of soil) pushed to one end of a landing make excellent small rodent habitat and also excellent areas for snakes. Also, seeding should be done with a good mix of native grasses and flowers to provide foraging areas for wildlife as well as serving the purpose of stabilizing the soil.

Food plots are permitted to be established if they are done so with out the use of timber receipt monies. This means that foresters can not require loggers to provide apple trees, conifers or expand landing sizes to make large herbaceous openings beyond the scope of the operation. Landings may be planted with trees and shrubs beneficial to wildlife after timber sale retirement with district funds or through volunteer organizations. A list of suitable, preferred wildlife trees and shrubs can be obtained from the ecological services section. If a landing or herbaceous opening is to be maintained for wildlife, native grasses and flowers should be used, and a plan included in the respective landscape folder for that opening.

Browse cuts and cuts to establish brushy habitat are permitted on a small scale. When browse cutting, trees not suitable for timber, inferior genetics and poor form should be used. Brushy habitat is excellent nesting for whippoorwills, grouse, ovenbirds etc. These cuts work well along the edge of herbaceous openings to enhance wildlife value.

The ideas for wildlife enhancement projects are virtually limitless. The important thing to remember is that a project that may benefit one species may be at the detriment of another. Balance and care must be used when proposing projects and all projects of this nature should be compatible with the Landscape Plan and reviewed by Ecological Services prior to implementation.

XVII. PNDI Procedures and Avoidance Measures

The Pennsylvania Natural Diversity Index (PNDI) is a system set up to map species of concern, threatened or endangered nature. This is a cooperative project between several wildlife management agencies and covers species under the jurisdiction of PA Game Commission, PA Fish and Boat Commission, PA DCNR, and the US Fish and Wildlife Service. All silviculture and land management activities should be submitted through the PNDI system. The purpose of this system is to call attention to the forester that species of concern, threatened or endangered nature are nearby or within the project area. A summary of the PNDI search should be attached to any project proposal, even when it registers “0” potential conflicts.

If a conflict arises within a search area, the responsible agency is listed. A map and a brief description of the project should be submitted to the jurisdictional agency, and copy to Ecological Services, for resolution or recommendation. In some instances, it is simply a matter of waiting for a response from the agency responsible stating that no problems are

anticipated and the project may proceed as planned or some practices recommended to protect the species listed. Other instances may require a site visit in which details of the project are discussed in depth with representatives of the agency responsible. This usually results in recommendations to the forester to alleviate conflicts. These may be seasonal restrictions, buffers and in some cases no cut areas placed around sensitive areas or critical habitat. Rarely will the occurrence of a PNDI "hit" totally eliminate options for a planned timber sale. Approval letters are issued from the agency responsible once agreement has been reached on the course of action. These approval letters should be included in all projects that had conflicts through a PNDI search.

Future streamlining of the PNDI process is anticipated. It is hoped that standard BMP"s will be adopted for some of the more common species encountered in PNDI searches. Ecological services may in the future design some of the BMP's with cooperation with other agencies. In any case, whether it is through BMP's or direct recommendations from the agencies responsible - as stewards of the land; it is our responsibility to use best management practice and common sense to protect ALL of our natural resources to the best of our ability.

XVIII. Soil Factors and Soil Protection

Soil types can have a major influence on the selection of a silvicultural prescription. Soil type dictates what types of trees should be growing there. In certain areas, past history and management activities can also influence the species composition. Restrictions on the types of logging equipment used, the seasons in which logging is permitted, and the pattern of skidding may also be necessary on some soils to protect advance regeneration from damage and maintain site productivity. Logging on seasonal high water tables during wet times can cause many problems. Excessive rutting can actually raise the water table, which can cause mortality to remaining trees or seedlings. Seasonal logging restrictions are the normal way that the BOF handles this situation.

In the Allegheny Plateau Ecoregions of Pennsylvania, soil drainage is the major factor affecting silvicultural prescriptions and practices. Soils with dormant season water tables less than 12 inches below the soil surface may have lower productivity than better-drained soils and they are vulnerable to damage during forest operations. Use of silvicultural systems that encourage species suited to these sites, and restrictions on equipment operations are appropriate.

In the ridge and valley sections, soil types are also the major factor affecting silvicultural prescriptions and practices. Excessively rocky areas are usually poor sites and very expensive for road building. Excessively fast draining soils are usually site 3 (ie, ridgetops). They may be well suited for road building however.

A. Wet Areas and Poorly Drained Soils

The following information is useful in helping to determine whether or not the soil in a particular stand is poorly drained and a management problem for the stand in question.

1. Poorly drained soils are those where a water table persists very close to the soil surface during all or most of the dormant season. Such soils usually have prominent mottling at depths ranging from 1 to 8 inches beneath the surface. Since soil examination is usually not feasible during the stand inventory, drainage must be estimated from landscape position, relief and indicator plants.

2. Landscape position and relief have a strong influence on soil drainage. Look for poor soil drainage in concave positions of broad flat plateau tops, in upland bottoms, and at the base of slopes. Low topography is more likely to be poorly drained than high topography. A convex topographic configuration generally indicates well or moderately well drained soils. In valley bottoms, soil drainage becomes poorer from the stream channel towards the base of the slopes. Concave and low-lying areas in bottoms are especially likely to be poorly drained, as are toes of slopes with many seeps.

3. Standing water in depressions and wet surface soils during the dormant season and during periods of normal rainfall in the summer and fall.

4. The leaves in the bottoms of depressions and windfall mounds are a black or other dark color and are significantly different from leaves nearby on the forest floor.

5. Wet site plants like sedges, rushes, sphagnum moss, sensitive fern, interrupted fern, cinnamon fern, skunk cabbage, false hellebore and marsh marigold are present.

6. There is a very deep spongy humus layer at the soil surface.

7. Avoid road building in wet or poorly drained areas.

8. If road building is absolutely necessary, a GP 7 or GP 8 permit may be necessary if crossing a wetland. Again, this should be avoided.

B. Rocky Areas

The following information is useful in helping to determine whether or not the soil in a particular stand is excessively rocky and management problem for the stand in question. Stony areas can be recognized after little experience.

1. Look for a stone layer beneath the forest floor in road cuts.

2. Look for large sandstone outcrops somewhere upslope.

3. A hard uneven feel to the soil surface when walked upon is a sure indicator of many surface stones.

4. The presence of many surface stones.

5. A good place to look at soil types and shale outcroppings is in stump holes where blowdown is present.

C. Haul Road Construction:

Consulting Soils maps is a must when considering haul road construction. Soils types that are listed as poorly drained, or very poorly drained and have severe equipment limitations are not very suited to haul road construction. This is due to the fact that when saturated, these soils will not support the weight of logging equipment. Another reason for avoiding poorly drain soils, is that they may actually be wetlands.

Good reconnaissance on the ground will often reveal many short comings for road suitability, but not all. Do not interpret stones on the surface as a good indicator that the soils is well drained. Several soils types appear on the surface to be well drained when they are not. Presences of tip up mounds and evidence of repeated wind throw may indicate seasonally high water tables. Flexibility in road design and construction may often be necessary to adjust to conditions on the ground. For more detailed information on haul road construction see the haul road portion of this manual.

D. Soils Surveys for Species Suitability

When designing prescriptions; soil factors and its suitability to grow a particular species is often the most over looked factor by foresters. Soil maps should be consulted to see if a site is even suited to growing a desired species, before large amounts of time and money are exhausted in pursuing a course of action. If the medium to grow trees does not support a given species, all other endeavors to achieve that goal will most likely end in failure. In short, if a soil type is not suited to a species, than primary efforts to grow that species should be diverted to another species.

E. Resources

An excellent soil resource can be found on the web at: http://websoilsurvey.nrcs.usda.gov/app/

This is an interactive web site. Once you define your area of interest, soil maps can be found along with detailed descriptions of the soil types, uses, suitability for operating equipment, planting trees and many other useful facts. Many of the descriptions can be tailored for your specific project. There are a large number of applications found here that pertain to forestry.

Online soil data can be downloaded from the PASDA web site for use with the GIS system. The soil types are a layer that can be used as a background layer on your map. Data is available for most counties and is continually being updated.

As always, the county soil map can be used. There should be a copy in each district office. There should also be a soil type map in each compartment folder.

XIX. Archaeological Sites, Architectural and Cultural Resources

DCNR is committed to protecting Pennsylvania's historical and cultural resources as well as its natural resources. The BOF partners with the PA Historical and Museum Commission's Bureau of Historic Preservation (BHP) to protect these valuable resources.

The role of the BHP as defined by the Pennsylvania History Code (*37 Pa. C.S.A., Section 101 et. seq. and Article 1, Section 27*) of the Pennsylvania Constitution is to identify and protect the architectural and archaeological resources of Pennsylvania. The BHP has a number of responsibilities under their charter, including law enforcement on properties listed on the National Register of Historic Places, approval of informational or educational signs and plaques and maintenance of data about historical resources including a spatial database, maps and documents.

The role of the BOF is to strongly protect any listed resources, generally protect non-listed resources, and to co-operate and seek the advice of the BHP on matters of new listings and signage development. New land acquisitions should be searched against the BHP's CRGIS database and provided to the BHP for their records.

In order to ensure these resources are protected the BOF has mapped the location of known listed resources and maintains the maps in both central office and district offices. A list of compartments which contain listed resources can be obtained from the Silviculture section. If you are proposing a project where there is potential for subsoil disturbance or other impact to a listed site, clearance for the project must be obtained from the BHP using their environmental review form and submitting appropriate project description and maps. The environmental review form is currently available from:
http://www.portal.state.pa.us/portal/server.pt/community/project_review_under_section_106_and_pa_history_code/3787

Unlisted resources should also be protected whenever possible. Examples of unlisted resources found on land administered by the BOF are: stone walls, charcoal pits, abandoned road, railroad grades and building foundations.

If a previously unknown cultural or historic location (such as a native American village site) is discovered on land administered by DCNR, the discovery should be relayed to upper level management of the managing Bureau without delay for evaluation and possible listing with the BHP. Care should be taken to minimize disturbance of any new discovery.

XX. High Conservation Value Forest (HCVF)

A. High Conservation Value Forests (HCVFs) are a concept that was introduced by the Forest Stewardship Council in 1999 to ensure that areas with outstanding conservation value are mapped and properly managed to maintain or enhance the value for which it was identified.

High Conservation Value Forests are summarized under Principle 9 of the Forest Stewardship Council's (FSC) US Forest Management Standard. HCVF's are those areas that possess one of more of the following High Conservation Values (HCV):

1. HCV forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g., endemism, endangered species, refugia), including Rare, Threatened and Endangered species and their habitats;

2. HCV forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance;

3. HCV forest areas that are in or contain rare, threatened or endangered ecosystems;

4. HCV forest areas that provide basic services of nature in critical situations (e.g., watershed protection, erosion control);

5. HCV forest areas fundamental to meeting basic needs of local communities(e.g., subsistence, health); or,

6. HCV forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).

B. Types

1. HCV 1.1 – Plant Sanctuaries - Timber management ok as long as it maintains or enhances the species present for which it was designated. Should be coordinated through Ecological Services. A specific management plan should be developed prior.

2. HCV 1.2 – Ecological Focus Areas - Timber management ok as long as it maintains or enhances the species present for which it was designated. Should be coordinated through Ecological Services. A specific management plan should be developed prior.

3. HCV 2.1 – Large landscape level forests (Wild and Natural Areas) – Standard protocol outlined in SFRMP, coordinate with Planning

4. HCV 2.2 – Large landscape level forests (Wild and Natural Areas) – Standard protocol outlined in SFRMP, coordinate with Planning

5. HCV 3.1 – Old Growth (Natural Areas designated for old growth) – Standard protocol outlined in SFRMP, coordinate with Planning

6. HCV 3.2 – Roadless Areas > 500 ac (ROS Primitive > 500 ac) - Timber management ok as long as no road is built that would reduce its designation as ROS Primitive, should be coordinated through Recreation.

7. HCV 3.3 – Rare Ecological Communities – Timber management ok as long as it maintains or enhances the species present for which it was designated. Should be coordinated through Ecological Services. A specific management plan should be developed prior.

8. HCV 4.1 – Public Drinking water source (DEP surface water and groundwater protection zones) – Standard protocol outlined in SFRMP. Coordinate with municipality.

9. HCV 4.2 – Public Drinking water source (DEP surface water and groundwater protection zones) – Standard protocol outlined in SFRMP. Should be coordinated with municipality.

10. HCV 4.3 – Functional Floodplains - Timber management ok as long as it maintains or enhances the species present for which it was designated. Should be coordinated through Ecological Services.

11. HCV 6.1 and 6.2 – Archeological Sites – Standard protocol outlined in SFRMP, coordinate with PHMC

C. Monitoring

1. HCVF's will monitored through the Silviculture Review of the Sale Proposal.

2. HCV 3.2 Roadless Area - ROS primitive areas greater than 500 acres. No new roads are to be built within that buffer for ROS primitive areas.

CHAPTER II
WATER RESOURCES

I. Bureau of Forestry's Mission

The Commonwealth of Pennsylvania began protecting water resources in 1897 when the legislature passed an act authorizing the purchase of unseated lands for forest reservations in the headwaters of each of the main rivers of the Commonwealth, including the Delaware, Susquehanna, and Ohio Rivers. This foresight, along with subsequent legislation, helped to acquire and establish the present state forest system, which today serves as a 2.1 million-acre source of clean water for Pennsylvania.

One of the original purposes for establishing the state forest system was to protect forested watersheds, and this remains part of the Bureau of Forestry's mission today. As water usage and environmental pressures increase, developing appropriate policies for managing Pennsylvania's water resources is critical to the Commonwealth's towns, cities, and natural resources, now and in the future. As developmental pressure continues to increase, the need for clean potable water will only serve to reinforce the importance of this mission. When it comes to streamside land management, close working relationships should be maintained with the Department of Environmental Protection, the local county conservation district and the Fish and Boat Commission.

II. Water Resources General Guidelines

Land management on watersheds requires certain restrictions to protect water quality. The following guidelines and restrictions will be imposed on all land management activities within all watersheds.

A. Earth disturbance activities should be avoided whenever possible. Disturbed areas such as skid roads, haul roads, log decks, etc., and should be confined to no more than 10% of the sale area.

B. Dead and downed woody material should be retained. It creates critical microhabitat for many species and provides large reservoirs of organic matter needed for nutrient cycling.

C. If possible and where appropriate, aquatic habitat buffers should be linked to provide connectivity for wildlife.

D. Compartment soil maps should be consulted for the presence of highly erodible soils with severe equipment limitations. Extra precautions will have to be applied in such areas. Wetlands and soils of poor drainage areas should be avoided.

E. Roads and trails must be located away from stream course except where stream crossings cannot be avoided. The distance between stream and roads and/or trails should be 50 feet plus 4 feet for each one percent of slope; thus a 20% slope between road and stream would require (20% x 4') + 50 feet, or 130 feet from the stream.

F. Stream crossings must be avoided whenever possible. When a road or skid trail must cross a watercourse (any channel visible on the ground with a definable bottom and banks, small springs or spring seeps) closed culverts or bridges must be used.

G. Fords are prohibited on all trout streams and in the watersheds used by municipalities, institutions, and private users for potable water supply and on Wilderness Trout Streams, Exceptional Value Waters and High Quality Streams. Existing fords should only be used as a last resort and only if it is not feasible to construct a bridge or install a culvert. In use of a ford the following conditions must apply:

1. Stream width prohibits bridges construction cost.

2. Stream has solid bottom and approaches that contain rock, stone and gravel.

3. Additional tonnage of rock, stone or gravel for a minimum distance of 50 feet to be applied on approaches with intercepting dips or culverts to prevent stream sedimentation.

4. Ford location is at right angle to the stream channel

5. No objection to fording the stream by the Waterways Patrolman, Pennsylvania Fish Commission.

6. Skidding across fords is prohibited.

H. The maximum grade on all roads and bulldozed or heavily used skid trails should be less than 10%. The optimum is between 4% and 10% to reduce accelerated erosion and transportation cost of removing forest products from the sale area.

I. Roads must be drained adequately by cross drains with either metal, open top, or box culverts, or broad based intercepting dips. See Timber Harvesting and Erosion Sedimentation Manual.

J. Roads, log landings, and skid trails should be constructed only during dry weather.

K. Sedimentation basins should be constructed at approaches to bridges or culverts in a stream channel to impound water from roads or skid trails.

L. Log landings should be constructed at least 200 feet from streams, ponds, lakes and marshes to reduce the risk of siltation caused by erosion from the landings. Special diversions and sedimentation basins may be necessary.

M. Approved wooden or metal gate should be installed at the entrance of main haul road prior to logging operations to protect road system from erosion caused by unauthorized vehicles.

N. Logging operations should be kept away from the streams to prevent soil disturbance near the stream. Trees cut below the road should be moved uphill with a winch.

O. In critical locations such as excessively wet areas, stream bottoms and highly erodible soils, logging operations should be avoided if at all possible, and if not; confined to the summer months when conditions are generally dry.

P. Sawmill sets within a watershed must be located no closer to a watercourse than 300 feet plus 10 feet for each percent slope between the site and stream.

Q. Close sale supervision must be exercised. The erosion and sedimentation control plan must be carefully followed. The greatest risk of erosion is during active logging. Drainage structures must be maintained. Water bars should be installed and temporary bridges and culverts removed at cutting block closure.

R. A herbaceous cover on portions of disturbed areas subject to erosion on sawmill sites, roads, log landings, and skid trails should be established prior to or as quickly as possible to comply with the Timber Harvesting Erosion and Sedimentation Manual.

S. Appalachia Standards sections 6.5g. to 6.5 t. will be adhered to for harvesting operations near streams and bodies of water. See: http://intraforestry/planning/Documents/Certification/FSC_US_Forest_Management_Standard.pdf Currently Bureau of Forestry policy exceeds the Appalachia Standards when harvesting near streams.

T. Considering the variability of conditions and circumstances across the State Forest, deviations might be necessary and/or beneficial to any of the aquatic habitat buffer guidelines. Requests for waivers will be reviewed per the following process:

1. If the activity is part of a silvicultural treatment (including District Forester timber sales), submit the request as part of the timber sale proposal. The Silviculture Section will then route the request to the Ecological Services Section and Assistant State Forester for Resource Planning and Stewardship for a one-

week review. Comments will be compiled by the Silviculture Section and documented in the Timber Sale file. The Assistant State Forester for Resource Planning and Stewardship will make the final decision.

2. If the activity is not part of a silvicultural treatment, a standard Environmental Review should be submitted to the Planning Section.

3. Exceptions to this review process include regular road, trail, and infrastructure maintenance.

III. Guidelines for Specific Aquatic Habitat Buffer Designations

The following guidelines apply for specific water body designations. In cases where multiple designations exist, guidelines for the most restrictive designation will apply. For each aquatic habitat buffer, an "inner" and "outer" zone is specified. The following describes the purpose, management, restrictions, and permitted activities for the two zones:

A. Inner Zone: The inner zone functions as a core area of protection that allows minimal human disturbance.

Tree cutting is only permitted for the protection of property or human safety.

B. Outer Zone: The outer zone functions as a transition area. The goal of this zone is to maintain a diverse community of tree, shrub, and herbaceous plants and vertical stratification.

1. Silvicultural activity is permitted in the outer zone. Entry by motorized equipment should be limited.

2. Prescriptions should focus on selection treatments where appropriate.

3. Harvests should consider the prescribed treatments in adjacent stands and employ a gradual or feathered transition area (i.e., vertical and horizontal stratification) from the outermost limit of the aquatic habitat buffer to the inner zone.

4. Guidelines are organized according to the following outline:
   - Streamside Forests
   - Wilderness Trout Streams and Wild Rivers
   - Exceptional Value (EV) Streams and Scenic Rivers
   - High Quality (HQ) and All Other Perennial Streams
   - Intermittent or Ephemeral Stream
   - Lakes, Ponds, and Impoundments
   - Vernal Ponds
   - Spring Seeps

- Wetland

IV. Streamside Forests

The aquatic habitat buffer begins at the top edge of the bank and applies to both sides of the stream. The widths of most aquatic habitat buffers do not vary with slope unless otherwise specified; however, management activities are not advisable on slopes exceeding 40%. The following guidelines are listed in decreasing order of restrictiveness for various stream designations.

A. WILDERNESS TROUT STREAM GUIDELINES

Wilderness Trout Streams are also considered Exceptional Value Waters Watersheds. Certain remote trout streams have been classified by the Fish Commission as "Wilderness Trout Streams". These streams have also been classified as Exceptional Value Waters under Title 25 Pennsylvania Bulletin, Vol. 9 No. 36, September 8, 1979.

The Wilderness Trout Streams program as established by the Pennsylvania Fish Commission "is designed to protect and promote native trout fisheries, the ecological requirements necessary for natural reproduction of trout and wilderness aesthetics." Under Chapter 93, all streams within the Commonwealth have been classified according to present condition and use. The Exceptional Value Waters classification was established to fulfill the federal requirement that some existing high quality streams within the Commonwealth be given special protection to insure that their high quality is retained.

Table 1. Minimum Aquatic Habitat Buffer for Wilderness Trout Streams and Wild Rivers*

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
200	0	200

* Wild River management plans supersede these guidelines.

Water quality criteria have been established for each classification delineating the limits of metals, dissolved oxygen, pH, temperature, turbidity, etc. that can occur within the streams in each class. Exceptional-value waters are an exception because specific criteria for levels of pollutants were not established but rather an "existing quality" or "antidegradation" criteria was established which specifies that no pollutants can be discharged into a stream of that class. This means that no man-made or man-caused activity can change the temperature, increase the turbidity or change the pH of the stream. Timber management on wilderness trout stream watersheds must

follow the same criteria that are required for logging on all watersheds. Additional restrictions are required to protect water quality.

Additional Restrictions

1. A 200-foot-wide zone will be maintained on both sides of the stream where cutting only for human safety is permitted.

2. All roads will be located away from the stream course; the distance between the streams and parallel road or trail shall be 200-feet plus 4 feet for each one percent slope.

3. Approved metal gate must be installed at entrance of main haul road prior to logging operations to protect road systems from erosion by unauthorized vehicles.

4. Fording of stream channel is not permitted.

5. Culverts will be permitted only on small tributary streams and no closer than 200 yards from the main stream.

6. Bridges will be permitted only if they can be installed without equipment entering the stream channel during construction or if a stream crossing with equipment is limited at one occasion.

7. No fill can be placed in the stream channel and no bank alterations will be permitted.

8. Sawmill sets must be located no closer to a watercourse than 300 feet plus 10 feet for each percent slope between the site and stream.

9. Skid and truck roads located within ¼ miles of a live stream channel including entire road systems, all landings and skid trails subject to erosion will be seeded prior to or as soon as possible after sale termination. Refer to seeding requirements found under the Haul Road Seeding Section.

B. Exceptional Value Streams and High Quality Streams

An exceptional value streams or watersheds is defined as follows: An outstanding national or state regional or local resource, such as waters of national, state or county parks and forests, or waters that constitute unfiltered potable water sources, or waters of wildlife refuges or state game lands, or waters that have been characterized by the fish and boat commission as “Wilderness Trout Streams” and other waters of substantial recreational or ecological value.

The big difference between "Exceptional Value Streams" (EV) and "High Quality Streams" (HQ) is that no water quality degradation is permitted in EV Streams.

Table 2. Minimum Aquatic Habitat Buffers for Exceptional Value (EV) Streams and Scenic Rivers†

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
135	0	135

† Scenic River management plans supersede these guidelines.

Table 3. Minimum Aquatic Habitat Buffers for High Quality (HQ) Streams and All Other Perennial Streams

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
30	105	135

Table 4. Minimum Aquatic Habitat Buffers for Intermittent or Ephemeral Streams

Intermittent streams are referred to as zero order streams with definable bed and banks. Water does not flow through the channel all of the time, but aquatic invertebrates and some vertebrates can survive in the moist substrate. Ephemeral streams only occasionally have water flowing.

Slope of Land Above Stream (%)	Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
0-10	0	40	40
11-20	0	50	50
21-30	0	60	60
31-40	0	70	70
40+	Activity may not be advisable due to erosion potential. Extreme care must be taken to prevent movement of soil.		

C. Lakes, Ponds, or Impoundments:

The aquatic habitat buffer for lakes, ponds, and impoundments starts at the edge of the water as it would exist during median capacity levels.

Table 5: Minimum Aquatic Habitat Buffers for Lakes, Ponds, or Impoundments ‡

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
30	105	135

‡ Individual lake management plans supersede these guidelines.

D. Spring Seep and Vernal Pool Guidelines

Spring seeps and vernal ponds are highly diverse and valuable components of our forest ecosystems in Pennsylvania. Spring seeps are important to wildlife as they provide a variety of food sources during periods of snow cover in addition to the diversity of species associated with the forested wetland habitat this create. Vernal ponds support a diversity of species not found elsewhere in the forest, including many invertebrates such as fairy shrimp. These ponds also are critical to the life cycles of many amphibians, which make up the largest vertebrate biomass in the forest, and perform many vital functions. Proper management of these systems is critical.

Some important management considerations should be remembered to protect the integrity of these systems. Shading is important on both spring seeps and vernal ponds. Especially in the maintenance of the unique vegetation associated with forested wetlands. High temperatures resulting from increased sunlight are a problem for the amphibians using vernal ponds. Increases in sedimentation are detrimental to both of these systems. Ruts in the vicinity of spring seeps can disrupt water flow. Ruts around vernal ponds can disrupt the migratory patterns of amphibians or cause the amphibians to breed in undesirable bodies of water, which may dry up too soon. Both spring seeps and vernal ponds are sensitive to disruption.

Spring seeps and vernal ponds are considered “jurisdictional wetlands” and as such, fall under regulatory process. Zoning variances will be granted, where justified, upon written approval by the State Forester. If you have any questions or comments regarding these guidelines contact Silviculture Section or the Planning Section.

E. Vernal Ponds

A vernal pond is a small, temporary body of water in a depression that is fed by surface runoff, lacks surface outflow, and is maintained by a high water table (does not persist year-round). Vernal ponds are also referred to as ephemeral or fluctuating pools.

Table 6. Minimum Aquatic Habitat Buffers for Vernal Ponds

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
100	100	200

Additional Guidelines for Vernal Ponds:

1. Restrict harvest operations within outer zone to **November through January**.

2. When the vernal ponds occur as groups in the landscape, the aquatic habitat buffer will begin around the edge of the entire vernal pond grouping.

3. Shading should be maintained and soil and leaf litter disturbance should be minimized throughout the aquatic habitat buffer.

4. Ruts created within the outer zone must be graded or raked to the original contour.

5. Shrub and herbaceous vegetation should be encouraged in the aquatic habitat buffer. They provide important food sources for wildlife and their presence helps to minimize invasion by non-native and invasive plant species.

F. Spring Seeps

A spring seep is a permanent or intermittent discharge of water that emerges from the ground and flows across the soil surface without defined bed and banks. The limits of the seep are demarked by the extent of surface water, water-stained leaves, or other signs of hydrology (e.g., oxidized root channels).

Table 7. Minimum Aquatic Habitat Buffer for Spring Seeps

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
30	70	100

Additional Guidelines for Spring Seeps:

1. Avoid soil and leaf litter disturbance within the aquatic habitat buffer.

2. Limit harvest activity to dry or frozen conditions when possible.

3. Ruts created within the outer zone must be graded or raked to the original contour.

4. Fell trees away from seeps and leave tops in wetland if they fall into standing water.

5. Encourage herbaceous vegetation around and below seeps and retain all valuable food producing small tree and shrub species in the vicinity of seeps, especially those seeps that remain open through the winter. Establish wildlife food shrubs and coniferous cover near seeps if needed (consult with the Ecological Services Section for list of plant species).

6. Where property boundaries and topographic permit, locate roads and high use recreational trails at least 150 feet down slope from head of seep; avoid roads within 150 feet uphill of seep. Down slope haul road locations are preferable to upslope. If topography does not permit recreational trails to be routed around the seep, elevate or stabilize trail surface as appropriate to ensure water flow and soil stability.

G. Wetlands

Wetlands are legally defined under Section 404 of the Federal Clean Water Act and Chapter 105 regulations issued pursuant to the Pennsylvania Dam Safety and Encroachment Act as: “areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, bogs, and similar areas.” Wetlands are typically characterized by hydrophytic vegetation, hydric soils, and the presence of water at or near the surface for a portion of the year.

Table 8. Minimum Aquatic Habitat Buffers for Wetlands

Wetland buffer guidelines have not been finalized and will be distributed as an addendum once finalized.

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
To be determined	To be determined	To be determined

Additional Guidelines for Wetlands

1. All wetlands will be protected or enhanced.

2. Fell trees away from wetlands. Leave tops in wetlands if trees fall into standing water.

3. Wetlands will be inventoried and evaluated according to the Landscape Examination procedures.
4. Proposed activities in wetlands will undergo an Environmental Review, as detailed in the Overview Section of the State Forest Resource Management Plan, prior to implementation.

5. Wetlands may be created or developed in suitable areas. An Environmental Review must be completed. Consult the Ecological Services Section. Other sources of information include the PA Game Commission, PA Fish and Boat Commission, PA DEP Bureau of Watershed Management, and the USDA Natural Resource Conservation Service.

V. Municipal Watershed Guidelines

The following guidelines apply, in addition to the general guidelines, when a proposed State Forest timber sale or other ;and management activities are located upstream from a dam or impounding basin on a watershed that supplies water to a municipality, institution or others for domestic, industrial or recreational use. To determine if the area in question is part of a municipal watershed, use the following link: http://nrforbofs05/watersheds/index.html

A. When the stand analyses have been completed, the District Forester shall notify the proper authority by certified, return receipt mail. The special precautions which will be taken by the Department to protect the watershed during the logging operations, how the timber sale will affect the watershed and deadline for reply (at least 30 days), should be included in the notification. District Forester shall send Regional Sanitarian a copy of the same information forwarded to a municipality, institution or private user.

1. If no reply is received from authority by deadline date, the District Forester shall attempt to contact the authority by telephone or in person in order to ascertain reactions to the sale and request a letter confirming it. If letter of confirmation is not received from authority the District Forester shall assume that the authority has no objections and proceed with the sale.

2. If the reply from authority offers no objections, the District Forester may proceed with the sale.

3. If reply from authority objects to the sale, the District Forester shall contact the authority to discuss the matter further in order to resolve the objection. If objection is resolved the authority should confirm this in a letter to District Forester. If objection is not resolved, the District Forester shall forward his recommendation to the Silviculture Section who will notify the District Forester whether or not sale should be processed.

4. Copies of all letters to and from each authority should be submitted by the District Forester to the Silviculture Section.

B. The sale proposal forwarded to the Silviculture Section shall include a report containing the following information:

1. The location and owner or lessee of each recreational area, dam or impounding basin and of the land immediately adjoining each dam or impounding basin. Owner or lessee's letter to the District Forester should confirm abandonment of a dam or impounding basin.

2. The distance each dam, recreational area or impounding basin is located down stream from the nearest boundary of the proposed sale.

3. A list of special precautions which should be taken by the Department to protect the recreational area, watershed or water supply and an explanation how the proposed timber sale will improve the watershed or water supply when, the proposed timber sale will affect the watershed or water supply.

4. A statement describing how the proposed timber sale will affect the recreational area, watershed or water supply.

C. Upon receipt of the sale proposal from the District Forester, the Silviculture Section shall decide if the proposed sale area and watershed shall be inspected with the District Forester and with the watershed authority before approval or disapproval is granted.

1. If proposed sale is approved, the Silviculture Section will notify the District Forester to proceed with the sale.

2. If proposed sale is not approved the Silviculture Section will notify the District Forester accordingly.

D. When the proposed timber sale is located on a watershed that does not supply water to a municipality, institution or others for domestic, industrial or recreational use, the word "none" shall be entered under total sale area opposite municipal watershed on Form FMT-5 or under area opposite watershed on Form FMT-4.

E. Timber management on municipalities, institutional, and private watersheds must follow the same criteria required for logging on all watersheds. Additional restrictions:

1. Approved metal gate should be installed at entrance of main haul road prior to logging operations to protect road system from erosion cause by unauthorized vehicles.

2. Sawmill sets within a watershed must be located no closer than 1 mile to the intake or impounding reservoir.

3. By Title Chapter 102.22, permanent stabilization is required immediately upon completion of any phase of earth disturbance or timber sale activity. Until permanent stabilization is met, erosion and sedimentation BMP's must be implemented and maintained. Permanent stabilization is only considered achieved if one of the two following criteria are met:

   a) A minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation

   or

   b) An acceptable BMP which permanently minimizes accelerated erosion and sedimentation. (Ie. Water Bars, broad based-dips, etc.) See Timber Harvesting Erosion and Sedimentation Manual

VI. Stream Encroachment Permits

The Department of Environmental Protection regulates activities within watercourses, floodways, bodies of water and wetlands under the authority of the Dam Safety and Encroachment Act of 1978. Section 6 of the Act requires permits for construction, operation, maintenance, modification, enlargement or abandonment of any dam, water obstruction or encroachment. Administration of the program is found at Title 25 PA code Chapter 105 Dam Safety and Waterway

Management Rules and Regulations. Chapter 105 regulates following activities in streams and wetlands using a five-tiered approach.

On State Forest lands Chapter 105 regulations will apply to all lakes, ponds, wetlands, perennial streams and intermittent streams with a definable bank and bottom. Chapters 105 provide a 5-tiered approach to the administration and regulation of wetlands and are listed below.

A. Activities in wetlands regulated by Chapter 105 that are subject to permitting.

1. The deposition of solid fill, gravel, soil, slate and other such material for the construction of temporary and permanent roads

2. The construction, operation, maintenance and modification, enlargement or abandonment of any dam, water obstruction or encroachments (i.e. culverts, fills, ditching).

3. To clear and grub, dig ditches and conduct other similar activities that are considered encroachments.

4. Constructing roads over streams.

5. Depositing fill for skid trails over streams, watercourses and wetlands.

B. Activities in wetlands not regulated by Chapter 105

1. Cutting timber and other vegetation

2. The placement of support mats, corduroy and other temporary fabricated roads for use as skid trails provided they are removed at end of operation.

C. Types of Permits for Regulated Activities

1. **Waivers**

There are total of 16 waivers for permits under chapter 105. The one that has the most bearing on timber sale operations, is that permits are waived for water obstructions in streams and floodways with drainage areas of less than 100 acres. **This waiver does not apply to wetlands that are located in floodways adjacent to streams.** For more information see the following website regarding chapter 105 regulations. **http://www.pacode.com/secure/data/025/chapter105/s105.12.html**

Although DEP waives obstructions in streams in watershed with less than 100 acres, the U.S. Army Corps of Engineers does not. There for it is required that contact is made with the US Army Corps of Engineers any time obstructions or crossings are to be placed in a stream channel or wetland. The checklist attached to the end of this section must be submitted to the local Army Corps of Engineers' office.

Additionally all projects that impact wetlands in anyway must have a bog turtle survey attached in the following counties: Adams, Berks, Bucks, Carbon, Chester, Cumberland, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill, and York. This is in addition to a PNDI survey which also must be conducted for management projects.

2. **General Permits**

General permits cover certain types of activities that present no danger to public health and safety and do not pose serious threat to the environment. Each contains special conditions relating to size of structures, drainage areas, trout waters and species of special concern that must be followed by the applicant. Updated versions of general permits are included in this section of the manual. Please make yourself familiar with the requirements in the permit applications when planning a stream crossing.

There are two General Permits that apply most often to forestry operations. They are for obstructions in streams and floodways with drainage areas of 100 to 640 acres. They also apply to all permitted activities that impact less than a quarter acre of wetland. The General Permits can typically be obtained and approved by the local county conservation district. The following criteria are the maximum amount of impact upon streams and wetlands permitted using general permits.

a) **GP-7 Permanent Minor Road Crossings.**

1) Not permitted on Exceptional Value or higher quality streams/watersheds or watersheds with drainage greater than 640 acres.

2) Single impacts to wetlands and small streams may not exceed 0.1 acres.

3) Total wetland impacts for all minor road crossings on an individual property may not cumulatively exceed 0.25 acres.

4) Crossings are limited to 100 feet in stream and/or wetland width.

5) Wetland replacement is required when impact is greater than .05 of an acre.

A GP-7 is best used when continued access will be necessary following timber sale activities.

b) **GP-8 Temporary Road Crossings**

1) Waived if crossing occurs on a watershed with less than 100 acres of drainage.

2) Stream and/or Wetland crossing is limited to less than 200 feet in length.

3) Valid from 12 months from the date of acknowledgement and may be extended by DEP at the request of the permit user.

4) Wetland replacement not required.

5) Restoration of the site including the wetlands is required when the use is completed.

A GP-8 is best used when the road will be retired and no administrative access will be necessary following the sale. Existing fords may be used but due to differing interpretation among county conservation districts: **it is strongly suggested that a meeting with the county conservation district be conducted on site during the planning stages of any management activity involving fords**. No new fords may be constructed on High Quality or Exceptional Value Streams or watersheds. Fords may not be used less than 2,000 feet upstream from a water intake or reservoir for public drinking water.

3. **Small Project Permit**

Small project permit applications are available for **activities in small watercourses and floodways that do not impact wetlands.** Typically small project permit applications are processed for the removal, installation, maintenance or abandonment of bridges, culverts and other minor types of crossings and activities in streams and floodways. Updated versions of small project permits are included in this section of the manual.

4. **Joint Permit**

Joint permits are used for all other regulated activities that are not authorized by waivers, general permits (GP-) and small project applications. It is called a joint permit application because one application is submitted for both federal and state permits. Federal and State programs do not regulate wetlands in the same manner. Permit applications are reviewed and permits issued by federal and state agencies independently. Both permits must be secured before any activity begins. Update versions of joint permits are included in this section of the manual.

D. When the construction of a haul road, spur haul road, skid road or trail required the installation or replacement of a culvert in or a bridge across any stream channel, the District must submit for approval to the respective County Conservation District or DEP and other federal agencies the appropriate permits involved to satisfy Chapter 105 requirements. Letter of approval should be requested to be returned to the District Office.

The entire "package" is then submitted to the Division of State Forest Management with the FMT-5. Any timber sale involving a regulated activity must have an approved permit before it is processed and advertised for sale.

E. Projects involving earth disturbances of greater than 5,000 square feet are subject to Title 25, chapter 102 regulations and require an erosion and sedimentation plan (E&S plan) to be file with the county conservation district. Disturbances less than 5,000 square feet require a written E&S plan if the site is covered under another DEP permit such as a GP-8 or GP-7, OR if the disturbed area has the potential to discharge into a Chapter 93 designated body of water.

Under agreement with DEP, the haul road portion of the FMT-7 timber sale contract (Section F) constitutes the Bureau of Forestry's standard E&S plan. This portion of the contract should be kept on site with operator like any other standard E&S plan, available for inspection upon request.

F. Management activities that involve greater than 25 acres of earth disturbance require a National Pollutant Discharge Elimination System (NPDES) Permit. Contacting the local county conservation district is a must, when planning projects that will require a NPDES permit. This does not pertain to silvicultural treatments such as scarification.

CHAPTER III
TIMBER STAND ANALYSIS

I. General Specifications

A stand analysis is required in all stands that are within proposed sale areas whether it is a permit or contract timber sale. The purpose is to gather information on the current stand conditions to determine the proper silviculture prescription based on a scientific approach. This will also create consistency in prescriptions that may be monitored and evaluated over time to determine their effectiveness. Waivers to doing sale analysis will need to be obtained from the Silviculture Section, and will need to be received in writing before proceeding with a sale. Reasons for allowing waivers will include but not limited to areas that will be converted from commercial forest to other land uses such as building sites, wildlife openings, or district wide salvage operations where time is imperative to realize full value for dead timber.

SILVAH 6.2 will be the accepted norm for all northern hardwood and oak stands. Procedures for taking analysis plots have been established for SILVAH and should be carefully adhered to in a careful conscientious manner: accurate recording and the proper number of plots **ARE ESSENTIAL**. These procedures will help to establish consistency for all treatments. Of all tasks in silviculture operations this is the most critical. In many cases, this analysis will serve as the only historical record of what the stand was, and the starting point for the future stand well into the next rotation. This information will be critical in aiding foresters in the future to the effectiveness of prescriptions and silviculture tools. This information is also critical to defending decisions and prescriptions as being scientifically based.

Nevertheless, these guides are not absolute. They represent only our best judgment at the present time; and are continuously improved and modified as research results and experience accumulate. Furthermore, no guide can ever be complete and perfect for all the many possible circumstances likely to be encountered. So, these guides must be used as an aid to professional judgment, not as a substitute for it.

SILVAH is a computer program that recommends a silvicultural prescription for a forest stand, based on a summary and analysis of field inventory data. As such, it is an "expert" system. The program also includes a simulator that can be used to project stand growth and development, estimating yields from either prescribed or user-defined treatments. The program's acronym - SILVAH - stands for Silviculture of Allegheny Hardwoods, although it has been updated to include guidelines for Mixed Oak Forests in the Mid-Atlantic region. SILVAH incorporates the current knowledge about silvicultural treatments in cherry-maple, beech-birch-maple, and mixed oak forests in the Alleghenies, and packages all the decision-making criteria that have been developed through research into a form that is easily used by practicing foresters.

Proper use of the SILVAH program requires some knowledge of silvicultural principles in Allegheny forests. A summary of the silvicultural information on which SILVAH is based is presented in USDA Forest Service General Technical Report NE-96 (Revised), "Prescribing Silvicultural Treatments in Hardwood Stands of the Alleghenies", by

David A. Marquis, Richard L. Ernst, and Susan L. Stout, 1992. For guidelines for oak regeneration, reference USDA, US Forest Service General Technical Report NRS-33 "Prescribing Regeneration Treatments for Mixed-Oak Forests in the Mid-Atlantic Region", Pat Brose, et all. 2008. Separate four-day training courses based on Silviculture in Allegheny Hardwoods and Silviculture in Mixed Oak Forests are given each year by the Northern Research Station in cooperation with the extension service of The Pennsylvania State University. A one-day course on the use of the SILVAH computer programs is also given periodically. It is recommended that all foresters take both courses at the earliest convenience. To register for these courses contact the silviculture section.

The prescriptions in SILVAH are arrived at through a series of decision charts that indicate a course of action to be applied to the stand based on what the objective is. This is why it is imperative that a final objective for the stand is set prior to implementing any stand prescriptions. The end goal must be established before a path to get there can be chosen. Different options should be explored to determine their likeliness for success. The forester then must decide on the best option that is both balanced in desirable outcome and cost effective.

The system of stand inventory, analysis and prescription relies heavily on numerical guidelines. Mathematical quantities have been assigned to things that had to be guessed at in the past. This system of mathematical weighting removes much subjectivity from the system and replaces it with an objective measurable and re-measurable system of judgment. These guidelines have been in practice for nearly twenty years on both public and private lands and usually lead to desirable results. In addition the U.S. forest service in conjunction with the bureau of forestry is under a system of constant review to refine these guidelines. They provide prescriptions that are consistent among stands of similar characteristics.

On occasion prescriptions will not be consistent with professional judgment. The forester may write a proposal to deviate from the silvah generated prescription, and must be approved by the silviculture section prior to proceeding. Reason for deviating from the prescription, the goal for the stand, and reason why the SILVAH generated prescription will not work must all be included in the written proposal.

II. Requirements

A. Timber stand analysis must be taken in each stand or portion of stand that will be included in a FMT-7 timber sale or FMT-4 Permit.

B. The number of regeneration plots in each stand or treatment should be 10 plots for each stand up to 20 acres, and 2 plots for every 5 acres greater than 20.

C. Overstory data should be recorded on data recorders, and entered into a Silvah file, regeneration plots should be collected in the same manner.

D. If a stand is not uniform, either in overstory or understory composition, it should be broken into similar parts and a separate cruise should be taken for each part.

E. Prior to marking of a sale, the District Forester will forward to the Silviculture Section a proposal for all FMT-7 timber sales. Included in this will be a SILVAH print out with the stand description and prescription, as well as an oak regeneration spread sheet for oak stands.

F. FMT-7 sales cannot be implemented without written approval by the Chief of the Silviculture Section.

G. The Timber Stand Analysis generated prescription developed by SILVAH must be no more than three (3) years old and represent the present condition of the stand.

H. Deviations from the SILVAH prescription must be explained in the narrative of the timber sale proposal.

For more information SILVAH data collection and use, please follow the link to intraforestry and explore the several topics discussed there: http://intraforestry/silviculture/silviculture.aspx.

III. Penn State Oak Regeneration Guidelines

In conjunction with the Penn State University School of Forest Resources, The Bureau of Forestry has had some additional research conducted in oak regeneration. The Penn State Oak Regeneration Guidelines are based on the relationship between 20 year sale exams and the original stand exams done prior to harvest on the same site. From that information probabilities were produced for seedling origin, and stump sprout origin stocking, inhibiting factors to successful regeneration. These probabilities factor into a decision making matrix that is worked through to produce prescriptions for stands.

Due to this system being relatively new and results as yet unproven, the confidence for its use is not as great as SILVAH. It is recommended that PSU regeneration guidelines be used as supplement to SILVAH, and to help substantiate a forester's professional judgment of a site when in disagreement with SILVAH prescriptions. However, for the immediate future, it should not stand alone as the sole stand analysis for the stand. As confidence and more uses are completed in the future, and results can be compared with predictions, the Silviculture Section may move towards allowing the oak regeneration guidelines as a sole prescription writer for stands. For information on how to use the Penn State Oak Regeneration Guidelines, please use the following linkhttp://intraforestry/silviculture/silviculture.aspx

IV. Conifer Management

In 2008, The Silviculture Section designed a decision matrix to help in prescription writing for conifer stands. It is based on several sites where conifer management has been applied state wide as well as additional research put out by

the forest service and academia. Data inputs for the decision process are based on information gathered through the SILVAH plot system. All major native species, as well as Norway Spruce have decision charts included. Use the following link to access the conifer prescription matrix: http://intraforestry/silviculture/Conifer_Management.pdf

V. Recommendation for Assessing Deer Impact

One of the most debated topics among foresters is assessing deer impact on a given site. Most of the disagreement stems form the subjective nature of how deer impact is assessed. Everyone can agree that most sites should be fenced at deer impact 4, but many can not agree if the deer impact is 2, 3, or 4. The reason for this is that deer impact is assessed for the site after an analysis cruise is complete. Assessing Deer impact is one of the most crucial decisions in stand analysis, since this drives the prescription, may determine if the site as adequate stocking, and determines the need for fencing. Below is a method for determining deer impact in a more consistent objective manner.

Step #1: On each plot count the current years browse on the ten tallest seedlings of desirable regeneration. If there is not at least ten seedlings, count the number you have. If there is no desirable regeneration, than no deer impact is taken for that plot.

Step #2: Divide the number of seedlings browsed by the total counted for the plot. This will give you a percentage.

Step #3: Average the percentages for all plots where deer impact was recorded.

Step #4: Take the average for the site and apply it to the following scale. Note: if no desirable regeneration existed on the site, then a default impact of 3 would be used.

0-20% = deer impact 1
21-40%=deer impact 2
40-60%=deer impact 3
61-80%=deer impact 4
81-100%=deer impact 5

With this method the actual impact on the site is measured regardless of what the deer population is. A deer population of 10 deer per square mile will have a higher impact on 100 seedlings to the acre, than those same ten deer on 10,000 seedlings to the acre. This system is an attempt to capture this dynamic in a consistent, objective fashion.

CHAPTER IV
HAUL ROADS

I. General Specifications

All roads necessary to operate a timber sale are classified into main haul roads, secondary haul roads and spur haul roads. Main haul roads are primarily for access to a timber sale area or where the volume to be cut requires a road which will bear traffic during most of the year with minimum wear and tear on equipment or where future use is planned. Secondary haul roads are roads, which provide access to State Forest areas from which limited timber volume will be removed, where construction of main haul roads is unnecessary or impractical, or where no future use or extension of the road is planned. Spur haul roads that lead into the main haul road are for use over a short period of time and over which a minimum volume will be hauled. Spur haul roads are generally confined within the sale area. Exceptions can be made if approved by the silviculture section.

A. Improvements to Class 1 and Class II roads cannot be specified by the timber sale contract. These roads must be maintained and repaired through the District's regular road maintenance programs. No deduction may be made for the purchase of material or labor to improve State Forest Roads with the exception of Class III roads and drivable trails. We may legally improve existing Class III woods roads via the timber sale contract without gating or permanently closing the roads. This does not affect our existing policy to routinely gate or permanently barricade haul roads following their use for timber removal. It does, however, provide us with the option of leaving all or a portion of an existing Class III woods road open to public travel following its use as a haul road. There are occasions where this can be justified and benefit the Commonwealth. On those occasions the Forester must document and justify their reasons for leaving the road open when submitting their sale proposal.

B. Accessibility to a proposed timber sale should always be established before effort and materials are expended on the sale area and prior to any sale proposal.

C. The joint use of State Forest roads for two or more State Forest timber sales should be avoided whenever possible. In some districts this is an unavoidable situation. When State Forest roads are used jointly for two or more State Forest timber sales, the District Forster will use their judgment to decide who is responsible for repairs on that road. Generally, sale operations should be suspended in writing before damage to the State Forest road system becomes excessive. If a Buyer wishes to continue operating they will assume full responsibility for all needed repairs.

D. In locating main haul roads, it is important that the Forester keep in mind future sales as well as fitting the haul road into the District road system. The overall goal of the road system is to reach the maximum number of acres zoned for timber management with the least amount of road mileage. For example if a haul road is being built for the first in a series of sales, the road should be designed to permit access to the additional sale areas with

a minimum of new construction.

E. Cost of construction, improving or seeding the main and secondary haul roads shall be carefully estimated and shown on the FMT-19. This main and secondary haul road cost estimate will be shown in detail on Form FMT-25; Estimate of Haul Road Costs for Deduction from Minimum Valuation for Timber Stumpage.

1. This form is prepared for all sales where a main or secondary haul road is required for removal of timber stumpage.

2. The estimated costs of the main and secondary haul road will be deducted from the computed sale value.

3. Construction, improvement and seeding costs will be submitted on separate FMT-25's for both main and secondary haul roads.

4. All bridges, culverts and other structures which are listed on the FMT-25 and the price of which is deducted from sale value shall become property of the Commonwealth.

5. The following types of haul road costs may be listed and deducted on the FMT-25. This is not inclusive and costs may be added with justification to the Silviculture Section.

   a) Grading, crowning, ditching and retirement costs of new or existing haul roads.

   b) Clearing and constructing costs of new haul road right of way.

   c) Installation and material costs of geotextile fabric on haul roads.

   d) Installation and materials costs of gates and locks.

   e) Delivery costs and costs of materials needed to barricade a haul road at sale termination.

   f) Installation and material costs of permanent culverts on a haul road.

   g) Installation and removal costs of temporary culverts on a haul road.

   h) Costs associated with installing a culvert, ford or temporary bridge according to GP Permit.

   i) Delivery, grading and material costs of stone, shale and other materials needed for road surfacing.

j) Construction and material costs of installing broad based dips.

k) Costs associated with construction of turnouts and landings.

l) Spreading and materials costs of lime, fertilizer, seed and mulch needed to retire landings, roads, and disturbed areas.

m) Sales tax on all materials that are not available from State Forest Lands

F. The following applies when main haul roads, spur haul roads, skid roads and trails must cross pipelines or transmission line rights-of-way not covered by lease agreements stating otherwise:

1. The District Forester shall notify the Lessee by registered letter, return receipt requested. In the letter the District Forester will request a meeting with a representative of the company to determine the most feasible locations to cross the right-of-way. At this time pipeline rights-of-way may also be inspected to establish protective skidding or hauling measures to prevent injury to the operator or damage to the pipeline. A letter of stipulations and approval from the Lessee must accompany the FMT-5.

2. After the Contract has been made, the District Forester will supply the Lessee with the name of the Buyer of the timber sale.

3. The Buyer must make arrangements with the Lessee for approval of the right-of-way crossings and be prepared to assume the liability for any damage that may occur during construction and use.

4. The Buyer is required to submit to the District Forester a copy of the letter from the Lessee granting them permission to use that portion of leased right-of-way on State Forest land.

5. The above does not apply to situations where the lease agreement makes the Lessee responsible for the crossing. Districts are encouraged to make this language a provision in all new lease agreements.

G. All main haul roads should be located, if possible, on State Forest land. However, on occasion conditions will require the location of the main haul road on private land to gain access to the sale area.

1. The District Forester should notify the landowner by registered mail, return receipt requested. In the letter the District Forester shall explain the need of accessibility and request a permanent right-of-way across his ownership.

2. If obtaining a permanent right-of-way is unsuccessful, the District Forester should attempt to secure a temporary right-of-way from the adjacent landowner.

3. If the purchase of a right-of-way is not successful, permission shall be requested by the District Forester to permit the Buyer to obtain and negotiate the right-of-way across private land to the sale area. The sale prospectus will be written specifying that the buyer will be responsible to negotiate access to the sale area for removal of the timber.

4. The Buyer is required to submit to the District Forester a copy of the letter from the private landowner granting permission to construct and/or improve the access road and to use said road during the period of the timber sale contract.

H. When access to a sale requires crossing State or Federal lands (other than State Forest land) a map showing the main haul road system is to be forwarded to the agency having jurisdiction. Accompanying the map is a letter of explanation that includes a request for written approval and a request for a written list of restrictions the agency wants enforced. A copy of all correspondence to and from the agency must be forwarded to the Silviculture Section. For example a special contract has been developed between the Bureau of Forestry and the Game Commission to deal with the special concerns the Game Commission has regarding haul roads. Note: Sale processing will be delayed until approval is received.

I. Main and secondary haul roads must be constructed before logging operations may begin. The exceptions to this would be where the haul road right-of-way is treated as a cutting block and on big sales with a large amount of roadwork. When the haul road is a cutting block it shall be cut first and the road constructed or improved prior to cutting any other block, unless otherwise authorized by the district forester.

On big sales with large amount of roadwork the provision may be made for the Buyer to begin logging operations on one block while roadwork progresses. The District would specify the block the Buyer could being operations in and no other blocks would be opened until all roadwork is completed. The District would need prior approval from the Silviculture Section for this provision. If approved, this provision would be included in the prospectus and contract for the sale in question.

J. When the location of the main or secondary haul road right-of-way takes it out of the sale area, then that area covered by the haul road is to be treated as a cutting block. The haul road acreage outside of the sale area is counted as part of the total sale acreage and is given the treatment code for “haul road”.

K. Payment for merchantable timber to be removed from the haul road right-of-way may be handled in the following manner:

1. The merchantable timber to be removed will be marked and tallied in a data recorder file for sawtimber and pulpwood. The area covered by the right-of-way should be treated as a cutting block with acreage assigned to it. If timber is to be cut in the road right-of-way, this cutting block shall be numbered and will be cut first.

2. If it is not practical to include the haul road as a cutting block, the timber to be removed on the right-of-way will be marked and volume computed. The value of the timber to be removed will be computed based on those volumes and included as determined in Section 10 of Form FMT-7, Tree Estimate Timber Stumpage Sale Contract. Invoice for timber required. Use the price per thousand on the adjusted species price sheet for this sale. If a species is missing, contact your silviculture rep for recent district price. Send all copies of invoices to the Silviculture Section!!!!

L. All main, secondary and spur haul roads, skid roads and trails, and landings should be retired as soon as the operator is finished with them. If the sale is large and will be operating over a long period of time, Cut banks should be seeded as soon as practical to prevent erosion. They should also be shaped up when an operator does not intend to use them for an extended period of time. Refer to Section on Haul Road Construction and Maintenance in the Contract Sale FMT-7.

M. Any haul road or skid trail which the District wishes to keep open for access should be identified at the beginning of operations to allow the Buyer to plan his work accordingly.

N. All drainage structures placed on haul roads to cross-streams and other water sources must be properly permitted according to Chapter 105 regulations.

1. Where a culvert will not handle the water, the Buyer will be required to construct or install adequate drainage structures where roads cross-intermittent or permanent live stream channels.

2. Such drainage structures are to be removed by Buyer when they are no longer needed in the operation of the sale and prior to submitting Form FMT-9 recommending termination of the sale.

3. If it would be desirable for administrative purposes to retain a drainage structure in a haul road, the District Forester may request the Buyer to leave it intact. Such requests must be in writing, permissible under Chapter 105 regulations and a copy of the letter must be sent to the Silviculture Section.

II. Main Haul Road Specifications

- Main haul roads are primarily for access to a timber sale area or where the volume to be cut requires a road which will bear traffic most of the year with minimum wear or tear on equipment or where future use is

planned to access additional sales or compartments. Main haul roads including all installations, which the Buyer shall complete at his expense prior to the start of logging operations, must be located and designated on the ground by the Forester and appear on the sketch of the sale area. (See **FM-T-7 CONTRACT** Exhibit A)

A. Location

1. Main haul roads, including any necessary turnouts, must be located on the ground by the Forester. This can generally be done best considering all factors of the sale layout after scouting is completed and before marking begins.

2. In some instances haul road locations will follow existing roads or old abandoned roads. In such instances these roads will be improved and maintained to conform to the same specifications for the location, construction, and maintenance of new haul roads.

3. The location of the main haul road must be shown on the sale area sketch, which accompanies Form FMT-19 and properly symbolized on the timber sale map.

4. U.S.G.S Topographic maps, aerial photos, soil maps and the management maps are helpful in locating the main haul road.

5. Proper drainage is the most important feature of any road and is especially true of a logging road. Proper drainage depends primarily upon location; whenever possible always located the road on a side hill. Where this is not practical, turnpiking or lateral trenching may be necessary. **KEEPING WATER OFF THE ROAD WAY IS THE SINGLE MOST IMPORTANT FACTOR TO MAINTAINING HAUL ROADS!**

6. Never use old woods road or railroad grade unless it is located properly and can be drained and improved to main haul road specifications.

7. Avoid heavy cuts and fills, sharp curves, steep grades, ledges, wet swampy areas, locations below high water levels and unnecessary stream crossings.

8. Cross streams at right angles and when streams are crossed avoid extending the road upstream from the crossing on both sides of the stream.

9. Sediment filtration strips must be left between all water courses and all roads. Width of such strips must be as follows:

Slope of Land Between Stream Course and Road (percent)	Width of Filtration Strips (feet)*
0	50
10	90
20	130
30	170
40	210
50	250
60	290
70	330

* Increase of 4 feet for each 1 percent increase in slope.

10. When possible, minimize adverse visible effects by building a bend or curve in access roads near where they enter public roads. Where possible, avoid coming off the main road at a right angle.

11. Grades are to be kept as low as possible. The objective being not less than 2 percent and not more than 8 percent. The maximum length of road without a break should be limited to 1,000 feet, up to 10 percent. 11% or more slope, the length should be limited to 500 feet followed by at least 300 feet of grade not exceeding ten percent.

12. The centerline of the main haul road shall be marked with a 2-inch band or red paint. Trees within the 24-foot right-of-way to be cleared shall be marked and tallied prior to the time the operator begins construction. Additional right-of-way width may be desirable on a side hill to prevent undercutting of trees on the uphill side and covering the trees on the downhill side with fill.

B. Clearing

1. Clearing shall be wide enough to allow the construction of a road having a minimum width of 18 feet including ditches (a 16 feet running surface). Where turnouts are required, additional width will be cleared as designated by the Forester. See sketch A in a sale contract. The right-of-way width must be 24 feet minimum to allow proper drying action by the wind and sun.

2. Tree stumps in the right-of-way may be pushed out with a bulldozer. All stumps, roots, and other debris must be moved back beyond the cleared right-of-way. Slash resulting from clearing of right-of-way for roadwork shall be immediately lopped and scattered sufficiently to eliminate and “jack straw” piles.

3. Whenever possible, cuts on a side hill must always be wide enough to allow construction of a road that will enable traffic to keep off the filled portion.

C. Construction

1. Road may be either in sloped, out sloped, or crowned as required by Forester.

2. Roadway must be sufficiently wide to allow construction of adequate ditches.

3. Cut slopes may be as steep as the soil will allow. Undercutting of slopes is prohibited.

4. Buyer may have, without charge, surface rock and surfacing material from State Forest land at locations approved by the Forester for use on haul roads.

D. Grading

1. Road either shall be in sloped, out sloped, or crowned as specified by Forester. See sketch B. Ditches must be constructed on all roads except- where they cross rock formations.

2. Cut slopes may be as steep as the soil formation or material will allow, as determined by the Forester during construction. Undercutting of slopes is prohibited.

E. Drainage

1. Underground culverts of either metal or plastic and intercepting dips may be used as approved by the Forester. Such structures will be placed at locations designed by the Forester who also specifies the size.

2. When a heavy flow of water is anticipated, brush, plank or rock must be placed at discharge end of the drainage structures to prevent excessive washing of soil.

3. Berm on the outside of the road shall be broken at strategic locations to allow drainage of the road surface. Such breaks may be made with a bulldozer and will be located by the Forester.

4. When any cross drainage or intercepting dip is within 25 feet of a stream crossing on a general watershed or within 50 feet of a stream crossing on a public or private watershed, Buyer shall install a sedimentation basin at the discharge end to receive water before it is discharged into the woods.

5. If soil washes at the discharge end of culverts, intercepting ditches, water bars, or breaks in the berm, a

floor of 2-inch plank or hand placed rock shall be provided. At discharge ends, tail ditches will be of sufficient length to insure drainage does not back up the road surface.

F. Bridges, Culverts, and Fords

1. Bridges, as specified by the Forester and approved according to Chapter 105 regulations must be installed where roads cross-intermittent or live stream channels in accordance with the provisions of the Encroachment Permit. The Forester prior to construction must approve bridge designs.

2. Culverts, as specified by the Forester and approved according to Chapter 105 regulations shall be placed in the bottom of the stream channel and covered with appropriate fill material. Culvert ends shall extend several feet beyond the toe of the road embankment. All culverts must be installed in accordance with the provisions of the Encroachment Permit.

3. Fords, as specified by the Forester and approved according to Chapter 105 regulations and by the Silviculture Section, are permissible only when it is not feasible to install a bridge or culvert. Fords are prohibited on all wilderness trout streams and watersheds of municipalities, institutions, and private users for supply or potable water and exceptional value waters. Fords must have solid bottoms and approaches that contain rock, stone, or gravel. Fords must always be located at right angles of the stream channel. **SKIDDING ACROSS FORDS IS PROHIBITED.**

G. Maintenance

1. The road surface is to be maintained to allow water to run off and be carried away by the drainage structures. This can be best accomplished by occasionally grading the road while the sale is active.

2. Drainage structures shall be kept open and functioning at all times.

3. Gravel or shale shall be spread on broad based dips, which become subject to erosion.

4. Road surfaces shall be maintained so as to allow water to be drained from the roadway.
5. Loose boulders and slide material shall be removed from roadway and side ditches.

H. Retirement of Main Haul Roads.

1. Roads are to be properly retired so that they may again be used in future logging operations. Road retirement is the responsibility of the buyer for using the road to remove the timber from the sale. The road must be retired to as good as or better condition than when sale operations commenced.

2. Roadways must be graded to eliminate any wheel ruts and to make certain that water runs off in the ditches. Fenders and high outside shoulders shall be removed.

3. All bridges, culverts and other structures which are listed on FMT-25 and the cost of which was deducted from sale value shall remain the property of the Commonwealth and remain in place. Items not included in the road deduction must be removed at the Buyers expense unless the District Forester otherwise grants permission in the writing. All haul road retirement must be completed prior to sale termination.

4. Temporary culverts are to be replaced by broad based dips, earth or log water bars. Additional water bars are installed when they are necessary to prevent erosion and allow grass to become established. Make sure water bars drain and do not act as dams.

5. If the road is to be retired and not used immediately, the Forester must require that disturbed soil be seeded to establish a grass cover.

6. All drainage ways must to be opened and deepened as necessary to carry the water off and away from the road.

7. Portions of main haul roads are to be retired when they no longer are used in the logging operation, rather than wait until the entire logging operation is completed.

8. An approved type of gate is to be installed either by the Buyer or the District to prevent travel by the public over retired main haul roads. A sign should be placed approximately 100 feet in front of the gate warning the public that this road has been gated.

9. To prevent injury or fatal accidents to snowmobilers and trail bike riders, all gates must be painted with alternate bands of black and reflective yellow paint to improve visibility against a snow and forest background.

I. Gates

1. All main haul roads must be gated with an approved type of gate. (See sketch “Current gate specs.”) Unless otherwise authorized in the attached contract, gates must be installed before logging operations begin on the timber sale.

2. Cables must **NEVER** be used as gates under any circumstances! Cables create hazards that may kill or injure.

3. All gates must be painted alternate bands of yellow and black to make them more visible to the users of State Forest lands. The buyer may install a prime paint coated gate and the district can paint it properly.

J. Highway Occupancy Permits.

All terms, conditions, and specifications of such permits applicable to the sale shall be followed. Any time a new haul road is to be constructed from a township, or state highway, the forester should check with the township or Penn DOT on rules regarding highway occupancy agreements. The permit should be obtained at the proposal stage to ensure access is feasible. The district will apply for the permit, if the permit expires before the operator starts road construction, the buyer will apply for the extension or new permit.

K. Seeding

All roads that are to be retired upon sale completion are to be limed, fertilized, and seeded to a grass cover as per the requirements of the sale contract.

III. Secondary Haul Road Specifications

Secondary haul road are roads, which provide access to State Forest areas from which limited timber volume will be removed, where construction of main haul roads is unnecessary or impractical, or where no future use of the road is planned. Secondary haul roads, including all installations, which the Buyer shall complete at his expense prior to the start of logging operations, must be located and designated on the ground by Forester and appear on the sketch of the sale area. (See **FM-T-7 CONTRACT** Exhibit A) All specifications for main haul roads will apply to the secondary haul roads with the following exceptions:

A. Clearing

The road right of way clearing will be wide enough to permit construction of the secondary haul road. Where a wider width is required, the Forester will specify it.

B. Road width

Secondary haul roads will have at least a twelve (12) foot running surfaces. Where a wider road is required, the District Forester will specify it.

C. Gates

A gate will not be required if the secondary haul road intersects a gated or otherwise barricaded road.

IV. Spur Haul Road Specifications

Spur haul roads, which lead into the main or secondary haul road, are for use over a short period of time and over which a minimum volume will be hauled. Spur haul roads are generally confined within the sale area. Spur haul roads may be located either after the sale contract has been awarded in conjunction with the buyer, or prior to submitting the FMT-19. When spur roads are located prior to sale submission, the location of the spur haul roads must also be shown on the sketch that accompanies the FMT-19. All specifications for main and secondary haul roads apply to Spur Haul Roads, with the following exceptions:

A. Spur haul roads must be constructed by the Buyer to required specifications at his expense. This is considered part of the logging cost such as skidding or loading and no deduction from the sale value for the cost of spur haul roads are allowed.

B. Location

1. Spur haul roads will be located by the Forester in charge of the sale in advance of, or in the company of the Buyer or his representative.

2. Spur haul roads are best located as the sale progresses.

3. Timber marked for removal in clearing for spur haul roads shall be paid for by the Buyer and the price computed as required for all timber damages not through neglect.

C. Clearing

Clearing for right-of-way and roadway will be only wide enough to allow safe and unhindered movement of trucks and other equipment. Widths will be determined by the Forester and will take into consideration of all drainage facilities necessary.

V. Log Landings

A. Minimize the number and size of landings through careful planning and location of main and spur haul roads and skid roads and trails. A good rule of thumb is a ¼ mile on a drag for a skidder to reach a log landing. Greater distances would require two or more landings.

B. Avoid low spots and poorly drained areas when locating landings; place them on gently sloping ground to facilitate good drainage.

C. Locate log landings behind a bank or hill at least 200 feet from roads or trails whenever possible. If no bank or hill is present, the road should be curved so the landing is not directly visible from the main road.

D. Landings should be located on the same side of a road open to public travel as the timber sale. If a timber sale is on both sides of a public road, there should be a landing on each side of the road. Skidding across a road open for public travel is prohibited.

E. Avoid locating landings at the downhill end of a long grade or skid trails, where no provision for preventing runoff from entering the landing exists. Construct diversion devices at all places where water might run onto and over landings. A ditch around the entire uphill side of a landing can be used to intercept and bleed water off before running onto or under landings.

F. Construct landings at least 200 feet from streams, ponds, lakes, and marshes to reduce the risk of siltation caused by erosion from the landings. Special diversions and sedimentation basins may be necessary.

G. Grade and back blade landings, access trails, and roads after use to prepare for seeding, liming, fertilizing, and mulching if needed.

VI. Skid Road and Trail Specifications

Skidding facilities necessary to operate a timber sale are classified into skid roads and skid trails. **SKIDDING ACROSS LIVE OR INTERMITTENT STREAMS IS PROHIBITED EXCEPT OVER APPOVED BRIDGES OR CULVERTS.**

A. **Skid Roads**- skid roads are for primary removal of timber products from a portion of the sale area to the landing or yarding areas. They must bear heavy use in all types of weather and must be located and constructed prior to start of cutting in each block. It is from main skid roads that secondary skid trails can be constructed.

1. Main skid roads must be located by the Forester in charge of the sale and preferably in company with the Buyer or his representative and shall be constructed by Buyer at his expense prior to the start of cutting in each block. All Skids Roads may be completed in conjunction with haul road construction. Where this is possible it is recommended to make skid roads part of the haul road cutting block.

2. Forester will specify the width of clearing permitted and will adjust same to accommodate the type of equipment being used.

3. Skid roads are to be located so they may be drained, thus eliminating mud holes. They must also be located to avoid sharp turns and steep grades.

4. Main skid roads must be designed to accommodate rubber tired speed skidders, unless their use is prohibited. Any piece of skidding equipment that has the potential to cause a large amount of damage to either the site or the residual stand should be prohibited from the sale area.

5. When necessary, skid roads are to be reinforced by cross or parallel poles when gouging or trenching occurs.

6. Fenders or bumper trees may be required at strategic locations to prevent damage to other more valuable residual trees along the sides of main skid trails.

7. Skid roads are to be retired in a manner to prevent washing and erosion. Water bars may be required and any bridges or culverts must be removed.

8. Main haul road requirements for abandonment, bridges, culverts, drainage, maintenance and retirement shall apply to skid roads.

9. Skidding through fords is prohibited.

10. Skid roads subject to gouging or rutting shall be corrected as required by Forester.

11. Skidding across roads open to the public is prohibited.

B. Skid Trails – Skid trails are used to skid logs from the stump to the main skid road and are selected as logging progresses. Trails receive limited use and generally require no construction.

1. Skid trails, which are used to skid logs from the stump to the main skid road, are to be carefully selected by the operator and constructed at his expense as the sale progresses.

2. The Forester in charge will require any skid trail, which is not located properly to be relocated immediately at a location he selects.

3. Skid trails shall be only wide enough to accommodate the type of equipment being used.

4. Grades shall be kept as low as possible, and never perpendicular to slope.

5. Drainage structures shall be constructed and maintained as necessary.

6. Requirements for fenders and bumpers shall be the same as listed above for skid roads.

7. Skid trails shall be maintained during skidding operations. When abandoned, required drainage facilities shall be installed to keep water off trails and prevent erosion.

8. Skid trails must be properly retired and left in a condition to prevent washing and erosion.

C. Steep Timber Sale

Special consideration must be given for steep timber sales during both sale design and layout and for logging and contracting.

1. Skid trail locations should be planned out during sale layout.

2. If the site is going to be part of a Herbicide Spray Block, than the skid trails should be planned out prior to laying out the spray block.

3. Should try and have skid trails on a 150 foot spacing or greater.

4. Do not place **winter cutting only restrictions** on blocks requiring skid trails.

5. Do not allow skid trails to be built when haul road work is done, because time of year and/or weather conditions when logging is done may affect how many trails are actually needed.

6. Can specify maximum width of machine to be used on a block to keep down the skid trail width.

7. Possible restrictions to consider for inclusion in contract for steep timber sales.

- All skid trails must be approved by the inspecting Forester prior to construction.
- All skidding on Block #_____ must be done with a tracked machine. No skid trails will be permitted.
- No new skid trails will be permitted on Block #_____. (if trails were installed during prior shelterwood)
- A dozer must be kept on site during all skidding operations.
- All skid trails on a block must be re-graded and water- barred to the District Foresters specifications prior to moving to a new Block.
- Skid trails must only be constructed to a maximum width of _____ feet
- Skid trails must be kept free of brush and tops prior to closing out block (shelterwoods treatments)
- No grapple skidders or felling machines may be used on Block #_____
- Skid trails may not be constructed on a Block prior to opening the Block for cutting
- Buyer may have to install a temporary culvert pipe(s) on a skid trail(s)

Note: Most of these restrictions should include the wording **"unless authorized by the District Forester"**.

VII. Highway Occupancy Agreements

A. Application for State or Township Occupancy permit must be completed and returned to either the respective Township or State Highway Official when a timber sale requires construction of a new haul road, which will enter a State or Township Highway or when an alteration will be made of the grade of an existing State Forest road at its entrance to a State or Township Highway

B. An approved permit must be secured prior to submitting the FMT-19 to the Silviculture Section for sale processing.

C. A copy of said highway occupancy permit with sketch, issued to District Forester must accompany Form FMT-19 when it is forwarded to the Silviculture Section. If the authority in charge does not require a permit, a written statement of this fact should be obtained from the authority and a copy of it sent with the FMT-19 in place of the permits.

D. A copy of the Driveway Regulations, in addition to the above mentioned forms, should be ordered from the respective Engineering Office listed on the back of form M-945A and filed with the forms. The application and regulations for a Township Road must be obtained from the respective Township in which you are making application.

VIII. Erosion and Sedimentation Control Plan

Projects involving earth disturbances of greater than 5,000 square feet are subject to Title 25, chapter 102 regulations and require an erosion and sedimentation plan (E&S plan) to be filed with the county conservation district. Disturbances less than 5,000 square feet require a written E&S plan if the site is covered under another DEP permit such as a GP-8 or GP-7, OR if the disturbed area has the potential to discharge into a Chapter 93 designated body of water. Under agreement with DEP, the haul road portion of the FMT-7 timber sale contract (Section F) constitutes the Bureau of Forestry's standard E&S plan. This portion of the contract should be kept on site with operator like any other standard E&S plan, available for inspection upon request.

Management activities that involve greater than 25 acres of earth disturbance require a National Pollutant Discharge Elimination System (NPDES) Permit. Contacting the local county conservation district is a must, when planning projects that will require a NPDES permit. This does not pertain to silvicultural treatments such as scarification. The Erosion and Sediment Control Plan will be included with all Contract and FMT-4 Permit Sales. State law requires a copy of the Erosion and Sedimentation Plan to be on site at all times for all timber harvesting operations.

Buyers must comply with the Erosion and Sediment Control Plan and take any additional precautions that are necessary in the opinion of the District Forester to prevent soil erosion and sedimentation during the operation of this sale. Should soil erosion and sedimentation occur on State or adjacent private lands from the operation of a sale, the Buyer, at his own expense, must correct the conditions immediately to the satisfaction of the Bureau of Forestry. All sale operations will be planned so as to conform to the erosion and sediment control regulations. Much of the information below is in the form of a general erosion and sedimentation control plan that is attached to all timber sale contracts. The forester responsible for the sale must adapt this general plan for any special or unusual circumstances that occur in a timber sale.

SPECIAL REQUIREMENTS FOR EROSION AND SEDIMENT CONTROL PLAN

In accordance with Rules and Regulations of Title 25 Pa. Code Chapter 102. Supplement to Contract Timber Sale FMT-7, Districts Forester's Timber Sale Permit FMT-4 and Forest Product Sale FMT-15. Buyer must comply with articles A to G inclusive which appear below, and take any additional precautions which are necessary in the opinion of the District Forester to prevent soil erosion and sedimentation during the operation of this sale. Should soil erosion and sedimentation occur on State or private lands from the operation of this sale, the Buyer, at his own expense, must correct said conditions immediately to the satisfaction of the Department.

A. Logging

Hauling or skidding or placing fills or other obstructions in live or intermittent streams is prohibited. Skidding across live or intermittent streams is prohibited except over bridges or culverts that are approved according to Chapter 105 regulations and by the District Forester. Hauling across live or intermittent streams is permissible over bridges, culverts, or fords that are approved according to Chapter 105 regulations and by the District Forester. Fords are prohibited on all sale areas that are located on the watershed of a municipality, institution, or domestic water supply.

B. Disposal of Tops, Slash and Other Logging Debris

No tops or slash shall be left on any drainage ditch leading from a culvert, water bar, intercepting dip or break in berm of road, or within 25 feet of a stream, dam or lake. The exception to this section is if in the opinion of the District Forester the tops and slash are needed to control an existing erosion problem.

C. Haul Roads, Skid Roads, Skid Trails

The Buyer, prior to start of logging on the sale area, shall construct or improve main haul roads and/or secondary haul roads, including the installation of bridges, culverts at a stream crossings and fords as marked on the ground and show on sketch (Exhibit A). Said haul roads, an additional main haul roads approved by District

Forester, spur haul roads, skid roads, and skid trails required for the operation of this sale shall be constructed or improved, maintained and abandoned by Buyer at his own expense as follows:

1. Main Haul Road Specifications

a) Location – Main haul roads shall be constructed by the Buyer prior to the start of logging operations and have been located and designated on the ground by the District Forester and appear on sketch of sale area.

b) Clearing – Clearing shall be wide enough to allow the construction of a road having a minimum width of 24 feet including ditches. Where turnouts are required additional width will be cleared as designated by District Forester.

c) Grading – Road either shall be in sloped or crowned, as specified by District Forester. Cut slopes may be as steep as the soil formation or material will allow, as determined by District Forester. Undercutting of slopes is prohibited.

d) Drainage – Open top culverts, underground culverts (metal, plastic, concrete or wood), intercepting dips of this size and type specified by District Forester shall be installed or constructed by Buyer at locations designated on the ground by Forester. When any cross drainage or intercepting dip is less than 25 feet from a stream crossing on a public or domestic watershed, Buyer shall install a sump, under the direction of the District Forester at discharge end of dip to receive the water before it is discharged into the woods. Berm on the outside of the road shall be broken at strategic locations marked on the ground by District Forester to allow run off to flow into the woods. Such breaks may be made with a bulldozer. For soil washes at discharge end of culverts, intercepting dips, water bars, or breaks in berm of road, a floor of 2-inch plank or hand-placed rock shall be provided.

e) Culverts, Bridges, and Fords – Culverts which meet with the approval of District Forester shall be installed where roads cross temporary or permanent live stream channels. Culverts shall be placed on stream grade and be of sufficient length to extend beyond the toe of road embankment. When District Forester approves fords, the location of each ford is shown on sketch of sale area (Exhibit A). Fords must be at right angle to stream and must have solid approaches. A heavy application of gravel or shale for minimum distance of 100 feet on each side of stream often will make a satisfactory approach. Bridges may be used when neither a culvert nor ford are feasible. All of the above structures must be installed and maintained as specified by the appropriate Chapter 105 permit.

f) Maintenance – Drainage structures shall be kept open and functioning at all times. Gravel or shale shall be spread on broad based dips that become subject to washing. Road surface shall be maintained so as

to allow water to be drained from roadway. Loose boulders and slide material shall be removed from roadway and side ditches.

g) Retirement or Abandonment – Surface of road shall be graded to eliminate any wheel ruts. Fenders and high outside shoulders shall be removed. All bridges, drain pipes and culverts installed by Buyer shall be removed unless Buyer has been notified in writing by District Forester to leave certain installations in place. Cross drains and culverts shall be replaced by broad based dips, earth or log water bars (Sketch A). All drainage ways shall be opened and deepened as necessary so as to handle all storm waters. Additional, dips earth or log water bars shall be installed if required by District Forester. Brush shall be scattered between water bars if required by District Forester. Above provisions shall be carried out as each haul road or portion of it is abandoned rather than waiting until after the logging operations is completed. Any haul road that is not going to be reused within the next year should be retired with an approved seed mixture.

2. Secondary Haul Road Specifications

a) Location – Secondary haul roads shall be constructed by the Buyer prior to the start of logging operations and have been located and designated on the ground by District Forester and appear on sketch of sale area.

b) Clearing – Clearing shall be wide enough to allow the construction of a road having a minimum width of 18 feet including ditches. Where turnouts are required additional width will be cleared as designated by District Forester.

c) Grading, Drainage, Bridges, Fords and Culverts, Maintenance, Retirement or Abandonment Requirements for main haul roads shall apply.

3. Spur Haul Road Specifications

a) Location – Spur roads will be located by Forester in company with Buyer and will be constructed by Buyer at his expense as the timber operation progresses.

b) Clearing – Clearing for right-of-way and roadway will be only wide enough to allow safe and unhindered movement of trucks and other equipment, as determined by Forester.

c) Grading, Drainage, Bridges, Fords and Culverts, Maintenance, Retirement or Abandonment – Requirements for main haul roads shall apply.

4. Skid Road Specifications

a) Location – Skid road as needed shall be located by Forester in company with Buyer and shall be constructed by Buyer at his expense prior to start of logging operation at locations designated on the ground by Forester.

b) Clearing – Forester will specify the width of clearing to accommodate the type of skidding equipment to be used.

c) Drainage, Bridges, Fords and Culverts, Maintenance, Retirement or Abandonment – Requirements for main haul roads shall apply.

5. Skid Trail Specifications

a) Location – The location of skid trails shall be carefully selected by the Buyer. Any skid trail that does not meet with the approval of the Forester shall be relocated immediately by Buyer at a location to be designated by the Forester. Skid trails shall be only wide enough to accommodate the type of equipment used. Grades shall be kept as low as possible.

b) Drainage – Water turnouts shall be constructed and maintained as necessary.

c) Maintenance and Abandonment – Skid trails shall be maintained and abandoned so as to keep water off trails and prevent washing. Where required by the Forester, Buyer shall scatter brush on trails to prevent washing. Buyer shall repair immediately in a manner that meets with the approval of the District Forester, any damage to State Forest roads, including camp access roads, resulting from their use for this timber operation, general wear and tear accepted.

6. District Forester may notify Buyer in writing to temporarily discontinue use of any of said roads and trails when in his opinion such action is necessary to prevent serious damage.

7. Buyer must make frequent inspections of haul and skid roads and skid trails and complete the essential maintenance as required by Paragraph (1) (a) hereof immediately to the satisfaction of the District Forester, when in the opinion of District Forester conditions are satisfactory for completion of said maintenance. Commencing November 1st and ending May 1st said inspections must be made as necessary and essential maintenance completed immediately in anticipation of freezing temperatures and/or snowfall. Serious soil erosion and stream pollution could result before next spring if said maintenance is not completed before freezing temperatures make it impossible. The Buyer should make every effort to insure roads and trails are in a condition that allows ease of maintenance.

8. Failure of Buyer to complete said maintenance immediately as required above, when in the opinion of the District Forester conditions are satisfactory for completion of said maintenance, will result in suspension of sale operations by District Forester until said maintenance has been completed to his satisfaction. Buyer must notify District Forester immediately when said maintenance has been completed.

9. Should Buyer fail to complete said maintenance within 48 hours following suspension of operations, when in the opinion of District Forester conditions were satisfactory for completion of said maintenance, Buyer must make a payment of $200.00 promptly to District Forester by certified or cashiers check payable to the Commonwealth of Pennsylvania. District Forester will refer the matter to the Silviculture Section for further action, which could result in the termination of sale, appropriation of performance deposit and ineligibility of Buyer to purchase State Forest timber.

10. Construction and/or improvement of main haul roads, spur roads and skid roads must be generally started during dry, unfrozen soil conditions and must not be completed during wet or frozen conditions, unless District Forester authorizes Buyer otherwise in writing should open weather occur.

D. Suspension of Operations and Termination of Contract

All or any part of the operations on the sale area, including the removal of felled timber, may be suspended upon written notice by District Forester if any condition or requirement condition or requirement contained in this plan is disregarded by Buyer. Failure of Buyer to comply with any one of said conditions or requirements shall be sufficient cause for the termination of this contract by Department. In the event of such termination, Buyer shall be liable for all damages sustained by the Department arising from Buyer's operations hereunder, and the Department may declare the Buyer ineligible to purchase State Forest timber.

E. Operation of Sale Restricted

Buyer must notify District Forester immediately in writing when he discontinues operations of this sale for the winter; also when he desires to resume operations of sale the following spring. Buyer must not resume operations until he has received a written reply from District Forester that haul and skid roads and skid trails are in satisfactory condition to resume operations.

F. Seeding of Sale Area

See Paragraph 33 SEEDING OF SALE AREA in the FMT-7 contract.

IX. Let's Build a Road

A. General Tips and Guidelines for Road building

Haul road layout and construction is one of the most critical jobs we do as foresters so let's get it right.

Haul road needs are assessed during the compartment exams. They are further refined during the sale layout stage. If the road requires major investments of time or money, the haul road should be laid out at the proposal stage. This will insure that the sale will have access. It may also help avoid the negative sale where road costs may represent too large a percentage of stumpage costs or the occasional sale where road costs exceed stumpage costs.

Proper pricing of material and equipment is essential to figure road costs. Each district should maintain a list of excavating, equipment and material costs pertinent to their district. This list should be updated at a minimum of once a year, and can be done through calling local quarries and excavators, as well as pricing materials such as pipe. The following is a list of equipment cost from a contractor in District 15, and should serve as a template for the kind of cost that are tracked.

8/19/08

MAX GREELEY & SONS
2 SOUTH MAIN STREET
COUDERSPORT, PA 16915
814-274-7094

PRICE SCHEDULE / EFFECTIVE 2008

D-6 CATERPILLAR BULLDOZER	$105.00 PER HOUR
D-5C CATERPILLAR BULLDOZER	85.00 PER HOUR
D-3 CATERPILLAR BULLDOZER	75.00 PER HOUR
953 CATERPILLAR TRACKTYPE LOADER (QUARRY, HEAVY ROCK AND CREEK, ETC)	110.00 PER HOUR 130.00 PER HOUR
426 CATERPILLAR BACKHOE	75.00 PER HOUR
FORD TANDEM AXLE DUMP TRUCK	90.00 PER HOUR
MACK TRIAXLE DUMP TRUCK	100.00 PER HOUR
MULCHER WITH OPERATOR	55.00 PER HOUR
LABOR	50.00 PER HOUR
TRACTOR TRAILER	120.00 PER HOUR
MITSUBUSHI GRADER	115.00 PER HOUR
8 N FORD TRACTOR	45.00 PER HOUR
STONE RAKE	50.00 PER HOUR
HYUNDAI EXCAVATOR/TRACK HOE	105.00 PER HOUR
KUBOTA BACKHOE	50.00 PER HOUR

PRICE SUBJECT TO CHANGE WITHOUT NOTICE!!!!

B. General Guidelines:

1. It takes a d-6 size bulldozer about an hour to build 100 feet of new road. So if the road is 1700 feet long, figure 17 hours X $105/hour = $ 1785. This is to build and shape the road. Any stoning required is extra. Often a contractor will use a trackhoe to stump the road. If they do, the road will be built faster but still use the 100 foot per hour. The contractor will have a higher cost per hour but fewer hours. It seems to work out.

2. Stone is best figured in cubic yards. KEEP IT IN YARDS if the stone is coming off state forestland. Figure 8 dollars per cubic yard for stone if it is coming off state forest land. There is no need to get fancy by trying to convert it to tons or specifying all different types of equipment to dig, haul and spread it. If you need 1200 cubic yards of stone, the cost will be $9600. Also, figure the material will compact to 2/3rds of the depth when applied to the road. 6 inches of shale or stone will normally compact to a depth of 4 inches.

3. If the stone is being purchased from a quarry, spec it in tons as that is how it is sold and weigh slips can be provided in case of a dispute. Remember the quarry price is usually just for the stone and does not include delivery.

4. Culverts should be figured at about 2 hours of installation time per pipe. Backhoe time and labor should be included. Culvert prices are usually by the foot. Galvanized pipe 16 gauge 15” diameter is currently running $15 per foot. Be cautious of using plastic pipes. They are difficult to install correctly. They often get a bow in them and both ends are up in the air. Double gauge smoothbore plastic pipes are good but expensive. Permit pipes often call for smooth bore pipes so they are necessary. The smoothbore pipe will allow more water to flow through it as it has less friction. Oval or squash pipes can be used when less fill is available to put over it. Primary haul roads usually have 24’ long culverts unless they are on a curve. Culverts installed on curves should be extra long. This may mean 30 to 60 plus feet in length.

5. Any timber on the road right of way should be tallied as a separate block. Any additional trees marked for removal should be tallied and sold on invoice at the adjusted species value.

6. Keep the grade on the road between 2 and 10 percent if possible. This will do the best job. This can be modified when necessary but use caution. Grade is determined with a clinometer. A piece of flagging tied at eye level can be used to sight on and check the grade. Curves should have a 60 foot radius if tractor trailers are being used. A good way to get the proper arc, is to locate a center point for the radius, and measure from that point 60 feet to all points on the curve. The same technique and information applies to switchback construction.

7. Switchbacks are best used when linear construction will exceed 10 percent slope. Switchbacks work well to position the haul road higher on the slope/or lower on the slope in a relatively short distance. Road grade should not exceed 10 percent except for relatively short distances.

8. The size of the log landings will vary on each sale and according to the needs of the logger. They should only be built as large as necessary. We do want to provide enough room to operate safely and efficiently**. Building extra large landings to use as food plots is not acceptable.** Food plots should be built and maintained with non timber funds. A ditch around the landing to properly drain it will make for a better job and less mud.

9. When the contractor starts building the road, a daily site inspection may be necessary. Each visit should be noted on the FMT- 9.

C. Road Retirements

1. Lime should be applied at 3 tons per acre. Fertilizer should be applied at 250 pounds per acre (10-20-20). Mulch if necessary 50-75 bales per acre

2. Best seeding results are obtained when seeding is done at the following times. "Seeding must be done between April 15 and May 31 or August 15 and September 30 unless otherwise specified in writing by the district forester. Lime, fertilizer and seed must be raked into the surface following application."

3. When seeding is not needed for a road retirement this wording should be used." No seeding is required for sale retirement; however the buyer will be responsible for grading crowning and ditching the haul road upon sale completion."

   a) A District 15 Road mix consisting of: 60% winter wheat, 20% medium red clover, 15% ladino clover, and 5% Nordic trefoil. This mix makes for good turkey habitat.

   b) This mix is widely used in district 15 (Cornell Bros. Forestry mix)

Cornell Bros Forestry Mix

Lot:AC109503

	Germ	Origin
19.66% Sparta Orchardgrassr	83%	DK
19.62% Per. Ryegrassr*	90%	OR
19.58% Fawn Tall Fescue	88%	OR
17.82% Kentucky Bluegrass	80%	WA
9.92 Jumbo White Clover	80%+2%HS	OR
9.89% Exact Trefoil	79%+1%HS	Canada

* Variety Not Stated

3.28% Inert Matterl

0.07% Weed Seed

Tested 11/03

Net Wt. 50 lb (22.7kgs)

CHAPTER V
SALE DESIGN AND LAYOUT

I. Introduction

Before a sale is submitted for proposal several steps have to be met both in the field and procedurally to prepare the sale for proposal. It is highly recommended that familiarity with the first four sections of this manual be accomplished prior to reading this section. Several guidelines covering policies haul roads, sale analysis, water resource and regeneration need to be understood before working on sale proposals. This chapter brings all of the previous chapters together in the sale layout and proposal writing. What follows is a sequential method of sale layout, designed to help the forester stay on track in an orderly procedural fashion.

II. Scouting

Scouting is the first and very necessary step in establishing a timber sale. Proper scouting will enable a Forester to avoid costly mistakes and to save valuable time in the marking and administration of a sale. The sale is first scouted on air photos, topographic maps and management maps. Wet areas, trails, roads, streams, camps and deer populations should be noted and planned for.

A. Purpose of Scouting:

1. To determine area or stands to be treated with silviculture applications. These treatments should be in compliance with compartment exams, landscape plans, Bureau of Forestry policies and mission, as well as the harvest allocation model.

2. To evaluate if a sale is economically feasible. This includes making sure there is enough value in the timber to cover haul road construction and any regeneration costs associated with the silviculture treatment. Below costs sales are not an option unless done for the strict ecological benefit of rare, threatened or endangered species!

3. To review the impacts of potential sales on other forest values. This includes but is not limited to water resources, wildlife, plants, recreational impacts, and aesthetics.

4. To determine if the sale is accessible. This includes public roads, weight restrictions, bonding requirements, seasonal hauling restrictions, the need for highway occupancy agreements, and any access that is needed to cross private land if necessary, and if so, will landowners grant permission to cross the property. Reference “Chapter IV: Haul Roads” for additional information this topic.

5. Management zoning and treatment options should be noted at this time.

B. A more thorough scouting of the area is made next to determine the following:

1. The specific area to be treated by the sale should be flagged. Sale boundaries should be irregular in shape and blend among terrain and stand types as much as possible to help aesthetically feather the sale into the landscape.

2. The logging feasibility is determined including equipment limitations, soil hazards, tentative skid trail layout, buffers both for aesthetic and water resources and sale boundaries are noted on the ground.

3. Location of a haul road if one is required for the sale.

4. Sale analysis, which leads to prescribed treatments, should be conducted at this stage. Cutting blocks and prescriptions for each block should be flagged and planned for.

5. The need for any special regeneration treatments such as herbicide, fencing and planting are noted and planned for the sale at this time.

III. Sale Boundary and Survey

A. Once it has been determined that the sale area is operable, the silvicultural treatment is prescribed for the involved stands, based on a sufficient number of analysis plots. The sale area is then surveyed with a GPS unit. Acreage is figured to the nearest acre for the sale acreage using corrected GPS data, and then converted into a GIS shape file to be submitted at the time of proposal.

B. Boundaries of various treatments should also be marked with blue flagging at this time. Each treatment block is to consist of only one treatment type with corresponding set of analysis plots. The boundary of each treatment should be surveyed and the area computed by GIS, using corrected GPS data. All treatments should also have tentative acreage determined at this time

C. Any new haul road construction or existing haul road improvement should be also definitely located at this time and the right-of-way flagged in red. All spur haul roads and main skid trials should be located and flagged at this time. These areas should be surveyed as well and calculated to the nearest tenth of a mile. Acreage should be computed by multiplying the length by the appropriate width, and adding the area of all landings. Haul roads and landings are calculated as a separate treatment block from all other treatments and will be sold as a separate cutting block at the time of sale. This includes roads that run outside of the sale area as well.

D. Project Maps- A series of project maps will be prepared based on the GIS data shape file for the sale boundary, treatment boundaries, and haul road information, showing the information below.

1. A map of each timber sale is to be prepared on a scale on one inch equals 20 chains or 660 feet. This map should show all haul roads, proposed landings, treatment blocks, trails, roads and water resources. This map will serve as the template for the final timber sale map. Block boundaries are not necessary at this time.

2. A second map showing stand typing is to be made overlaying the sale shape on it and submitted with the proposal. Items on the typing map are to be included showing stand classification, road and stream buffers as well as state forest boundaries and trails. Also the map must be sufficiently complete so the sale area may be accurately located on the typing map.

3. A topo map, showing physical terrain features and drainages as it relates to the sale should be created.

4. A map with soil information should also be created with the sale shapefile overlaid upon it.

5. All four maps should be submitted with the sale proposal to the Silviculture Section. Also, it is at this time that an electronic shapefile should be sent to the Silviculture Section showing treatment blocks, so the statewide timber sale GIS information can be kept up to date.

IV. PNDI

A current PNDI (Pennsylvania Natural Diversity Index) review must be conducted for all resource management activities. The PNDI search can not be older than 1 year at the time of project proposal. The Pennsylvania Natural Diversity Index or PNDI, is a system set up to map species of concern, threatened or endangered nature. This is a cooperative project between several wildlife management agencies and covers species under the jurisdiction of PA Game Commission, PA Fish and Boat Commission, PA DCNR, and the US Fish and Wildlife Service. All silviculture and land management activities should be submitted through the PNDI system. The purpose of this system is to call attention to the forester that species of concern, threatened or endangered nature are nearby or within the project area. A summary of the PNDI search should be attached to any project proposal, even when it registers “0” potential conflicts.

If a conflict arises within a search area, the responsible agency is listed. A map and a brief description of the project should be submitted to the jurisdictional agency, and copy to Ecological Services, for resolution or recommendation. In some instances, it is simply a matter of waiting for a response from the agency responsible stating that no problems are anticipated and the project may proceed as planned or some practices recommended to protect the species listed. Other instances may require a site visit in which details of the project are discussed in depth with representatives of the agency responsible. This usually results in recommendations to the forester to alleviate conflicts. These may be seasonal restrictions, buffers and in some cases no cut areas placed around sensitive areas or critical habitat. Rarely will the

occurrence of a PNDI "hit" totally eliminate options for a planned timber sale. Approval letters are issued from the agency responsible once agreement has been reached on the course of action. These approval letters should be included in all projects that had conflicts through a PNDI search.

V. Permits

It is at this stage when request for permits should be written and sent for. This includes highway occupancy permits and any stream crossing permits that may be required. All appropriate documentation of correspondence with appropriate regulating agencies should be submitted with the sale proposal.

A. Highway Occupancy Agreements.

All terms, conditions, and specifications of such permits applicable to the sale shall be followed. Any time a new haul road is to be constructed from a township, or state highway, the forester should check with the township or the Penn DOT regional office that covers the subject county on rules regarding highway occupancy agreements.

B. Stream Encroachment Permits

Any stream or wetland crossings on water sheds greater than 100 acres in size will require GP 7 or GP- 8 permits. This requires DEP approval should be applied for at this time, as well as any appropriate Army Corps of Engineer approval. See Chapter II: Water Resources of this manual, section V., for more information regarding encroachment permits and a blank application for GP-7 and GP-8's.

C. NPDES Permits

If the sale is to construct 25 acres or more of haul roads and landings, contact should be made with the county conservation district about an NPDES permit. Again, see Chapter II: Water Resources, Section V. for more information.

VI. Correspondence with Other Entities and Agencies

A. Municipal Watershed Guidelines

The following guidelines apply, in addition to the general guidelines, when a proposed State Forest timber sale or other management activities are located upstream from a dam or impounding basin on a watershed that supplies water to a municipality, institution or others for domestic, industrial or recreational use:

1. When the stand analyses have been completed, the District Forester shall notify the proper authority by certified, return receipt mail. The special precautions which will be taken by the Department to protect the watershed during the logging operations, how the timber sale will affect the watershed and deadline for reply (at least 30 days), should be included in the notification. District Forester shall send the Regional Sanitarian a copy of the same information forwarded to a municipality, institution or private user.

   a) If no reply is received from authority by the deadline date, the District Forester shall attempt to contact the authority by telephone or in person in order to ascertain reactions to the sale and request a letter confirming it. If a letter of confirmation is not received from the authority, the District Forester shall assume that the authority has no objections and may proceed with the sale.

   b) If the reply from authority offers no objections, the District Forester may proceed with the sale.

   c) If reply from authority objects to the sale, the District Forester shall contact the authority to discuss the matter further in order to resolve the objection. If the objection is resolved, the authority should confirm this in a letter to the District Forester. If objection is not resolved, the District Forester shall forward his recommendation to the Silviculture Section who will notify the District Forester whether or not sale should be processed.

   d) Copies of all letters to and from each authority should be submitted by the District Forester to the Silviculture Section.

2. The sale proposal forwarded to the Silviculture Section shall include a report containing the following information:

   a) The location and owner or lessee of each recreational area, dam or impounding basin and of the land immediately adjoining each dam or impounding basin. Owner or lessee's letter to the District Forester should confirm abandonment of a dam or impounding basin.

   b) The distance each dam, recreational area or impounding basin is located down stream from the nearest boundary of the proposed sale.

   c) A list of special precautions which should be taken by the Department to protect the recreational area, watershed or water supply and an explanation how the proposed timber sale will improve the watershed or water supply when, the proposed timber sale will affect the watershed or water supply.

   d) A statement describing how the proposed timber sale will affect the recreational area, watershed or water supply.

3. Upon receipt of the sale proposal from the District Forester, the Silviculture Section shall decide if the proposed sale area and watershed shall be inspected with the District Forester and with the watershed authority before approval or disapproval is granted.

   a) If proposed sale is approved, the Silviculture Section will notify the District Forester to proceed with the sale.

   b) If proposed sale is not approved, the Silviculture Section will notify the District Forester accordingly.

B. State Parks

1. When a proposed State Forest timber sale adjoins, is located in the view shed, or significantly impacts the infrastructure (especially roads and bridges) of a State Park, the District Forester shall notify both the local Park Superintendent and the Director, Bureau of State Parks. Notification should include sale location, sale map, and restrictions, if any, which are necessary to prevent interference with the recreation area. It should be requested that comments be made within 30 days. If none are received, it can be assumed that the Bureau of State Parks has no objections to the proposed timber sale.

2. If there are objections to the sale, they will be negotiated by the Silviculture Section and the Bureau of State Parks.

3. A copy of the notification to the Bureau of State Parks should be sent to the Silviculture Section with the request for approval to conduct a sale.

4. The written approval of the Regional Park Superintendent shall be secured by the District Forester when it is necessary or desirable to travel through State Park recreational areas for access to and from proposed State Forest timber sale areas. Said approval shall include restrictions, if any, which are necessary to prevent interference by said travel with recreational use. A copy of said approval shall be forwarded by the District Forester to the Silviculture Section with Form FMT-19 for sale processing.

C. Oil and Gas Leases

1. When timber is to be sold from land leased for oil and gas, the District Forester must notify and send a prospectus to the Oil and Gas Lessee of all proposed timber sales on the area that the lease comprises. After the award has been made to the successful Bidder, his name and address are to be furnished to the Lessee for his information

2. When oil and gas leases are proposed on areas where timber sales are active, notice to oil and gas prospective bidders should contain the following information:

a) This oil and gas tract includes areas currently leased for timber sales. The oil and gas operations shall be conducted subject to the prior rights of the timber Buyer. A map that shows the location of the timber sale, road clearings, sawmill sites and any other sales installations within the proposed leased oil and gas tract is attached.

b) When the oil and gas lease is prepared for execution by the Department, it shall contain the following conditions:

1) No proposed roads, well sites, compressor stations or pipeline clearings within the timber sale area will be approved by the Department without prior written approval of the timber sale Buyer.

2) A copy of the timber Buyer's letter is to be furnished to the Oil and Gas Lessee by the District Forester

3) Any timber removed for gas or oil lease operations in a sale area under contract will be handled in the following manner: timber reserved by the Department with in the sale will be charged to oil and gas company, timber that is to be sold to the Buyer by the contract will be negotiated with the Buyer for terms of removal by the lease company. The District Forester will mediate all negotiations in conjunction with the Silviculture Section and Minerals Section

D. Leased Campsites

A 150 foot buffer will be placed around all State Forest leased campsite buildings. A 10 chain buffer will exist around organized campsites. Logging is not permitted on the lease itself unless permission is given in writing by the lessee. Two-aged, Shelterwood for Two-aged, uneven aged and group selection cuts are permitted within these kind of buffers. Camp lessees should be notified in writing of adjoining timber sales and the correspondence included with the proposal. The letter should plainly state that the lessee should contact the district with concerns or if they wish any trees to be removed from the lease.

E. Trail Clubs

National Scenic Trails such as the Appalachian Trail or other National Scenic Trails yet to be established will have a 200 foot <u>no cut buffer</u> on either side of the trail. Only cutting for human safety will be permitted within this zone. State Forest Hiking Trails such as the Loyalsock Trail, will have a 100 foot no cut buffer on either side of the trail. Notification of any proposed cutting that borders these trails must be made to the

organization responsible for the maintenance on the subject trail. Some organizations have memorandums of understanding that allow some harvesting with in established buffers. See the Guidelines Section of this manual, section

1. When notification is sent to a trail club for comment, it should be requested that comments be made within 30 days. If none are received, it can be assumed that the responsible agency has no objections to the proposed timber sale.

2. If there are objections to the sale, they will be negotiated by the District Forester and the responsible trail organization. If this meeting fails to resolve the issue, it will be forwarded to the Silviculture Section for resolution.

3. A copy of the notification to the trail club should be sent to the Silviculture Section with the request for approval to conduct a sale.

4. The written approval of the trail organization shall be secured by the District Forester when any cutting for any reason is to be done with in a trail buffer. Said approval shall include all restrictions and the forester shall abide by them. A copy of said approval shall be forwarded by District Forester to the Silviculture Section with Form FMT-19.

F. Pipelines and Electrical Lines

1. Pipelines and Transmission lines

For sales adjacent to, or which have a haul road that crosses a public utility right of way of any kind; contact must be made with the entity responsible for the right of way. Usually for pipelines and transmission line, precautions must be taken in crossing over them with a haul road or skid trail. This sometimes requires steel plates, or increasing the depth of stone over the line to keep breakage from occurring during hauling operations. The responsible entity often will specify the conditions necessary for crossing over the line.

2. Electric and Phone Lines

Overhead electrical and phone lines also require special attention if a sale is adjacent to them. If any trees must be felled that present a danger to the line, the district forester should contact the utility company to work out a solution. Often times the company will either fell the timber for the a buyer or lower the lines so trees can be cleared. If the company is not willing to work with the district to take down the trees, care must be taken to not mark trees that may fall into the line.

3. When notification is sent to a responsible utility for comment, it should be requested that comments be made within 30 days. If none are received, it can be assumed that the responsible agency has no objections to the proposed timber sale.

4. If there are objections to the sale, they will be negotiated by the District Forester and the responsible organization. If this meeting fails to resolve the issue, it will be forwarded to the Silviculture Section and the Operations Section for resolution.

5. A copy of the notification to the utility should be sent to the Silviculture Section with the request for approval to conduct a sale.

VII. Adjacent Land Owners

Whenever a sale boundary is the State Forest Boundary, a good faith effort must be made to notify the adjacent landowners of a pending timber sale. What constitutes a good faith effort will be made in the following order.

A. An attempt to talk to the landowner face to face to let them know the intent of the pending timber sale and allow them to express concerns and take them under advisement.

B. If contact cannot be made face to face, a letter should be left in the mailbox or on the door of the primary residence to inform them of the impending sale activities, and a number in which the administrating forester can be reached to discuss the sale if they so wish. Also a mailed letter can be sent to achieve the same result provided the landowners address is known.

C. If the landowner is absentee or not known, signage along the boundary line should note a timber sale boundary, with a number to contact the district office for further information.

VIII. Sale Proposal

A. All Timber Sales Resulting in a Silvicultural Treatment

Once all scouting, surveying, sale analysis and map making have been completed, and PNDI searches completed, and required permits sent for, the actual proposal should be the next logical step in bringing everything together. All timber sales must have a proposal prepared and submitted to the Silviculture Section prior to any marking or cruising being started on the sale. Good proposal writing can not be over emphasized. The proposal is what defends our actions to any and all persons in the public and by which we will be judged by. Therefore, ALL sale proposals must contain at the very least the following information:

1. A written description of the treatment goal and the reason for initiating the treatment. Any problems that may occur and a DETAILED plan on how the forester will attempt to overcome these problems must be mentioned.

2. A written description of the area involved. This must include a narrative for each treatment area involved describing its species composition, condition and history. This narrative should include the prescription for each stand derived from the SILVAH timber stand analysis, residual basal area goal, and species to be favored or discriminated against. If the SILVAH prescription is being modified the reasoning for that decision MUST be included. If a reproduction cut is planned, a description of the regeneration must also be included.

3. A request for any waivers to deviate from established policies such as acreage limits, even aged cutting in buffers, whole tree harvesting, or any other policy must be detailed in the proposal, and the reasons and need clearly stated to deviate from the policy. Waivers must be approved by the Planning Division Chief.

4. Timber Stand Analysis/ SILVAH printouts for all stands involved in the sale. A sufficient number of plots are required. This number is detailed in the SILVAH manual and is based on the number of acres in each stand.

5. A map of the proposed sale area on a copy of the stand typing map showing the general sale area with the sale area accurately plotted to scale and a copy of a topographic map with the sale area plotted to scale. Soils and topo maps are to be included with accurate plotting of the sale as well.

6. A written description of the soil types within the sale area and any problems expected with erosion and sedimentation control. THIS IS ABSOLUTELY NECESSARY TO MEET ERIOSION AND SEDIMENTATION PLAN REQUIRMENTS SET FORTH BY DEP. Erosion mitigation should be detailed with soils that pose a hazard for erosion or equipment limitation. The need for any special permits should be noticed, along with a copy of all correspondence necessary to obtain these permits.

7. A copy of the PNDI search of the sale area for species and sites of special concern. Any correspondence involving the resolution of PNDI potential conflicts should also be included.

8. All correspondence to any state parks, trail clubs, other agencies, municipal watersheds campsites and utility right of ways.

B. Any Sale to be sold on an FMT-7 Contract.

1. All of the above items in Section A along with a request for approval must be forwarded by the District Forester to the Silviculture Section before marking is permitted.

2. The District must receive a letter from the Chief of Silviculture Section approving the sale proposal before any marking may begin.

3. The above restriction applies to the entire sale.

4. The sale may be approved with out required permits, but may not be advertised for prospectus until all occupancy permits and encroachment permits are received. No sale may be approved without PNDI clearance on all conflicts from the proper agency.

C. District Permits that result in a Silviculture Treatment

1. All of the above items in Section A must be kept in the sale file in the district office.

2. Marking may begin with the approval of the District Forester, and all clearances on PNDI.

3. The sale may not be advertised for sale until issues with trail organizations, utilities, gas and oil companies, and parks have been resolved.

4. For district sales that do not result in a silviculture treatment and that are done to meet some utilitarian purpose, a sale analysis and detailed proposal are unnecessary. However all maps, PNDI clearances and waivers still apply.

D. Addendums

Anytime a change increases the acreage of a sale or changes the prescription of an approved treatment block, all procedures must be followed in creating the addendum as if it was a new sale. Addendums are also required to previously approved sales that include a reduction in acreage by omitting a section of the sale, the splitting of one sale into two, the merging of two sales into one or a change in haul road location that would involve an encroachment permit. Addendums for these aforementioned reasons that do not increase the size of the sale merely involve a written statement to the Silviculture Section with notice of the intent and reason for the change. All addendums must be approved by the silviculture section.

CHAPTER VI
MARKING AND TALLYING TIMBER FOR SALE

I. Procedures for Processing all Sale Volumes.

A. All timber to be sold on an FMT-7 contract must have prior approval from the Silviculture Section Chief prior to being marked. Timber to be sold on a FMT-7 contract will have its volume calculated by the Silviculture Section and processed along with the sale's FMT-19. All timber sales over $20,000 minimum bid for salvage situations and $10,000 minimum bid for all other sales must be sold on FMT-7 contracts.

B. All timber to be sold on an FMT-4 district contract will be calculated by the district that is responsible for the sale. Any sale less than $20,000 minimum bid for salvage situations, and $10,000 for all other situations may be handled by an FMT-4 contract.

C. All timber less than 3,000 in value may be sold on an FMT-15 Fuelwood Permit.

D. When timber is merchantable for more than one product, it is to be sold for the highest commercial value.

E. All volumes will be calculated through the Bureau of Forestry's "Timber Beast" software program. This program is based on the International ¼" standard volume tables for sawtimber and the Penn State Pulpwood Volume tables. Form class is based on the Bureau of Forestry's "Continuous Forest Inventory data for Girard from class." Volume tables for board footage can be found at the following link: http://intraforestry/silviculture/Form%20Class%20Volume%20Tables.xls

F. All sawtimber is to be marked and tallied, and sold on per board foot value.

G. All pulpwood is to be sold on a cubic foot value. Pulpwood is calculated from the Penn State Volume tables from the publication "Board foot, cubic foot and cubic meter volume tables for commercial forest species of Pennsylvania." By Brian J. Turner, Penn State University, College of Agricultural Sciences, School of Forest Resources

H. All fuelwood is to be sold by the standard rough cord.

II. Marking Timber Sales

A. While cruising sawtimber for 100% tally, a constant check should be made to ensure that the proper prescribed basal area is maintained in the stand. This should be done with a 10 BAF prism. This can be easily

done in overstory removals and clear-cuts by marking the reserve trees in blue prior to tallying the sawtimber. In shelterwood and intermediate cuts, this will need to be done periodically as marking progresses.

B. Tree marking should use the following manner for designations:

1. Yellow: For marking of merchantable and cull trees to be removed or girdled which are designated for cutting in the contract.

2. Blue: For marking block boundary lines, sale boundary lines, state forest boundary trees below stump height, reserve trees, den trees, roost trees, and damaged trees not to be removed by the buyer due to negligence during sale operations. If a tree is to remain though cutting operations, than it should be marked with blue paint.

3. Red- For marking the sale haul road and landings to be cleared, for damaged trees to be removed and any additional timber sold during sale operations for any reason.

4. Orange-Should be used to delineate the boundaries of proposed regeneration projects such as fences and herbicide blocks. Often these are referenced in the timber sale contract. Marking them on the ground will provide the operator with an indication of where fence lines and herbicide block lines may be in relation to their operations.

C. Only foresters and forest technicians may designate or select trees to be cut in accordance with prescriptions. Other employees may assist in tallying and measuring timber but should not be designating which trees are to be cut. The forester responsible for the sale assumes all responsibility for the outcome of the work.

D. Sale boundaries shall be marked with a one inch band of blue paint around the entire tree, and then marked at the stump with an additional spot of blue paint. In areas where a State Forest Road, or any trail is to be used a sale boundary, the band may be marked on one half the tree, facing into the sale, and then marked with a stump mark of blue paint. When the State Forest Boundary is to be used as a timber sale boundary, only a spot of blue paint will be applied to the stump of boundary trees which already posses a white blaze.

E. Block Boundary Trees that are used to separate cutting block boundaries will have two one inch wide bands of blue paint applied around the entire circumference of the tree. If the tree is to be removed when both blocks have been cut, then no stump mark is necessary. If the tree is to remain in place as a residual tree following sale operations, then a spot of blue paint shall be applied at stump height. Block boundary trees to be cut, should remain as long as they border one uncut block

F. Reserve Trees.

1. In timber sale contracts that specify cutting unmarked trees down to a particular DBH, all reserve trees should be marked in blue to differentiate between merchantable trees and reserve trees. Reserve trees shall be marked with a spot of blue paint at DBH, and a stump mark at the base.

2. In contracts that specify only marked trees may be cut, there is no need to mark reserve trees with any paint. It is implied with in the contract that unmarked trees are reserved and should not be cut.

3. On contracts that specify that a particular species is reserved and should not be cut, there is no need to mark trees of that species with blue paint for reservation. It will be instructed that they remain within the contract.

G. Trees to be cut in cutting blocks.

1. Trees will be marked for removal on all contracts that specify only marked and designated trees may be cut. Sawtimber trees marked for sale will have yellow slash painted at DBH and a spot of yellow paint marked at stump height. Merchantable pulpwood will be marked with a spot of yellow paint at DBH and a stump mark. Cull trees which may be felled will be marked at DBH with a yellow "X" and a stump mark. Trees to be girdled should be marked with a "G" at DBH and no stump mark.

Type of Tree	**DBH**	**Stump Mark**
Merchantable Sawtimber	/	Spot
Merchantable Pulpwood	Spot	Spot
Culls to be felled	X	Spot
Trees to be girdled	G	None

2. Trees to be removed on contracts that state "All unmarked trees down to ___ DBH must be removed unless otherwise stated" do not need to be marked for removal. It is implied with in the contract that all unmarked trees must be removed, and therefore do not need to be marked with yellow paint.

3. When a contract states that all trees of a particular species must be cut down to a specific DBH, there is no need to mark that or designate trees of that species with paint for cutting. It is implied within the contract.

H. Trees to cut on haul roads and landings

All trees to be removed for haul roads and landings must be marked with red paint. Sawtimber trees marked for sale will have a red slash painted at DBH and a spot of red paint marked at stump height. Merchantable pulpwood will be marked with a spot of red paint at DBH and a red stump mark. Cull trees which may be felled will be marked at DBH with a red "X" and a stump mark.

Type of Tree	DBH	Stump Mark
Merchantable Sawtimber	/	Spot
Merchantable Pulpwood	Spot	Spot
Culls to be felled	X	Spot

I. Additional trees to be sold

1. A forester may decide to sell additional volumes of timber due to adding skid trails during operations, additional landings, additional volume due to mortality or for any other administrative purpose. Timber marked for additional volume within the sale boundaries shall be marked in red and sold on a BF-16 invoice associated with the sale or permit at the adjusted species bid price. If the additional trees will severely alter the treatment for a block or sale, then the district should notify the Silviculutre Section for instructions and approval prior to selling the additional timber.

2. Trees to be sold as damage due to sale operations must also be marked in red using the same symbology as trees marked for haul roads and landings. These too shall be sold on a BF-16 timber invoice at the adjusted species bid price.

3. See Chapter VIII: “Sale Administration” for more information on how to handle skid damage and timber invoices.

III. Reservation Guidelines

A. Purpose

The purpose of leaving reserve trees is to retain biologic and site integrity and diversity, while reducing aesthetic impacts on a particular site. Retention of specific trees on a site will retain or promote genetic species and structural diversity in the residual and future stand, as well as protect other site values. On all reproduction cuts such as seed tree, overstory removal, clear-cut and two-aged management it will be standard practice to leave residual trees of the original stand. The purpose is to provide an older residual age class to carry into the next rotation and to retain some vertical canopy structure for song birds and wildlife that benefit from early successional habitat. Trees to be retained should include rare species on a particular landscape, unique phenotypes, trees of superior form, den trees, snags and trees of various size classes and rare species for a particular landscape species.

B. Reservation guidelines on Even-aged stands.

1. Where stands are even aged and are to be reproduced, 10-20 square feet of basal area should be retained from the original stand. It is not enough to just retain 10-20 square feet of scattered trees. This does nothing to satisfy "structural diversity." Where possible the "island" or clumping of trees should be strived for as a component of the reserve trees. Most trees should be retained in groups or clumps to maintain them into the next stand and help prevent wind throw and "burn-out." These islands should be undisturbed areas where logging equipment is not permitted. These clumps and islands should retain all layers of the canopy from the sapling layer up to the dominant height class for the site. Often these clumps and islands can be placed around den trees and snags to protect them from logging damage and wind-throw following harvesting. In addition, scattered individual trees are also recommended to help achieve the 10-20 square feet of residual basal area.

2. A minimum of 2-3 den trees per acre should be retained. On many sites this number may be difficult to obtain, and will result in all den trees for the site being retained. Protecting these den trees with surrounding residuals is recommended.

3. 2-3 dead snags per acre are also recommended. If snags are lacking, this situation can be remedied by girdling cull trees and leaving them stand.

4. Rare species, whether it is on the landscape level, or throughout its entire native range, are recommended to be reserved by contract, in which the language will read "no trees of that species may be cut". Species may also be reserved above a certain diameter limit, for example: All Table Mountain Pine greater than 10" is reserved and may not be cut. This will allow all larger pine to remain on site but allows perhaps genetically inferior trees of that species less than 10" to be cut.

5. Downed woody material should be reserved as well. When the purpose of the sale is not for blowdown salvage, and an absence of downed large woody material exists on the site, it is recommended that this material remain in place and not be removed or disturbed during sale operations. This woody material creates micro habitats for salamanders, other reptiles and amphibians, as well as fungal species that require damp moist shade.

6. All tops smaller than four inches should be reserved for nutrient recycling on a site. On rare occasions, whole tree harvesting may be approved, but must be granted at the discretion of the Planning Section Chief. Requests to whole tree harvest should be made at the time of sale proposal with sufficient documentation as to the need for whole tree harvesting. These will be reviewed on a case by case basis.

C. Reservation guidelines for Two-aged management

In buffers where two-aged management will be the treatment 20-30 BA of overstory is recommended for retention in oak and pine stands, and 30-40 BA will be retained in northern hardwood stands. Scattered trees are recommended over the "island" approach of reservation in these stands since aesthetics is the main concern. All other recommendations for even aged management should be followed in two-aged buffers.

D. Reservation guidelines for Shelterwood cuts

In general a shelterwood cut is an even-aged cut in waiting. Although it is not necessary to designate trees that will remain in the final residual of an overstory removal, it is suggested that the final residual BA be thought of in this stage when the canopy is intact. Islands and den trees can be marked at this time. In addition, as many snags as possible should be retained to supply options for retention when the time for final removal arrives.

IV. Cruising and Marking Sawtimber and Pulpwood

Only two methods of cruising sawtimber will be acceptable for sale of standing timber. The first is 100% tally; the second is variable plot cruise. No other form of cruise design will be accepted for sale processing. Both types of cruising can be used for the same sale, but only one method per block. In addition, sawtimber may be 100% tallied for a particular block, while pulpwood is variable plot cruised.

Due to the low value of pulpwood it may be tallied using one of four methods, 100% tally, 10% tally or 1% tally and the variable plot cruise. 100% tally of pulpwood is recommended when the tally will be small- such as in previously shelterwood cuts that have removed much of the pole class, or on haul roads and landings where the number of trees to be removed is small. In districts that have a strong pulp market, 10% tally is recommended in blocks where sawtimber will be 100% cruised. This is because of the relatively higher value of pulpwood within the district. In districts that have a poor pulp market- a 1% tally is suggested for blocks with 100% sawtimber tally. Variable plot is recommended when sawtimber will be cruised in the same fashion. Variable plot cruises for pulpwood is acceptable in combination with 100% sawtimber tallies.

All volume will be tallied using an electronic data recorder, equipped with the Bureau of Forestry's data collector files. Only 1 nmk or mrk. file (100% tally) will be accepted for each sale. Only one .cru file will be accepted (variable plot) for each sale. For more information on how to use the data collector programs, please use the following link: http://intraforestry/silviculture/DCSHelp.doc. Due to the complexity of these programs it is suggested that contact be made with the Silviculture Section for more instruction prior to using them for the first time.

A. Variable Plot Cruising

1. When stands are relatively uniform, and consists of moderate to low value species, or in a salvage situation where expeditious processing is important; a variable plot cruise is recommended to save time. Variable plot cruising will be done using a 10 BA factor prism.

2. The standard error for these cruises is to be ± 10%.

3. Variable plot cruising will require prior permission from the Silviculture Section.

4. All sawtimber must be tallied according to species, diameter and height. Cull percent and, if grade is to be used, must be tallied for every sawtimber tree.

5. All volumes will be tallied using a 10 BA factor and derived from using the international ¼" CFI volume tables for species, and processed through the Bureau of Forestry's Timber Beast Program. All FMT-7 sale volumes will be processed by the Silviculture Section, all FMT-4 sales will be processed by the district.

6. Reserve trees should be marked prior to beginning a variable plot cruise.

7. All volume to be removed should be done so by contract instead of being marked. For example, the FMT-19, and subsequently the prospectus and contract should read: all unmarked trees are to be cut down to 2" inches DBH. The minimum DBH can be adjusted as desired by the forester.

B. Guidelines for Timber Volume Estimate Using Variable Plots

1. SILVAH's analysis recommends 1 plot /acre for up to 10 acres, and 1 plot for every 10 acres thereafter. However, more plots are needed for a good volume estimate on sawtimber than to derive general estimates and prescriptions from SILVAH.

Good planning is paramount to obtain reasonable accuracy. The plots should be located in a fashion as to be equally distributed throughout the stand. Typically, plots are laid out in a square grid, equidistant from one another. Even a "uniform" stand has variability, and having the majority of the plots on one side or another of the stand does not behoove an accurate volume estimate. The next thing to ensure accuracy is to take an adequate number of plots.

The following is a rule-of-thumb for determining the number of plots:
10 acres or less – 10
11 to 40 acres – 1 per acre
41 to 80 acres – 20 + .5 (area)

81 to 200 acres – 40 + .25 (area)
(taken from the forestry handbook)

This rule-of-thumb assumes the stand is fairly uniform. The more variable the area becomes the more plots would be needed to ensure accuracy. Foresters will gain experience over time on how many more plots to take.

It is recommended that mixed cruises not be used when tallying sawtimber. Statistical difficulties arise when the 100% cruise method is used for the valuable sawtimber (such as the black cherry) and the remaining timber is cruised by variable plots. Mixing cruising methods in this way is like prism cruising a high-graded stand, which has a lot of variability. Hence, more plots would probably be needed for reasonable accuracy.

These guidelines are not intended to replace professional judgment and experience.

2. When cruising with a prism for sawtimber volume, there is no such thing as a borderline tree. If you cannot tell if a tree is in or out, you must measure the distance from plot center to the center of the tree. For a 10 factor prism, it is 2.75 * diameter of tree = limiting distance. Simply counting every other tree as in will give the wrong answer.

Consequently, the forester should measure each borderline tree to determine if the tree is “in” or “out”.

For example, if the diameter of a borderline tree is determined to be 17.6 inches. Therefore, 17.6 * 2.75 = 48.4 feet. The tree would have to be within 48.4 feet of the plot center to be “in”. If this tree was more than 48.4 feet from the plot center the tree would not be tallied.

The more care you take in being accurate, the more accurate your volume estimates will be. For example, your volume estimates will be more accurate if you measure each borderline tree instead of counting every-other-one, and if you use a d-tape instead of a Biltmore stick. Diameters on check trees should be measured to the nearest tenth.

Table 1: Horizontal limiting distance in feet for BAF 10 point-sampling instruments

dbh, in.	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
5	13.75	14.02	14.30	14.57	14.85	15.12	15.40	15.67	15.95	16.22
6	16.50	16.77	17.05	17.32	17.60	17.87	18.15	18.42	18.70	18.97
7	19.25	19.52	19.80	20.07	20.35	20.62	20.90	21.17	21.45	21.72
8	22.00	22.27	22.55	22.82	23.10	23.37	23.65	23.92	24.20	24.47
9	24.75	25.02	25.30	25.57	25.85	26.12	26.40	26.67	26.95	27.22
10	27.50	27.77	28.05	28.32	28.60	28.87	29.15	29.42	29.70	29.97
11	30.25	30.52	30.80	31.07	31.35	31.62	31.90	32.17	32.45	32.72
12	33.00	33.27	33.55	33.82	34.10	34.37	34.65	34.92	35.20	35.47
13	35.75	36.02	36.30	36.57	36.85	37.12	37.40	37.67	37.95	38.22
14	38.50	38.77	39.05	39.32	39.60	39.87	40.15	40.42	40.70	40.97
15	41.25	41.52	41.80	42.07	42.35	42.62	42.90	43.17	43.65	43.72
16	44.00	44.27	44.55	44.82	45.10	45.37	45.65	45.92	46.20	46.47
17	46.75	47.02	47.30	47.57	47.85	48.12	48.40	48.67	48.95	49.22
18	49.50	49.77	50.05	50.32	50.60	50.87	51.15	51.42	51.70	51.97
19	52.25	52.52	52.80	53.07	53.35	53.62	53.90	54.17	54.45	54.72
20	55.00	55.27	55.55	55.82	56.10	56.37	56.65	56.92	57.20	57.47
21	57.75	58.02	58.30	58.57	58.85	59.12	59.40	59.67	59.95	60.22
22	60.50	60.77	61.05	61.32	61.60	61.87	62.15	62.42	62.70	62.97
23	63.25	63.52	63.80	64.07	64.35	64.62	64.90	65.17	65.45	65.72
24	66.00	66.27	66.55	66.82	67.10	67.37	67.65	67.92	68.20	68.47
25	68.75	69.02	69.30	69.57	69.85	70.12	70.40	70.67	70.95	71.22
26	71.50	71.77	72.05	72.32	72.60	72.87	73.15	73.42	73.70	73.97
27	74.25	74.52	74.80	75.07	75.35	75.62	75.90	76.17	76.45	76.72
28	77.00	77.27	77.55	77.82	78.10	78.37	78.65	78.92	79.20	79.47
29	79.75	80.02	80.30	80.57	80.85	81.12	81.40	81.67	81.95	82.22
30	82.50	82.77	83.05	83.32	83.60	83.87	84.15	84.42	84.70	84.97

C. Timber Cruising 100% Tally

1. Where stands have moderate to high value, or there is wide variability in stand structure, a 100% tally is recommended.

2. All merchantable sawtimber within the area being cruised are to be measured for their diameters and height visually estimated to the nearest half log. Trees should either be marked with yellow paint, or with a paint or lumber crayon to show that they have already been tallied.

3. Stump marks- either for reserve trees or trees to be designated for removal- should be placed at ground level on a place where they aren't likely to be rubbed off by logging equipment. Also, insure that the mark is made on the bark of the stump, and any interfering moss or other debris is scraped away.

4. Every tenth merchantable sawtimber tree will be a check tree. Check trees should be numbered sequentially by block. This allows anyone inquiring on the sale volumes to compare their volume and defect estimates with that of the marking crew. Heights should be measured using an Abney Level, Haga altimeter, Clinometer, Spiegel Releskop or any electronic instrument so calibrated for height measurement, in combination with a tape for correct distance from the tree. Defect should be calculated for each check tree. If grades are to be used, the check tree will be graded. Residual BA should be taken at each check tree to help insure accurate implementation of the silviculture prescription. Check trees are important for calculating % cull on a sale, and for aiding in keeping the timber cruiser's eye honest in assessing tree heights.

5. Every pulpwood tree that is a check tree depending on the cruise design, shall be measured and its height estimated to the nearest 8 foot bolt. In 100% tallied, every pulpwood tree will be measured. In 10% tally, every tenth pulpwood tree will be measured. In 1% cruise design, each 100th tree will be measured. A running tally of the number of pulpwood trees for each block should be kept.

V. Classes of Timber Products

A. Merchantable Sawtimber

1. Any black cherry, white ash, sugar maple, or walnut which is 11.5" DBH or greater. The maximum scaling defect to an 8 inch d.i.b. top, is 66%. Greater defect is allowed provided a minimum 12 foot sound butt log is present.

2. All other hardwood trees which have 11.5" DBH or greater will have a maximum scaling deduction of less than 50% to an 8 inch dib top. Defect can be greater than 50% provided there is a 12 foot sound butt log.

3. Any softwood species will be measured as sawtimber if it is greater than 9.5" DBH, and maximum defect is less than 50% to a 6 inch dib top. Defect may be greater provided there is a minimum of a 12 foot butt log.

B. Merchantable Pulpwood

Any tree 5.5 inches DBH or greater to a 4 inch DIB top is considered merchantable for pulpwood. Defect must be no greater than 50 %. It is entirely possible to have a tree cull out as a sawtimber tree, but still be sound enough for pulp wood. In these instances these trees should be tallied as pulpwood up to 24" DBH. This maximum diameter that many pulp mills can handle.

C. Cull Trees.

Any tree that does not meet merchantability for pulpwood or sawtimber should be culled with no value assigned to it.

VI. Measurements for Timber to be Sold

A. Sawtimber Trees

1. Each standing sawtimber tree will be measured to a 1 inch diameter class. The height will be estimated from a one foot stump to a point on the stem where merchantability is limited by branches, deformity or a minimum diameter of 8.5 inch dib for hardwoods or 6 inche dib for softwoods, at half log increments. Heights should be measured using an Abney Level, Haga altimeter, Clinometer, Spiegel Releskop or any electronic instrument so calibrated for height measurement, in combination with a tape for correct distance from the tree. On variable plot cruises, every tree will be considered a check tree.

2. Downed trees will be measured at 4/12 feet from the stump with a tape where possible, and if not with a pair of tree calipers. Heights should be estimated using the same criteria for standing trees. When a downed tree is a check tree, it is measured with a loggers tape from stump to merchantable height at the nearest half log.

3. When a tree forks below DBH, it will be considered two trees with the height of each beginning at the fork.

4. When a tree forks above DBH, it will be considered one tree and its dominant leader used to determine height.

5. Sawtimber deductions will include but are not limited to: excessive sweep, crook, forks, seams, cracks, and indicators of rot such as cankers, conks, swollen knots, visible butt rot, spiral seams, holes, swelling of the bole, scars, broken or dead tops/limbs, and frost cracks.

6. Deductions will be made on each four foot section of a tree, and then calculated using the cull percentage. This chart can be found on the Form Class Cruise Instructions 0on intraforestry. (http://intraforestry/silviculture/silviculture.aspx).

7. It is recommended that 1 inch of diameter is subtracted from DBH for every year that a tree has been standing dead. This will help account for the subsequent sapwood rot that occurs once a tree has suffered mortality.

B. Pulpwood to be sold

1. Each pulpwood trees is tallied. A visual estimate to make sure greater than 50% merchantability exists to a 4 inch dib top should be assessed. Any tree that does not posses enough sound wood should be culled.

2. Each standing pulpwood tree should be measured if pulpwood is to be 100% tallied or is variable plot cruised. Each 10th or 100th tree should be measured on 10% and 1% cruises, respectively. Pulpwood will be

measured at DBH to the nearest 1 inch diameter, and its height estimated to a 4 inch dib top. Heights are measured in 8 foot bolts.

3. Downed pulpwood trees should be measured using methods similar to downed sawtimber trees.

4. When a tree forks below DBH, it will be considered two trees with the height of each beginning at the fork.

5. When a tree forks above DBH, it will be considered one tree and its dominant leader used to determine height

6. Defect for pulpwood will be limited to rot, forks, and extreme crook.

C. Fuelwood

Must be sold on a standard rough cord whether stacked or standing. Standing fuel wood should be calculated using the formulas found on table in the Appendix. Stacked wood can be measured for dimensions and then divided by 128 cubic feet.

VII. Log Grading

Grading the butt log of trees is not necessary in volume computations, and currently not very common, but it can be chosen as an option to differentiate prices for differing qualities of a species (such as low value species codes), or for helping to determine the value of a species as a whole. The following guidelines should be adhered to if log grading is to be used.

A. Determination of Log Grade in Marking Contract Sales

1. The butt log of each check is to be graded if log grades are to be used. Log grades will be based on information from the U.S. Forest Service, Forest Products Laboratory All logs are graded based upon DBH on the US Forest Service publication as listed at the following link: http://www.fs.fed.us/ne/newtown_square/publications/technical_reports/pdfs/scanned/gtr1.pdf

2. The best continuous 12 foot section is graded and its grade applied to the whole 16 foot butt log.

3. The best 12 foot section must be divided into four grading faces so oriented to give the best number of good faces.

4. Defects are to be confined to one grading face whenever possible**.**

5. The second poorest face is to be used for log grade.

6. The grade of the butt log will be recorded for each check tree as a one digit number.

7. The forest service log grades posted in the appendix are to be used for all log grading.

B. When no grade is to be used, a grade of “6” will be used for the log grade.

CHAPTER VII
BIDDING AND CONTRACTING

I. Sale Processing

Prospectuses and contracts for all FM-T-7 sales are prepared through automated programs developed and used by the Silviculture Section. FM-T-4 District Contracts can be prepared by the Silviculture Section using the methods detailed below but many districts prefer to do their own. The districts doing their own have a variety of methods that may be standardized at some future date. The procedures outlined below are useful in preparing these district sales. After marking is completed, the following forms and data must be submitted to the Silviculture Section:

A. Timber Sale Map

1. Maps may be prepared by GIS or hand sketched on "Exhibit A" sketch forms. See the appendix for an example.

2. The map should be prepared at the standard scale of 1"=1,320'

3. The map should show sufficient detail of roads, streams, and sale boundaries to allow proper orientation by buyers unfamiliar with the sale. Distances to nearest roads and towns should be clearly labeled at the edge of the map on main access roads.

4. Maps must use the Bureau's standard timber sale map key for symbols. See the appendix for an example.

5. If hand sketched all header data shall be typed. It is preferred that map names and labels also be typed or very neatly printed.

6. Cutting blocks must be labeled and treatment types carefully marked for each block.

7. GIS shape files showing the blocks and treatment types shall be provided to the Silviculture Section for each sale.

B. Forms FM-T-5, FM-T-19, FM-T-25, and Exhibit B

These are the electronic spreadsheet forms used to communicate the data necessary to process sales and prepare timber sale prospectuses and contracts. The spreadsheets are a series of Microsoft Excel forms that

allow easy emailing and easy uploading of the data for automated sale preparation. Forms can be printed for the required District Forester signature or they may forwarded through the District Forester to the Silviculture Section. If forwarded by email the District Forester is still responsible to carefully review and approve the information.

1. **FM-T-5**: Contract Timber Stumpage Sale Prospectus and Appraisal Report

The form is largely self-explanatory. Information is required for each relevant to the sale. Special logging restrictions should be listed at the end of the form along with a justification for the restrictions.

2. **FM-T-19**: Timber Sale Program Control Data

This form is necessary to identify blocks, acreages, cruise types and minimum species prices.

3. **FM-T-25**: Estimate of Main Haul Road Cost for Deduction from the Minimum Valuation of Timber Stumpage

This form is prepared for all sales where a main haul road is required for the removal of timber or for where seeding is required to retire portions of the sale area. No deductions may be made for the purchase of materials or labor to improve public access roads. Deductions may only be used for roads necessary to access the timber and that are closed to the public throughout most of the year.

4. **Exhibit B**

This form lists block specific cutting instructions.

C. Special Permits

A copy of any necessary Highway Occupancy Permits, Water Quality Management Permits, NPEDS permits, encroachment permits or other necessary permits shall be mailed to the Silviculture Section to aid in the preparation of contracts.

D. Timber Beast Data Files

These are the files generated by custom programs used in the Bureau's handheld data collectors to inventory timber marked for sale. The raw files as well as the Microsoft Access files should be emailed to the Silviculture Section after marking has been completed. A complete Bureau of Forestry Manual is available on intraforestry under Silviculture on the use of data collectors and the creation of data files.

II. Prospectus and Sale Advertising

A. Sale processing can currently take a couple weeks depending on workloads within the Silviculutre Section.

B. Upon completion of a draft prospectus the Silviculture Section will send the draft to the district Resource Assistant District Forester for final review. It is critical that a careful and thorough line by line review be done of the prospectus.

C. After district approval, a final copy of the sale prospectus will be emailed to the district for mailing to their prospective bidders list. At the same time, sale specific bid forms and bid envelope labels and detailed block statistics will also be emailed to the district for distribution to bidders that express an interest in bidding.

D. Final prospectuses should be emailed to the district no less than about 4 and a half weeks prior to the bid opening dates. Shorter notice sales may be requested by the district but generally not advisable except under special circumstances (i.e. certain salvage situations, etc.).

E. The Silviculture Section will post and advertise all FM-T-7 timber sale prospectuses on the Bureau of Forestry's website.

III. Bidding Procedures

A. General

The Bureau of Forestry is authorized by the Administrative Code of 1929 to sell "surplus products of the land" such as timber for not less than the fair market value. To determine fair market value the Department normally requires sealed bids to be submitted by prospective buyers. The bids are opened publicly at a set time and place. The sales are awarded to the highest responsible and responsive bidder. In situations when bidding is not possible (right-of-ways, etc.), or where bidding would unacceptably delay the sale of timber (some salvage situations, etc.) or on sales less than $3,000, the District Forester shall determine the fair market value. Determinations of fair market value are subject to scrutiny and therefore documentation of market value determinations associated with FM-T-7 Contracts and District Forester Contracts sold without bidding must be maintained with the sale records. The District Forester must sign all non-bid sales and shall be responsible to verify the values assigned. For procedures not detailed in this manual, similar procedures found in the Commonwealth's Procurement Code may be used.

B. Requirements to bid

1. <u>FM-T-7 Sale Contracts</u>. Sealed bids are required for all FM-T-7 Sale Contracts.

2. FM-T-4 District Sale Contracts with estimated sale value of $3,000 or more. Sealed bids are required unless approval is received from the Silviculture Section to negotiate the contract.

3. FM-T-4 District Sale Contracts with estimated sale value of less than $3000 but more than $1000. Sealed bids are not required, however, the following procedure must be followed:

   a) The District Forester must make a verbal or written attempt to solicit bids from at least three prospective buyers.

   b) All prospective bidders contacted must be recorded on the District Sale Bid Results (FM-T-13) form.

   c) The original copy of the completed District Sale Bid Results (FM-T-13) form must be placed in the sale folder. A copy of this form must be sent to the Silviculture Section.

4. FM-T-4 District Sale Contracts with estimated sale value of less than $1000 may be sold for not less than fair market value. Fair market value should be determined by the District Forester based on bids for sales of similar types of timber.

C. Bid Opening

1. All bid results must be recorded on the District Sale Bid Results (FM-T-13) form.

2. The original copy of the completed District Sale Bid Results (FM-T-13) form must be placed in the sale folder. A copy of this form must be sent to the Silviculture Section.

D. Bid Agreement

The prospective bidder should submit a bid on form FM-T-14, Bid for Tree Estimate Sale. This agreement details, among other things, what will happen to the bid deposit should the bidder default. The Department reserves the right to reject any bids not received on this form. The District Sale Number, amount of the bid deposit, and the minimum acceptable bid must be placed on the bid form prior to distribution to prospective bidders.

E. Bid Envelopes

The Silviculture Section will supply pre-addressed yellow bid envelopes for FM-T-7 contracts and a document that will allow labels with bid information to be printed and placed on the backs of the envelopes.

Bid envelopes are not required for bids, but all sealed bids must be clearly labeled on the outside with the sale number, sale name, bid opening date and the bid opening time.

F. Bid Deposits

A bid deposit must accompany all bids. The amount of the bid deposit will be as follows:

MINIMUM SALE VALUE Before Road Cost Deduction ($)		REQUIRED DEPOSIT
FROM	TO	
100	1,000	100
1,001	5,000	300
5,001	10,000	600
10,001	20,000	1,000
20,001	50,000	2,500
50,001	100,000	6,000
100,001	500,000	10,000
500,001	1,000,000	20,000
1,000,001	2,000,000	30,000
2,000,001	3,000,000	40,000
3,000,001	4,000,000	50,000
4,000,001	5,000,000	65,000
5,000,000	And Higher	1.5 % of value rounded to

G. Acceptable Bid Deposits

1. The bid deposit must be in the form of either: 1) a certified cashier's, treasurer's or official check, or 2) U.S. Postal, bank or express money order.

2. All payments must be made payable to the "Commonwealth of Pennsylvania". Personal checks or personal money orders will not be accepted.

3. An alternative for frequent bidders is to provide the Commonwealth with an annual bid bond. An annual bid bond is a letter-of-credit or corporate insurance bond that is approved by the Department in advance of bid opening. Normally allow at least 2 weeks for bond reviews and approvals. Bidders choosing an annual bid bond are responsible to see that the bond is adequate and current prior to bidding. Bid bonds that are not adequate for a bid may be supplemented with other acceptable forms of bid bonds as described above in (1) and (2) provided they are supplied timely with the bid.

H. Confidentiality

Prior to bid opening, the number of bids received, bidders, or any other information concerning the bids must not be divulged.

I. Public Opening

All sealed bids will be opened publicly at the date and time specified in the prospectus. Bids for FM-T-7 sales will be opened by the Department's Office of Chief Counsel in Harrisburg. Bids for District FM-T-4 sales will be opened at the district offices. Bids may be mailed or hand delivered. Bidders are responsible to see that bids are delivered on time regardless of the delivery system they choose.

J. Bid Results

Bid results will be recorded on the bid proposal tabulation (0300-FM-DCNR001). The Silviculture Section will FAX bid opening results to each district immediately following bid opening and post those results on the Bureau of Forestry's website:
http://www.dcnr.state.pa.us/forestry/stateforestmanagement/timbersales/index.htm
A summary of the bid proposal tabulation will be mailed to each bidder.

K. Bid Award

The highest responsible and responsive bidder will be awarded the contract within 60 days although award decisions are often made within a day or two of bid opening. The definitions of responsible and responsive are detailed in the Commonwealth Procurement Code. The Commonwealth's Contractor Responsibility list, previous contracting records with the Department and other verifiable information may also be used to make award decisions.

L. Revising a Bid

1. Prior to the time set for bid opening an original bid may be revised by submitting a new written bid.

2. Any new written bid must be submitted in a sealed envelope marked "timber sale bid revision" followed by the sale number and bid opening date and time. A sign statement from the bidder must be included stating that the new bid supersedes the original bid and the bid deposit furnished for the original bid is to be applied to the new bid.

M. Withdrawing a Bid

1. Prior to the scheduled time for bid opening, original bids may be withdrawn in person by properly

identified individuals

2. Or by submitting a written request that is received prior to the scheduled time of bid opening

3. After the scheduled time of bid opening, bid withdrawals are normally considered a default of bid agreement terms. The bid bond will normally be retained by the Department. On bid defaults a request should be made to list the contractor on the Commonwealth Contractor Responsibility list. Requests to list a contractor are to be addressed to the PA-DCNR-Bureau of Administrative Services, Procurement and Supply Division Chief, P.O. Box 8769, Harrisburg, PA 17105-8769. A defaulting bidder will not be allowed to bid on this particular sale a second time or to purchase the sale at a negotiated price.

N. Ineligible Bids

1. Bids without an acceptable bid bond at the time of opening will be rejected

2. Bids not submitted on the Department's FM-T-14, Bid for Tree Estimate Sale, may be rejected.

3. Bids that are received late will be rejected and returned to the bidder unopened.

4. Bids from those who are not responsible or responsive as defined in the Commonwealth Procurement code will may also be rejected.

O. Tie Bids

When the highest bids are tied, it will be necessary to solicit new bids from those who received the prospectus originally

P. No Bids Received

When no bids are received for a contract sale, the district Forester will be required to report the circumstances on form FM-T-6 under the heading No Bids Received and return the form to the Silviculture Section. With concurrence of the Silviculture Section, the sale may then be negotiated, re- advertised or cancelled.

Q. Negotiated Sales

1. FM-T-7 Sales.

a) Approval to Negotiate: When the Silviculture Section gives approval to negotiate a sale, the district has six months to negotiate the contract from the date of approval.

b) Negotiation Value: No less than the minimum bid value may be accepted for a sale. If the minimum bid value is too high the minimum bid should be recalculated and the sale re-advertised for bidding with the new minimum bid value to allow all bidders an equal opportunity to purchase the timber.

c) Negotiated Sales Agreement: Once negotiated the district must complete the Bid/Negotiated Sales Agreement (FM-T-14a) or (FM-T-14b). http://intraforestry/silviculture/silv_manual.aspx Contract terms are not negotiable without rebidding the sale.

d) Bid Deposit: If the buyer does not have a permanent bid deposit on file, the buyer must provide a certified, cashier's or treasurer's check; or postal or express money order for the bid deposit for the amount listed in the latest prospectus.

e) Sale Award: Awards are made by the Silviculture Section to the first responsible and responsive contactor that provides a signed bid agreement and an acceptable bid bond to the District Forester.

f) Extending Contract Expiration: The expiration date of contract may be extended to allow for the time lost between the date of the original bid opening to the date that the sale was negotiated.

g) Failure to Negotiate: Sales that are not negotiated by the 6-month deadline should be re-evaluated. There are two options on how the district may proceed with these sales: re-advertisement or cancellation. Following consultation with the Silviculture Section, the district must submit a written request for approval on the option that they choose.

h) Sale Cancellation: If it is determined that the sale be cancelled the Silviculture Section will remove the sale from the list of available sales.

i) Re-Advertisement: Re-advertised no-bid sales that do not receive bids are eligible for sale by negotiated contract.

j) Re-marking: If tree-marking paint/ink is faded to the point that it is determined that it will not last for the life of the sale, all trees shall be remarked prior to entering into a negotiated sales agreement with a prospective buyer.

k) Advertising No-Bid Sales: No-bid sales will be listed on the bureau's WEB site under the State Forest Timber Stumpage Sales Link. http://www.dcnr.state.pa.us/forestry/stateforestmanagement/timbersales/index.htm

2. FM-T-4 District Sales

The requirements are the same as for the FM-T-7 except approval to negotiate is not necessary form the Silviculture Section and awards are made by the District Forester.

R. High Bidder Rejected

1. Prior to rejecting a high bid and awarding to a lower bidder, circumstances justifying the rejection should be submitted for review to the Silviculture Section. The Silviculture Section will review the information with Legal Services as necessary.

2. If the high bidder is rejected the contract may be negotiated with any other bidder or re- advertised.

3. One bid sales may be negotiated or re-advertised following the rejection of the only bidder.

S. High Bidder Defaults

1. If the highest qualified bidder fails to execute the contract or provide a satisfactory performance deposit or otherwise defaults, the bidder will normally forfeit his bid deposit to the Department as liquidated damages and the timber will be offered to the other qualified bidders in the order of descending bids, or negotiated or re-advertised as the Department deems most beneficial.

2. The consequence of such a default may also subject the bidder to further sanctions under the statewide Contractor Responsibility Program in accordance with Management Directive 215.9. Amended, as issued by the Governor's Office. Such Contractor Responsibility action may result in finding the Bidder non-responsible in subsequent timber sales and preclude an award to the Bidder in those sales.

3. Defaulting bidders will also have their bids rejected on the sales they default on and will not be eligible to negotiate the sale they defaulted upon.

4. Repeated defaults will lead to a contractor being found non-responsible and all future bids may be rejected for a period of time. Additional guidance on this is available within the Governors Contractor Responsibility program and the Commonwealth Procurement Code.

IV. Award and Contract Execution Procedures

A. General

1. FM-T-7 Sales

a) Once an award decision has been made by the Silviculture Section in consultation with the District Forester, then an original and three copies of the contract will be prepared by the Silviculture Section.

b) A draft copy of the contract will be emailed to the resource Assistant District Forester and administering Forester for review. It is the Assistant District Foresters responsibility to assure that a thorough and careful final review has been done of the draft contract.

c) A letter is then prepared by the Silviculture Section telling the successful bidder of the contract award. The letter will request the Buyer, as agreed to in the bid agreement, to return the signed contract along with a performance bond within 30 days. Grace shall normally be extended provided the Buyer is making reasonable progress on completing these tasks. This letter is mailed to the Buyer by the Silviculture Section along with the final contract and 2 copies. Other items in this mailing will include the appropriate performance bond instructions and samples.

d) The performance bond is due in 30 days from the award letter but the Buyer may elect delay the initial block payment until they are ready to start cutting.

e) Should the buyer fail to return the contract within 30 days, the buyer will be called and reminded. If this is ineffective in securing the contract, the Silviculture Section will notify the buyer by registered mail, return receipt that the contract is due by a definite date (no more than 10 additional business days) and of the potential consequences of defaulting on the bid agreement.

f) When the buyer returns the properly signed original contract and two copies together with the performance bond, the District Forester shall review the documents and if satisfactory forward them to the Silviculture Section for final legal review and signatures.

g) The Buyer will be notified after contract signing to proceed once the first block payment is received. The Bureau shall give several days notice prior to commencing road building or sale operations so that a forester can be present to start the project.

h) Buyers shall not be allowed to start a contract unless a contract is approved by legal services and then fully executed by the Department.

i) Contracts in excess of $5,000 must be posted on the Department of Treasury's website once they are executed as required by the Pennsylvania Right-to-Know law. The Silviculture Section will post all FM-T-7 contracts.

j) Signatory Authority**.** Prospective buyers may designate an employee to act as their agent or representative for submitting and signing bid/negotiated sales agreements, bonds, contracts, and other documents relating to the purchase of timber stumpage. The following documents must be submitted to the Silviculture Section by the owner or officers of the company or corporation:

1) Individual, Partnerships and Unincorporated Companies

Authorization: A notarized letter of authorization is required. The letter must be signed by at least one of the owners and the representative or agent. See sample letter in the appendix. Signatory authorization remains in effect until rescinded. See sample letter on intraforestry, Silvicultural Manual, Bidding and Performance (http://intraforestry/silviculture/silv_manual.aspx).

2) Corporations

Authorization: A certified resolution by the board of directors of the corporation is required, which authorizes the agent or officer to sign. The secretary of the corporation should sign this resolution. The corporate seal should be affixed to this resolution. This resolution must be sent to the cover letter. This cover letter should include the signatures of all representatives or agents named in the resolution. See sample resolution in the appendix. Signatory authorization remains in effect until rescinded. See sample resolution on intraforestry, Silvicultural Manual, Bidding and Performance (http://intraforestry/silviculture/silv_manual.aspx).

2. FM-T-4 District Sales

These sales are awarded and signed the same as FM-T-7 contracts above except that all duties listed for the Silviculture Section the District Forester will normally complete.

B. Buyer fails to execute the contract

If the highest qualified bidder fails to execute the contract or provide a satisfactory performance deposit, the bidder will be considered in default and will forfeit his bid deposit to the Department as liquidated damages and the timber will be offered to the other qualified bidders in the order of descending bids, or negotiated or re-

advertised as appropriate. The consequence of such a default may also subject the bidder to further sanctions under the statewide Contractor Responsibility Program in accordance with Management Directive 215.9 Amended, as issued by the Governor's Office. Such Contractor Responsibility action may result in finding the Bidder non-responsible in subsequent timber sales and preclude an award to the Bidder in those sales.

C. Assignment of Contract

1. If the Buyer wishes to assign a contract, the following items are required:

   a) The buyer shall request the assignment in writing and the District Forester shall forward that along with a recommendation to the Silviculture Section.

   b) If approved, the assignment will be made in a written contract, prepared by the Silviculture Section, signed by both parties, approved by the Attorney General and executed by the Silviculture Section.

2. In the case of disability or death of the Buyer, the Department will consider assignment of the contract to another party as set forth below:

   a) The assignment must be in the form of a written contract prepared by the Silviculture Section, signed by the assignee, and Buyer if alive and capable. If the original Buyer is not alive and capable, then signature by the executor or administrator of the estate is acceptable.

   b) If the assignment is made by an executor or administrator, legal proof of authority to act on behalf of the estate must be provided.

D. Subcontractors

No prior approval of the Department is required unless the subcontractor has a record of poor contract performance either on State Forest land or elsewhere.

E. Extension of Timber Sale Contract

1. Buyers of State Forest stumpage are expected to complete all cutting and hauling by the expiration date of the contract. The request for additional time must be clearly based on conditions of operation which are beyond the control of the Buyer.

2. 45 days prior to the expiration date of a contract the District Forester shall determine if a legitimate need exists which may require the extension of the contract. If such a need exists the District Forester shall then

notify the Buyer and reference the procedure in the contract for extensions.

3. If an extension is necessary the Buyer must provide the District Forester with a written request that sets forth the reasons the request is justified. The request should also stipulate a reasonable time in which to complete the sale.

4. The expiration date of the contract may be extended at the discretion of the Department. When the District Forester suspends sale operations in writing for any reason other than Buyer non-compliance, the contract can be extended at no cost to the Buyer for a period equal to the period of suspension. If for any other reason a contract extension beyond the contract extension date becomes necessary, the Buyer must submit a written request 30 days prior to the contract expiration date to the District Forester stating the period of extension requested in months and the reasons why the contract cannot be completed by the expiration date. For each month of the requested extension period, the Buyer shall pay the Department five (5) percent of the value of all cutting blocks not yet closed by the District Forester by the date of the extension request. Payment in full for each extension payable to the Commonwealth of Pennsylvania must accompany the request for extension. No refunds will be given if sale operations are completed earlier than anticipated.

5. If sale operations have not been completed by the contract expiration date and a contract extension has not been approved by the Department, sale operations will be suspended. If an extension is subsequently approved, the Buyer must make payment as outlined above to include the period of suspension.

6. For free extensions sales that are suspended by the District Forester the length of the credit period shall begin on the date the District Forester's letter states the sale was suspended and end on the date the District Forester's letter states that sale operations may resume. A copy of each letter is to be forwarded to the Silviculture Section with the extension request. The credit period will be for a period of time and not broken down into isolated working and non-working days.

7. If it is determined that an extension of the contract is justified, the Department will approve the extension by a letter to the Buyer. If the performance bond is in the form of a corporate bond, the Silviculture Section will forward a copy of the extension to the bonding company.

8. When a request for extension is not approved the Buyer will be notified with a letter from the Department with a copy to the District Forester.

F. Performance Bond

1. A successful bidder must furnish a performance bond as guarantee for performance of their contract.

On all FM-T-7 and FM-T-4 sales a performance bond is required from the successful bidder. The amount of the performance bond shall be calculated in accordance with the following table:

BID VALUE	PERFORMANCE DEPOSIT
Less than $50,000	25% of the sum of the bid value plus the Department's estimated road and seeding costs (in the prospectus)
$50,000 to $250,000	20% of the sum of the bid value plus the Department's estimated road and seeding costs (in the prospectus)
$250,000 to less than $2.5 million	15% of the sum of the bid value plus the Department's estimated road and seeding costs (in the prospectus)
$2.5 million or more	10% of the sum of the bid value plus the Department's estimated road and seeding costs (in the prospectus)

To further protect the Commonwealth, the district forester may require higher performance bonds and/or a detailed time specific payment schedule under special circumstances. Special circumstances include salvage sales which have a high potential for serious degrade during the contract period. The district forester should make an estimate of the potential for loss if the buyer defaults. Performance bonds should be set accordingly to adequately protect the Commonwealth.

2. Acceptable Securities: The Department accepts a variety of securities to guarantee of contractor performance payable to the "Commonwealth of PA". Personal checks, personal money orders, statement savings accounts and stock certificates are not acceptable. The following securities are acceptable:

a) Certified Checks

b) Cashier's Checks

c) Treasurer's Checks

d) Bank Money Orders

e) Postal Money Orders

f) Express Money Orders

g) Corporate Surety Bonds (FM-T-28)

The Silviculture Section will complete the corporate bond form and mail it to the buyer for

execution. These bonds shall be prepared so the period of coverage is from the date that the contract is executed through the contract expiration date and any extension thereof.

h) Letters of Credit

1) The contractor's financial institution prepares the letter of credit in accordance with the sample in the appendix.

2) Acceptable Form: Letters of credit are only accepted from financial institutions organized or authorized to do business in the United States.

3) Required Information: The following information must appear on all Letters of Credit:

a. The timber sale contractor's name and address must be legal in form and be entered exactly as it appears on the contract.

b. The issuing financial institution must number them.

c. There must be a statement that the letter of credit is irrevocable.

d. Letters of credit shall be prepared so the period of coverage is from the date that the contract is executed to thirty days past the expiration date of the contract. If the contract expiration date is extended, a new letter of credit or an amendment to the original letter of credit must be obtained. This document must cover the period from the original expiration date to thirty days past the expiration of the extension.

e. They must refer to the timber sale contract number.

f. The amount must be equal to or greater than the required performance deposit listed in the timber sale contract.

g. The Departments address should appear as follows:

Commonwealth of Pennsylvania
Department of Conservation & Natural Resources
Bureau of Forestry – Silviculture Section
P. O. Box 8552
Harrisburg, PA 17105-8552

h. Signatures: Letters of credit must be on original letterhead and bear the original signature of an officer of the financial institution.

i. Payment on Demand: Letters of Credit shall be payable to the Department in part or in full upon demand of the Department in the case of a forfeiture or the failure of the operator to replace the letter of credit.

j. Standards: All letters of credit shall be subject to the Uniform Customs and Practice for Documentary Credits (1993 Revision), International Chamber of Commerce Publication # 500, or most current amendment, revision or successor publications.

i) Bank Savings Accounts

1) General: The Silviculture Section will prepare the Assignment of Bank Savings Account and Consent of Bank (FM-T-22a) and mail it to the buyer for execution. Information provided by the district forester on the Report on Bid Opening/Negotiated Sales (FM-T-3) form is necessary to complete assignment agreement.

2) Term of Agreement: The assignment agreement shall be prepared so the period of coverage is from the date that the contract is executed through the contract expiration date and any extension thereof.

3) Buyer's Responsibility: The contractor shall execute the original assignment agreement and have his financial institution execute the associated Consent of Bank (FM-T-22b) form. The contractor shall return the executed assignment agreement and consent of bank form to the district forester.

4) District Responsibility: The district forester shall review these forms for completeness and accuracy and forward them to the Silviculture Section for legal review.

j) Certificates of Deposit

1) General: The Silviculture Section will prepare the Assignment of Bank Certificate of Deposit (FM-T-23a) form and mail it to the buyer for execution. Information provided by the district forester on the Report on Bid Opening/Negotiated Sales (FM-T-3) form is necessary to complete assignment agreement.

2) Term of Agreement: The assignment agreement shall be prepared so the period of coverage is

from the date that the contract is executed through the contract expiration date and any extension thereof.

3) Buyer's Responsibility: The contractor shall execute the original assignment agreement and have his financial institution execute the associated Consent of Bank (FM-T-23b) form. The contractor shall return the executed assignment agreement and consent of bank form to the District Forester.

4) District Responsibility: The District Forester shall review these forms for completeness and accuracy and forward them to the Silviculture Section for legal review.

5) Federal Reserve Regulations: Federal Reserve Regulations require that certificates of deposit be endorsed with either one of the following two options listed in (1) and (2) below:

Options 1: "Transferable only on the records of the institution"

Options 2: "Transferable only with permission of the institution"

6) Non or Not Transferable Certificates: **DO NOT** accept certificates with the endorsement "Non or Not Transferable"

7) Maturity Date. All certificates should be automatically renewable and should not mature before the termination date of the timber sale contract.

k) Financed Bonds

1) General: If the contractor borrows funds to purchase a surety or corporate bond, only the contractor's name and signature shall appear on the bond form. Upon issuance of the performance bond the bonding company, the lending institution and the contract together must enter into and complete a principal agreement. The principal agreement form is furnished and executed by the bonding company. This requirement is necessary to insure the bonding company's indemnity from the second party if the contractor fails to meet terms of the contract.

2) Bond Coverage and Payments: The contractor is responsible for renewing bond coverage and additional payments that may be required by his bonding company to cover bond extensions.

a. Cash Bonds: The district should transmit cash performance bonds to the comptroller upon receipt. Cash bonds include: Certified, cashier's and treasurer's checks; and bank, postal and express money orders.

b. Chief Counsel Review: The following securities require legal review and should be forwarded with three copies of the contract, sign by the buyer, to the Silviculture Section upon receipt and review by the district forester: Corporate surety bonds, letters of credit, bank savings accounts and certificates of deposit.

G. Modified Performance Bonds

1. General: Performance may be modified if it becomes necessary to delay haul road and landing retirement due to unsuitable site conditions. The Silviculture Section Chief will consider requests to modify bonds under these circumstances when all other contract obligations have been satisfactorily completed. The new bond must sufficiently cover the cost of haul road, landing and related sale retirement costs, including administrative costs that may occur if the contractor does not fulfill the terms of his contract. The amount of the bond should be rounded to the next highest $100 once these costs are determined.

2. Contractor's Responsibility: The contractor must submit a written request with his replacement or modified bond to the District Forester requesting that his performance bond be modified or reduced.

3. District Forester's Responsibility: The district forester must forward the contractor's request along with the replacement or modified bond with their recommendation to the Silviculture Section for legal review and approval. If the contractor submits a cash bond to replace his original bond the district should transmit the check to the comptroller. Cash bonds must be in to form of a cashier's, certified or treasurer's check; or bank, postal or express money order payable to the Commonwealth of Pennsylvania.

4. Silviculture Section Responsibility: If the contractor replaces the original bond with a replacement or modified negotiable security the Silviculture Section will forward it to the Chief Counsel for review. The original bond will not be released until the Chief Counsel gives his approval on the replaced or modified bond. The Silviculture Section will not return the original bond to the bonding company until the new bond is validated.

H. Appropriating Performance Bonds

1. General: When a contractor defaults on the terms of the contract the agreement will be terminated and the performance bond will be appropriated to cover damages.

2. District's Responsibility. The district must notify the Silviculture Section in writing explaining of the nature of the default. The district forester should include an itemized accounting of the expenses and payments in this notification. If unsatisfactory conditions exist, the district must include an estimate of the costs for labor, material, equipment and administrative costs that will be incurred for remediation.

3. Silviculture Section Responsibility:

a) General: The Silviculture Section will review the situation in consultation with the district forester. The district many not precede with remediation efforts until it has received authorization from the Silviculture Section Chief.

b) Cash Bonds: If the performance bond is in the form of cash the Silviculture Section will notify the comptroller to move the funds from the securities appropriation to the timber stumpage restricted receipts appropriation.

c) Negotiable Securities: If the performance bond is in the form of a negotiable security the Silviculture Section will request restitution from the bonding company. When payment is received from the bonding company the Silviculture Section will transmit the check to the comptroller for deposit into the forest stumpage sales restricted receipts account.

4. District Reimbursement: The district should submit a statement of itemized costs that were incurred as a result of remediation of damages to the assistant state forester responsible for field operations. A copy of this communications should be sent to the Silviculture Section. The assistant state forester will keep a tabulation of these expenses and will be take the expenses into consideration when a need for an adjustment to the district budget is justified.

V. District Timber Sale Contracts (FM-T-4)

District Forest Products Sale Contracts are drafted and executed at the district level. Generally the District Forester uses this type contract to sell small, low volume or low value tracts of timber. This contract may also be used to expedite the salvage and sale of timber removed as a result of a natural catastrophe; and for the removal and sale of non-timber forest projects where controls are necessary to ensure resource sustainability and that environmental concerns are satisfied.

A. The following guidelines must be followed for District Forest Products Sale Contracts.

1. Contract Limits
   - $10,000 limit
   - $20,000 limit for salvage or right-of-way timber

2. Silvicultural Treatments

Silviculture treatments (overstory removal, shelterwood, improvement etc.) are restricted to 20 acres. Any treatment greater than 20 acres will require a standard proposal through the FMT-7 sale process. Silviculture treatments smaller than 20 acres, still require a written proposal and stand analysis, but may be approved by the district forester, with a copy going to the Silviculture Section.

3. Salvage Timber

A stand analysis is not required for a District Forest Products Sale for the salvage of dead timber only, unless the treatment changes the stand typing. In all other salvage treatments (salvage improvement, salvage shelterwood, etc.) a complete stand analysis and stand treatment proposal must be submitted either to the District Forester or the Silv. Section Chief, depending on the criteria stated in section 1 and 2 above.

B. Bid Requirements

1. FM-T-4 District Sale Contracts with estimated sale value of $3,000 or more. Sealed bids are required unless approval is received from the Silviculture Section to negotiate the contract.

2. FM-T-4 District Sale Contracts with estimated sale value of less than $3000 but more than $1000. Sealed bids are not required, however, the following procedure must be followed:
   - The District Forester must make a verbal or written attempt to solicit bids from at least three prospective buyers.
   - Bids for District FM-T-4 sales will be opened at the district offices. Bids may be mailed or hand delivered. Bidders are responsible to see that bids are delivered on time regardless of the delivery system they choose.
   - All prospective bidders contacted must be recorded on the District Sale Bid Results (FM-T-13) form.
   - The original copy of the completed District Sale Bid Results (FM-T-13) form must be placed in the sale folder. A copy of this form must be sent to the Silviculture Section.

3. FM-T-4 District Sale Contracts with estimated sale value of less than $1000 may be sold for not less than fair market value. Fair market value should be determined by the District Forester based on bids for sales of similar types of timber.

C. A prospectus for all must FM-T-4 District Sale Contracts be developed and provided to prospective bidders.

D. Bidders must be provided an opportunity to tour the sale areas. The District Forester has the option to set tour dates and times or schedule them by appointment only. Tour information should be listed in the prospectus. The tour date should be scheduled at least 5 working days before bid opening.

E. The Soil Erosion and Sedimentation Control Plan for the project must be attached to and made a part of the contract. The buyer must post the plan on-site during harvest operations.

F. Contracts shall be issued in ascending numerical order in the following format: "District Number"-"Year" "DF" "Contract Number" (i.e., 21-2003DF01). Starting with Contract Number 01 at the beginning of each calendar year.

G. All products will be designated, cruised, marked and/or tallied in accordance with established guidelines.

H. Only estimated net volume should be recorded on the prospectus and contract.

I. Contract

1. The standard District Timber Forest Products Sale Contract (FM-T-4) form must be used. See: (http://intraforestry/silviculture/silv_manual.aspx).

2. It is important to ensure that the volumes list on the prospectus and the bid prices are accurately listed.

3. When appropriate the following supporting documents are attached to and are included in and made a part of the contract:

   a) Map. A sketch map that includes standard legend symbols.

   b) Erosion and sediment control plan. (http://intraforestry/silviculture/silv_manual.aspx)

   c) Non-discrimination clause. (http://intraforestry/silviculture/silv_manual.aspx)

   d) Contractor integrity provisions. (http://intraforestry/silviculture/silv_manual.aspx)

e) Specifications and sketches for haul roads, skid roads and skid trails.

4. Three copies of the Forest Products Sale Contract (FM-T-4) must be forwarded to the buyer for execution. The buyer must sign all three copies and return them to the District Forester with his performance deposit.

5. If the buyer provides a cash performance deposit, the District Forester should transmit the payment to the comptroller. The district must forward the transmittal or surety and three copies of the contract to the Silviculture Section for legal review

6. The Silviculture Section will forward the contract to the chief counsel's office for review. Once the contract and surety passes legal review the Silviculture Section will return all three copies of the contract to the district for execution.

7. The District Forester may not sign the contract until the contract is reviewed by the Chief Council.

8. The district should collect all payment associated with the sale from the buyer.

9. The following must be in the possession of the district before operations begin.

a) The fully executed contract.

b) The performance deposit

c) Initial or lump sum stumpage payment.

10. The following procedures should be followed when submitting the paperwork to the Silviculture Section.

a) Upon execution, after Chief Counsel approval and the District Forester has signed the FM-T-4; a copy of the permit should be forwarded to the Silviculture Section.

b) Only the sale map should be attached to the Permit. The Silviculture Section does not need any other attachments or exhibits.

c) **Hold all invoices until payment is made. When payment is made, send only the invoice with the revenue transmittal stapled to the invoice. Send the invoice (with transmittal attached) only once.**

11. Extensions

a) The District Forester may extend the contract for up to ninety days without prior approval from the Silviculture Section Chief. The Silviculture Section Chief must approve extensions beyond the ninety-day limit.

b) If the contract was suspended for reasons other than non-compliance, a free extension may be granted for the length of time that the contract was suspended.

c) Paid extensions may be granted upon written request from the contractor. Costs for extension are calculated in the same way as in a FM-T-7 contract. Payment in full is required for each extension.

12. Terminations

a) The forest district must notify the contractor in writing that the sale is terminated. A copy of this letter should be forwarded to the Silviculture Section.

b) If a cash performance bond was required the district should return it to the contractor as an enclosure with the termination letter.

c) The District Forester must notify the Silviculture Section in writing along with a request to return the performance deposit.

CHAPTER VIII
SALE ADMINISTRATION

I. General Information and Guidance

Timber sale administration is one of the most important aspects of a forester's skill sets. When it comes to silviculture, it is where ideas intersect with action. Good administration is the key into translating those ideas into a satisfactory outcome.

Few people are naturals when it comes to sale administration. Many have to work at it since most foresters are introverted by nature. Many also focus on the technical aspect of the job, missing the larger point that people skills and good people management are far more important and clutch to getting a good job done. Below are some hints in assisting with good sale administration.

A. Objectives of good administration

The most important objective of sale administration is carrying out silvicultural treatments in a way that is environmentally sensitive. Maximum protection must be given to soil, water, and the residual stand, to insure their viability for the future. You must do this in a way that is practical under existing operating conditions, equipment limitations, policies and procedures.

The timber sale contract is only the back bone for good sale administration. The majority of good administration must be accomplished through technical knowledge and people skills. Both of which only become honed through practice, experience and training. It must be understood that mistakes will be made along the way, but mistakes applied in a positive manner as a learning experience, only aid in better future judgment. Most good sale administration must be learned on your own, and tailored to a style that befits yourself.

The timber sale contract is a legal binding document. The Bureau of Forestry expects and must have compliance with in the scope of the contract. The requirements of the contract must be fulfilled and duly executed by the operator. The forester must remain objective and impartial in seeing to this. The contract can not anticipate every situation that may arise, and on very often flexibility will be called for with in the parameters of the contract. On occasion good administration may require going beyond the scope of the contract. This is why good cooperation between operator and forester must be maintained.

B. Cooperation versus police power

Efforts to induce compliance are far more effective through education and cooperation than through the authority of the contract and our position. Foresters are most effective as advisors, trainers, and persuaders, done in a friendly manner. What has been the back bone of the Bureau of Forestry's timber sale program is the trust and cooperation that exists between Bureau staff and timber sale operators. Through repeated sales and

operations: they will get to know you just as you will get to know them. A good reputation on how you treat people, and if they can trust you, will often go a long way to helping in administrative matters.

The contract does have “teeth’ in it to back up the forester in obtaining compliance. However it should be used as a last ditch effort, only after cooperation and education have failed to do the same. It must also be kept in mind that if you exercise police power it comes with a cost and a breach of the working cooperation that may exist between you and the operator. That is not to say it shouldn’t be used when necessary, but rather that is shouldn’t be used unnecessarily and only be done after efforts of cooperation and education have failed to remedy the situation. The sad reality is that it is the only option after efforts of cooperation and education have failed to remedy the situation.

In short, do not show up with the arrogant air of authority but rather with a genuine desire to help the operator carry out their responsibilities. People recognize when someone is on their side and there to help, and usually will reciprocate that good will in their own actions. Listen with empathy to what the operator has to say, even if they feel the need to just vent some frustration. This will go a long way to establishing cooperation and personal relationship with the operator.

C. How to encourage cooperation

Getting cooperation of Buyers and their crews begins with getting their respect. This is something that is earned gradually and cannot be taken for granted. Below are some good human relations to follow when dealing with operators.

1. Be sincerely interested and sympathetic with the operator’s problems, learn and discuss his problems. Learn to put yourself in his or her shoes and see it from their viewpoint. In discussing their problems you will often find opportunities with in the conversation to make a few of your concerns or problems known from your point of view.

2. Avoid passing the buck to your supervisor. If you convey the impression that you do not know or believe in the Department’s policies or requirements and do not know the reason for them, the operator is less likely to comply with them as well. You need to know what must be done and why.

3. Recognize the limitations of the operator, their crew, their equipment and the weather. Work that is impossible to do under the circumstances should not be requested to be done. The job requested will not be accomplished, and will set precedence for non-compliance and result of loss of respect for you. An operator may offer many reasons for not completing a job. You must learn to decipher which reasons are legitimate and which are merely excuses when it comes to not being able to complete a task.

   Related to this is the possible increase in damage to the environment from requiring an operator to do a poor job over again or to do an overlooked job under bad weather conditions. For example in road construction: if an operator has been allowed to build a road off the planned route, weigh the factors

involved. They may indicate a willingness to live with a mistake rather than to fix it. Guard against operators that may take advantage of that situation which may appear to be an "accident' but in reality was done by design.

This is why follow up instructions to operators are very important. The operator may have the best of intentions, but instructions may not have been clear to everyone on the crew. The operator may have to deal with breakdowns in equipment of personal problems. Do not automatically assume that the operator has no problems with equipment or personnel. Sometimes their subordinates are not very dedicated to their work or very reliable.

Your responsibility as a forester does not end by merely giving instructions or passing information to the operator. This responsibility ends only when the job has been completed on the ground. Frequent inspections while work is progressing to catch problems while they may still be fixable are necessary. And do not assume a job is done, until you have inspected it on the ground and found it satisfactory.

4. Be careful in being accusatory towards an operator when things do not go as planned. There may be extenuating circumstances that may absolve an operator. Even if you are certain of an operator's negligence, be sure to offer them an "out". When possible present the operator an opportunity to remedy the situation. This does not mean a continued acceptance of malpractice or poor operations. The point instead is a friendly climate is generally more effective in promoting better work from the operator.

5. Consult the operator for advice. Do not assume you know the best of everything, because you don't. You may choose not to follow his advice, but he may be one of your best consultants on logging and road building problems. Generally people are more cooperative when you show respect for their judgment.

When an operator puts you on the spot with a question on what to do, it is not necessary to give an answer immediately. You may wish to pause to consider the issue from all sides and various alternatives before giving an answer. Bear in mind, the operator may have a satisfactory solution not apparent to you, so consider his point of view. However after consideration, you may decide that your course of action is best. Free and informal discussion and dialogue that helps him understand in whatever you decide, and why, is very important. Allow them to voice their concerns and ideas, and make your best judgment after listening and considering the best course of action. Yes, it is your decision ultimately, but you must achieve "buy in" form the operator that it is the best course of action. Many times, the solution is somewhere in the middle of the two, and you will be able to find common ground for both of you.

6. Method of approach is important. It is seldom wise to threaten an operator directly. This goes back to being excessively heavy handed and using police power to leverage the operator. Often there are two ways of making the same statement. You can say to an operator- "Do this or I will shut you down". Or you could say, "Well I sure hope we get this done. I'd hate to shut you down, I know you have money wrapped in this road and need the logs". That is two ways of saying the same thing, but the latter encourages cooperation as you are showing appreciation of their needs a well as the needs of fulfilling the contract.

You will be surprised how far a friendly smile will go even in the tensest situations. Usually a smile, with the statement of "tell me all about it" will go a long way to calming someone. It opens the channel to allow them to vent some of their frustration by explaining what's going wrong from their point of view. Above all, control your own temper and tongue. Cultivate the ability of saying "no" with a smile. As you become familiar with different operators you will learn different was to approach each. Some require sensitive planned approaches. Some may just want it straight forward and to the point. Other may appreciate a good ribbing or bantering, or a well timed joke to diffuse a situation and lighten the mood.

Also the method of approach may vary with each operator depending on the situation. A usual jovial operator, may not appreciate the same humor when things are going badly, equipment is broken down, or is having personnel issues. When an operator is on the verge of losing his or her temper, bringing up a sensitive matter may be best left for another time if it is at all possible. Emotions may become heated, and it may be best to break off the conversation altogether with the statement "I think its best if we both leave this be for now until we can approach this with cooler heads".

You are also different form everyone else. With experience you will learn what you're most effective ways to approach operators are. Above all, be sincere and be yourself in your approach. If you become aware of objectionable traits in yourself, work to change these. Study yourself as well as your associates to see what is effective and what is not.

7. Be firm, fair and impartial with all operators. A forester with a reputation for firmness will command more respect and cooperation than one who operators feel they can sway or take advantage of.

It is important to guard against emotions to be an effective administrator. Avoid feelings of indebtedness to any operator for special favors received. Do not let them influence you, remain impartial. Operators quickly suspect collusion or favoritism between the Department and a particular operator. Do not trade favors. Do not make decisions based on one's dislike for an operator or base it on a desire to spite or punish an operator. As much as it may be tempting sometimes, it will only lead to future trouble.

8. Never bluff or pretend you know more than you do. This kind of insincerity is transparent and will not be accepted. If you do not know the answer your only recourse is to admit "I don't know for sure" and then try to get back to the operator with an answer as quickly as possible. This kind of honesty will also help to build trust and respect. No one is born knowing everything. Even if you did at one time know the answer, there is much knowledge to retain and it is impossible to remember everything. Be forthcoming in your answers, and always, always be open and honest.

D. The importance of timing: Crucial times in the life of a sale

1. The first conference with the operator, plus their key subordinates, prior to any operations. This meeting is to insure the operator understands the sale requirements. The logging plan should be discussed. The haul road construction and what's required should be discussed. Contracts should be made available

and reviewed. Insist upon understanding of the contract requirements. Discuss the equipment to be used. With the current trend towards larger and more mechanized equipment, more care is required in navigating stands with high residual and good regeneration (See Appendix I - Pre-Work Conference Checklist).

2. Other crucial times in the life of a sale include the start of different phases of the operations. For instance, by the first or second day of clearing right-of-way timber you should be on the job checking and informing. Explanations of the marking rules in the office are rarely sufficient. Follow-up on the ground will get the loggers started off on the right foot. After the right-of way has been half felled and cleared, it is a little too late to fix anything that may be wrong. Require logging plans and approve changes to them. Check with truckers, crew leaders, equipment operators and other workers. Get to know everyone on the job.

3. Haul road construction is very critical. A poorly made road can be a hindrance through out the rest of the sale's life, and often beyond. Make sure you visit the site daily, if possible, to insure that road construction follows the plan. If things are not quite right, they are often easily fixed while the operator or excavator has their road building equipment present. Make sure any fill material is properly placed and that road grading, dips and any pipes are where they should be. It is not fair to ask an operator to move their equipment back on site, after construction has been completed, if you weren't there. Good road design is not enough; it must be executed as well. Good road plans carried out on the ground are often the difference in fair weather logging and all weather logging operations. A good road with good drainage will allow the latter.

4. During wet weather or seasonally high water table. When wet weather conditions are present, a pick up in site inspection frequency is necessary. You will want to catch any potential problems quickly. Look for poor drainage locations on haul road that may need to be fixed, and for any potential rutting, or excessive run off that may be starting to occur in the cutting blocks or skid trails. Also, look ahead of the cutting operation where you anticipate the crew to be moving towards. This may allow you to head off potential problems or move them to a drier portion of the cutting block. If necessary it may require temporary shut down of operations until drier conditions prevail. If you suspect or spot a problem, show it to the crew leader and work out a solution with them. Often people don't mind fixing small problems, it's when they have to shut down and take a day or two to fix big problems that the complaining starts. In addition, the environmental damage caused during excessive wet conditions can often be mitigated, but never completely undone. Stay on top of the site, and stay ahead of the weather!

E. Anticipation of problems

You can learn to minimize problems, by anticipating likely areas of trouble and remove negative factors before they cause a problem. For example, you might anticipate that a particular section of haul road may be lost

in wet weather if not carefully made. When critical work is to be done where you anticipate a problem may arise, it is important to be on hand to make sure that phase of the operation is done properly. Such as with the haul road, you should be on site to make sure proper drainage placement is made. If problems arise out of that phase of the operation (the road becomes soft during wet weather) and you were not there, then your administration has failed. Of course most things can be done over again, but there is a waste in time and money. In addition, any damage done to the site may be mitigated, but not undone.

You may anticipate that an operator may drag their feet on cutting the smaller sapling and poles in an overstory removal. Here you should be certain to detail the job required and press for early compliance. It is very important to tell all prospective bidders at the time of the tour what will be required of them, especially out of pocket expenses and any new changes in policy that will be reflected in the sale contract. You will also have to be on your toes to anticipate problems that arise from change in personnel, equipment breakdown, changes in weather and changes in market conditions.

F. Efficient use of time.

The demands for a timber management forester on a busy district frequently appear to be more than they can supply. You will have to plan to use your time and take advantage of systems that permit efficiency.

1. Where possible do more than one job, or visit more than one sale to make better use of travel time.

2. Plan what you have to do on each inspection. It is so easy to ride out to a sale, stand around and talk with the operators and do nothing.

3. Do not spread you time too thin. Make each inspection count. There is a tendency for a forester with many active sales, to spend too little time on each one. This results in more frequent, yet less efficient trips. Make sure you take the time to cover all items that may need attention.

4. Make copious notes and check lists. There are so many details to keep track of, that you can easily overlook some. Use brief, simplified notes from the more important aspects of the contracts.

5. Gain the habit of being curious and observant. You will pick up information easily passed by. Some of this will affect the planning of later trips. Jot down notes for the sale folder concerning progress of sale and cost data.

6. Do not do the operators supervisory work for them. Some contractors will encourage frequent inspections of work in progress by the forester and try to use them in a foreman capacity. Thus you can be put on the spot frequently with respect to details and the operator does no better job than absolutely necessary. Also, if

later defects show up, the operator may pass the buck to the forester. A certain amount of strategic training of the contractor and his crew is good practice. Effort here, may pay off in better work in the future.

II. SFI Requirements

A. On-site crew leaders for all logging crews working on any state forest sale must be trained under the Pennsylvania Sustainable Forestry Initiative. Information relating to this training may be found on the internet at www.sfiopa.org. Each crew leader operating on the sale must present a valid PA SFI Core Level Training card as proof of training to the District Forester prior to beginning logging operations on any sale. Comparable training from other states may be accepted in lieu of Pennsylvania Sustainable Forestry Initiative training.

B. Enforcement of the SFI requirements will be done at the time contract signing. The contractor must return the contract to the district office, with a list of who will be the crew leader for the job and each block. There is an attached sheet to every contract cover letter for this purpose. They should also present a photo copy of the training card. The crew leader page should be copied and returned with the signed contracts to the Silvicuture Section for processing. If no crew leader is available to the contractor, the district should contact the Silviculture Section to discuss solutions.

C. The SFI leader must be present on the job at least 50% of the time. It is not enough to have the truck driver serve as crew leader, or another person who will show up once every few days. The SFI crew leader must be on site to ensure SFI requirements are fulfilled.

III. Beginning Logging Operations

A. Buyer may not commence logging operations or road construction, nor may they occupy State Forest Land relative to operating the timber sale until the contract has been fully executed by the Department.

B. When forwarding the executed contract to the Buyer, it is requested that they notify the District Forester prior to the start of any logging operations. The period of notification should be reasonable to allow the District Forester to have the administering forester present for road construction, landing clearing, or when actual logging operations begin. The practice will permit the forester to make sure the Buyer or crew leader understands the location of haul roads and specifications, understands sale boundaries, block boundaries, State Forest Boundaries, cutting block boundaries, cutting block operational procedures, all locations of landings, damage payments, garbage disposal, forest fire prevention and control requirements and environmental protection , etc. A **Pre-Work Conference Worksheet** has been developed to help the administering forester with a checklist for this meeting (See Appendix I - Pre-Work Conference Checklist).

C. The construction and improvement of all haul roads must be completed to the satisfaction of the forester or District Forester, prior to beginning logging operations. Exceptions to this may be where two haul roads are to be constructed in different areas of the sale, and the district forester may choose to waive in writing this requirement with specific conditions attached. All haul road and right of way timber must be paid for prior to beginning road construction operations.

D. If desirable the District Forester may require the Buyer to furnish a plan of operation. The plan could set forth a time schedule, order of cutting blocks, the equipment to be used or any other information the District Forester may so desire.

E. The Silviculture Section will be notified by letter when haul road construction begins.

IV. Payment and Operation Procedures

A. No trees may be felled until they have been properly marked for cutting or are designated for cutting and paid for as a condition of the Timber Sale Contract. When the Department has authorized payment by cutting blocks, each block must be paid for in full before cutting may begin in that block.

B. Before the Buyer may begin logging operations in a cutting block, permission is writing must be given in writing by the District Forester. This is usually, and sufficiently accomplished by sending the FMT-21 tracking form to the buyer acknowledging payment, and noted that operations may begin in that block at the bottom of the form.

C. Should the Buyer begin logging operations in a block for which payment was not received by the District Forester, operations on the sale should be immediately suspended until the cutting block has been paid for in full. Also at this time, the department may require immediate payment for all unpaid blocks included in the sale.

D. If lump sum payment is required, or the Buyer elects to make a lump some payment, a sale must still be operated one block at a time.

E. A District Forester may grant the Buyer permission to operate in more than one block at a time, when in their judgment it is desirable to do so. These blocks then must be paid in full before operations may begin in each block.

F. Only one logging crew at time may operate in a block, unless it is waived in writing by the District Forester.

G. No more than one buyer shall operate on a haul road at one time, unless approved in writing by the District Forester.

H. The last block paid for on a timber sale, must be paid for with a certified, cashiers or treasurers official check or some other form of non-stoppable payment.

V. Sale Inspections and Record Keeping

A. The sale inspection phase is one of the most critical phases of good silviculture. Good, thorough inspections are a necessity if a stand is to receive the prescribed treatment. Proper inspections keep minor problems from becoming major problems which usually result in lost time and money on the part of the operator and loss of confidence in and respect for the forester administering the sale.

B. The District Forester is responsible for the conduct of the timber sale contract program in their respective district. A major part of this is the responsibility to obtain compliance with the terms and conditions of the contract. A District Forester or their staff represents them to the Buyer and operators as he or she inspects and administers after timber sales.

C. Contracts should be inspected only by a forester except during emergencies when the forester assigned to the sale and other staff foresters of the district are unavailable. At that point, the District Forester may assign a Forest Technician to make inspections, except initial and final sale inspections, provided the technician has had enough timber sale experience to make good judgments.

D. It is important that only one forester be assigned to inspect and otherwise be responsible for the conduct of a timber sale. An exception would be when a forester will be absent from the district for any extent of time for any reason. At that point, another forester should be assigned to oversee the sale until the original forester's return, or until sale completion; whichever comes first. It is desirable for one forester to responsible for a sale beginning with initial layout, through to termination.

E. The Forester must deal only with the Buyer of the Sale, or the Buyer's representative who is responsible for the sale, and acting with the Buyer's authority.

F. Periodic inspections of an operating timber sale must be made by the forester to whom it has been assigned. Inspections are to be made at irregular intervals and not more than week apart. When deemed necessary more frequent inspections are to be made. Do not get in the habit of showing up every Tuesday for sale inspection. Make the days different and the time different so the Buyer will come to expect that you may show up at anytime.

G. The following items should be carried with a forester during sale inspections:

1. Field copy of the sale contract.

2. Original and one copy of the FMT-9: "Contract Timber Sale Inspection and Completion Report."

3. Red and blue paint for marking damaged trees, plus a tally sheet or notebook.

4. Flagging to mark locations of where work may be necessary.

H. A record of the inspection is kept on the FMT-9. Items inspected are checked on the front and actions taken to correct unsatisfactory conditions are entered on the back at the time of inspection. A original and one copy of this form is maintained with original going to the Silviculture Section when the sale is closed and the copy being made a permanent part of the sale folder.

I. When unsatisfactory conditions are found on an inspection, they should either be corrected immediately or pointed out to the individual in charge and a deadline established for completion. In either event, the Buyer responsible for the sale is notified in writing and a copy of the letter sent to the Silviculture Section.

J. Should Buyer fail to correct all unsatisfactory conditions by the deadline date the District Forester or their representative shall:

1. Notify the Buyer by certified mail, with return receipt requested, that operations on the sale area have been suspended.

2. Set a new deadline for correction of unsatisfactory conditions.

3. Inform the Buyer that if all unsatisfactory conditions are not eliminated by the new deadline date, the matter will be referred to the Silviculture Section, which could result in the termination of the sale, appropriation of the performance bond, and the ineligibility of the Buyer to purchase future State Forest timber sales.

4. Forward a copy of the letter to the Silviculture Section

5. Reinstate operations on the sale after all unsatisfactory conditions have been corrected and approval obtained from the District Forester.

6. Refer the matter to the Silviculture Section for final action if the Buyer fails to correct all unsatisfactory conditions by the new deadline date.

K. The Silviculture Section must be furnished with copies of all correspondence originating from the District relative to the operations of administration on a timber sale. All correspondence between the Buyer and the District should also be kept as a permanent part of the sale folder.

VI. A Word on Safety

A. Personal Protection Equipment or PPE: The importance of safety can not be stressed enough. The Buyer, their employees and sub-contractors are required to perform all logging operations in a safe manner as required by applicable laws and regulations. The Department expects the Buyer to ensure that logging crewmembers dress in protective attire, and perform their duties with equipment, in accordance with standards established by the logging industry and the Occupational Safety and Health Administration (OSHA). The forester should check to insure that approved protective chaps or pants, hard hats, eye protection and ear protection are worn when crew members are working with chainsaws. Failure to do so is considered a breach of contract. This should be handled as in Section V. if it is found that any of the logging crewmembers is not wearing the proper attire.

B. The Reservation of Snags: The reservation of dead snags is in direct contradiction to OSHA regulations that require all loggers to remove all dead and hazard tree within two tree lengths of the active logging location. There for, the Forester shall allow the Buyer to determine which dead trees are deemed hazardous or unsafe. These trees may be cut, but to discourage the practice of cutting them for extra volume, all reserved dead snags cut for safety reasons should remain on site as property of the Commonwealth and the Department.

VII. File Management of FM-T-7 Sales

All sale folders shall have the name and/or number of the form enclosed and the file in which it is located typed on the tab or format of the folder. In those folders where the forms are kept by years, they should be placed in numerical order by year and sale number. These folders should be kept in the district office as a permanent record of sale information. The folders which require more information to properly prepare are as follows:

A. A separate folder is set up for each contract sale at the time it is proposed. This folder is to contain all correspondence and material relative to the sale as it progresses from a proposed sale to its termination.

B. When a timber sale is set up, the sale number and location are written on the folder tab. When the fully executed contract is returned to the Buyer, a file label is prepared which shows the sale number, contract number, name and address of Buyer, location of sale and the effective and termination dates of the sale. This label is attached to the folder tab.

C. Information and correspondence are attached to each side of the folder. The right side of the folder should contain the following in chronological order:

1. All maps included in the sale proposal.

2. Timber Stand Analysis for all stands involved.

3. Correspondence with water companies, gas companies, trail clubs, State Parks, adjoining land owners, etc., if any are involved in sale area.

4. Copies of all information submitted in the proposal to the Silviculture Section, including the written proposal.

5. All approvals from the Silviculture Section Chief, PNDI clearances, and any other approvals.

6. Copy of ER-FM-T-5, 19 and 25 submitted to the Silviculture Section plus all attachments, permits, etc.

7. Prospectus and bid envelope.

8. Copies of bids.

9. Tabulation of bids.

10. Copy of ER-FM-T-6 if the sale was negotiated.

11. Copies of all correspondence in chronological order.

12. Copy of completed ER-FM-T-9.

D. The left side of the folder should contain the following in chronological order.

1. Executed contract.

2. Copy of the performance bond, with any extensions

3. Copies of all transmittals.

4. Copy of al ER-BF-16 invoices.

5. Copy of letter from Harrisburg Office terminating sale.

VIII. Closing Blocks

A. Logging operations, including clean up must be completed in one block before the Buyer may be permitted to begin in another logging operations in another block. The District Forester may modify this in writing when in his or her judgment it is desirable to do so. When a block is closed, the Buyer must be notified in writing.

B. A cutting block may be closed with the exception of haul roads, skid trails, and landings if they are to be used to operate other cutting blocks. These exceptions should be clearly stated in the letter closing out a cutting block, so that the buyer knows what they are responsible for on that block.

C. Terminated blocks on a sale may be reopened by written request of the Buyer to utilize residual logging debris, felled sawtimber, poletimber, culls and tops for firewood, which may have not been saleable when the blocks were initially cut. Only one block may be reopened at a time by written authorization from the District Forester. The Buyer of the timber sale will be responsible for any damage to residual trees, cleanup work, grading and maintenance to drainage structures on roads, skid trails and landings prior to block termination the second and final time. The Forester responsible for the sale must make inspections as with any other open block and terminate reopened blocks when all requirements have been met by the Buyer. The Forester should use a new FMT-9 for blocks which are to be reopened. At the top of the FMT-9 should be designated "Re-opened blocks."

IX. Residual Damage and Additional Trees to be Sold

When logging operations damage residual trees the forester administering the sale has the options of selling those trees to the Buyer at the adjusted species value for the sale. Skid and logging damage should be handled in the following manner.

A. When damage is considered reasonable: On all operations it is invariable that some damage will occur to the residual stand. The forester must have a threshold in his or her mind of what will be acceptable. This is will vary depending on the difficulty of the job, density of the residual stand, slope, time of year, and equipment being used. Damaged trees do not have to be sold, and may remain in place as long as they do not present a hazard, or affect aesthetics where ever they are a priority.

1. A tree may be considered damaged if excessive root exposure/breakage, stem damage or top damage has occurred. The Forester has the option of marking these trees and removing them from the stand by selling them to the Buyer. Root and top damage should be assessed on whether or not the tree will recover to be a healthy, productive tree for the future stand both as a seed source and a commodity. Bole damage can be assessed if large pieces of the back have been stripped off. A good rule of thumb is if the patch of the bark removed is larger than a square foot. Also, any tree tipped over and loose, knocked down, broke off, or rainbow-ed should always be removed from the stand unless sufficient good reason exists to leave them.

2. Damaged trees should be marked in red, tallied for volume and sold on a BF-16 timber invoice. The invoice should list the species and board-footage, and the price for which they were sold at. Timber invoices have two weeks to be paid. Invoices should be kept small and paid for before each block is closed out. The forester may choose to have the tree(s) removed prior to being paid for on the invoice, to take advantage of not having to move equipment on to a portion of the block twice.

3. If a forester starts to suspect that a Buyer may be intentionally hitting certain trees to acquire them through skid damage, they may choose to leave them. This will send the message that not all skinned or barked trees will be taken for damage. You may even wish to talk to the buyer ahead of time regarding certain superior trees and tell them to take extra precautions.

4. "Bumper Trees" may be necessary along skid trails where the residual stand density is high. By selecting trees to act as "bumpers" for other trees, you will reduce residual skid damage. The trees should remain in place along skid trails, and marked in red and selected in company with the crew leader or buyer so they know which trees they may use to turn on a skid or drag. These trees should then be removed when no more skidding will occur on that trail.

B. When Skid Damage becomes Excessive: When skid damage has crossed a threshold for acceptable, the Forester will have to immediately take action to correct the situation.

1. The first step should be to walk the site with the Buyer or crew leader and point out why the damage is Excessive in you mind. Allow the logger an opportunity to explain their side of it and seek a resolution. It may require shorter length on skidding, or suspending operations in a block until another season more conducive to logging. Often this verbal discussion will be enough, but follow it up in writing to the Buyer and reiterate what was discussed.

2. If excessive damage continues, another conference with the Buyer and any crew leader should be called on the site and again point out that the situation is unacceptable. Explain to the Buyer that if excessive damage continues, that damaged trees will be marked in blue, remain on the site and triple stumpage will be charged.

3. If two warnings have not been enough to cease excessive skid damage, then trees should be marked in blue and a BF-16 invoice should be drawn up and sent to the buyer similar to single stumpage skid damage. Note in a registered letter that sale operations are suspended until the damage is paid. Once paid, then logging operation may begin again on the sale.

4. If excessive skid damage continues beyond an invoice for triple stumpage, suspend operations on the sale and contact the Silviculture Section for discussion on a solution.

C. When Additional Trees are to be Marked Not Related to Skid Damage: Occasionally trees will die, blow over, or will need to be removed to widen haul roads and landings within an active sale. When this occurs the District Forester has the option of selling these trees to the buyer at the contract bid price for each species. If the value is less than $20,000 per sale, the District Forester may act on his own accord to sell the additional timber on a BF-16 invoice. If the value of the timber over the entire sale will exceed $20,000, then a letter should be sent to the Silviculture Section requesting permission to sell the additional timber. If the timber sold will significantly alter the

stand prescription, an addendum should be prepared to change the treatment code and included with the request to sell the additional timber. When timber to be removed will exceed $20,000 the District Forester may request additional time on the contract for the buyer to remove the volume. Any timber to be sold in this manner (not related to skid damage) must have the written consent of the Buyer to purchase it at the adjusted species price.

X. Suspension of Operations

A. Due to Conditions Caused by an Act of God.

1. This includes but is not limited to prolonged periods of bad weather under which sale operations would result in damage to infrastructure and the environment. Because the list of conditions which would qualify under this heading is numerous, each would be judged individually by the Silviculture Section. This will be done by the district writing a request to the Silviculture Section and requesting the time to be added to a contract and for what reasons. The Silviculture Section will review the request, make a determination and inform the district in writing as to the decision.

2. Generally, when a Buyer suspends operations voluntarily due to weather conditions, they will be ineligible for credit for the down time they experienced. If the Forester administering the sale decides to suspend operations to prevent environmental damage they will be eligible for a credit period with the written permission of the Silviculture Section. Time will be equal to the weather shut down period.

3. Such suspensions must be made and confirmed in writing as well as resumption of sale operations. Copies of both letters are sent to the Silviculture Section.

4. The Dates of these letters will be used in determining the credit period a Buyer will receive if a contract extension is requested.

B. Due to Non-compliance with the contract

1. Operations on a timber sale contract may be suspended immediately when a Buyer refuses to conduct their operations as required by the contract. This includes but not limited to any of the following: cutting blocks prior to payment, excessive skid damage, failure to correct haul road or skid trail problems, cutting timber not designated for sale, unapproved stream encroachments, etc.

2. The suspension is confirmed in writing, sent by registered letter to the buyer with a copy of the letter going to the Silviculture Section. The Silviculture Section is notified immediately by phone of the suspension. The Silviculture Section will take appropriate action resolving the matter up to and including bond seizer if it is necessary.

3. Operations may be reinstated on a sale by the District Forester with the approval of the Silviculture Section after unsatisfactory conditions have been corrected. Reinstatement should be granted and confirmed in writing with a copy of the letter going to the Silviculture Section.

C. Due to Improper Payment

1. When a check for stumpage is returned to the Department for insufficient funds, the District forester will immediately suspend all sale operations and notify the Silviculture Section.

2. The District Forester will notify the Buyer by certified mail, with receipt requested, of the situation and inform the Buyer that they must furnish to the District, by a certain date, with a certified, cashiers or treasurers official check or some other form of non-stoppable payment. A copy of this letter will be sent to the Silviculture Section.

3. Upon receipt of proper payment in the form of a certified, cashiers or treasurers' official check or some other form of non-stoppable payment, the District Forester may reinstate operations. This should be done in writing with a copy of the letter going to the Silviculture Section.

D. Due to Contract Expiration

1. Once a timber sale has expired all operations must be suspended on the sale.

2. The buyer may request an extension, provided they produce necessary payments, extend the coverage of the performance bond and the extension is signed by the Department.

3. Standard extension is 5% of the value of open blocks, per month. Whenever a buyer request an extension, any block that is not completed at that time must be included in the extension. Exceptions to this do occur due to poor market conditions, extenuating circumstances, and additional volume being added to the sale. These extensions will be reviewed on a case by case basis by the Silviculture Section to determine what, if any, the proper payment should be.

4. If the buyer fails to apply for an extension, the Buyer will be considered to be in default of the contract, and the matter should be forwarded to the Silviculture Section for further action.

E. Due to Alleged Illegal Action and/or Timber Theft

1. It is sad to state, but illegal action does occur from time to time on timber sales. When illegal action and/or timber theft is suspected on the part of the Buyer, an investigation into the matter should be done more

thoroughly. If it is necessary to protect any evidence during an investigation, the sale should be suspended and the buyer informed by certified mail as to why. If investigation provides insufficient evidence to establish reasonable suspicion, operations should continue, and any days lost should be added to the end of the contract if necessary. If on the other hand, enough evidence exists to establish reasonable suspicion, operations should be immediately suspended if not done so already, until the operator is either proved guilty or exonerated. All correspondence to and form the buyer should be sent to the Silviculture Section

2. If the investigation produces enough just cause for the Department to believe the Buyer is guilty of illegal action, and its of a minor offense, the District Forester may choose to reinstate sale operations upon restitution or mitigation of the illegal action. A letter to the Buyer concerning the terms of reinstatement of operations will be sent with a copy sent to the Silviculture Section.

3. If the investigation produces enough just cause for the Department to believe the Buyer is guilty of illegal action, it's of a major offense, the Silviculture Section will present the matter to the Department's legal council for further review and guidance.

4. Any trees that were illegally removed should be accounted for in the following manner: Stumps diameters measured and DBH calculated according to Chart 1. The height is obtained from the average merchantable height of all trees of that species from that block's timber cruise. Volume is then obtained from the volume tables on intraforestry, silvicultural section, Form Class Volume Tables (http://intraforestry/silviculture/silviculture.aspx). There is no deduction for defect.

Chart 1

Diameter at Breast Height and Stump Diameter Relationship

Stump Diameter (inches)	**Softwoods**	**Hardwoods**	**Stump diameter (inches)**	**Softwoods**	**Hardwoods**
4.0	3	3	21.0	18	18
5.0	4	4	22.0	19	19
6.0	5	5	23.0	20	20
7.0	6	6	24.0	21	21
8.0	6	7	25.0	22	21
9.0	7	7	26.0	23	22
10.0	8	8	27.0	23	23
11.0	9	9	28.0	24	24
12.0	10	10	29.0	25	25
13.0	11	11	30.0	26	26
14.0	12	12	31.0	27	27
15.0	13	13	32.0	28	28
16.0	14	14	33.0	29	28
17.0	15	14	34.0	30	29
18.0	15	15	35.0	31	30
19.0	16	16	36.0	32	31
20.0	17	17			

Stump diameters were measured at 12" above ground level for sawtimber and 6" above ground level for smaller trees.

XI. Sale Termination

A. The Forester in charge of administering the sale is responsible for insuring that the Buyer has met all of the contract requirements. The Forester signifies this when he sign and submits the FMT-9 to the Silviculture Section.

B. The FMT-9 is to be used as a check list on the final sale inspection. All items are to be complete and all payments received in the proper form before the FMT-9 is signed and submitted to Harrisburg.

C. When a multi-block sale has been administered properly, the termination of a sale should occur with the closure of the last cutting block. Exceptions would be the retirement of haul roads, skid trails or landings which were left open in closed blocks to facilitate logging in other blocks.

D. If a contract is about to expire and cutting operations have been completed, but weather prohibits the proper retirement of haul roads, skid trails and landings, the original performance bond may be released and a smaller bond substituted with the approval of the Silviculture Section. The FMT-9 is not forwarded to the Silviculture Section at this time. The contract cannot be terminated and the smaller bond required for faithful performance returned to the Buyer until all work has been completed satisfactorily.

E. When the Forester in charge of the sale is satisfied that all the contract requirements have been met, they sign the FMT-9, has the District Forester sign the FMT-9, and forwards the original FMT-9 to the Silviculture Section with a cover letter recommending the contract be terminated and the performance bond returned to the Buyer.

CHAPTER IX
DEER EXCLOSURE GUIDELINES

I. Introduction

Browsing by white-tailed deer has continually been the main factor in the successful forest regeneration of quality hardwood stands. Deer exclosures have been widely used and are effective in increasing biodiversity and reducing regeneration failures caused by browsing. Although fences are not effective at excluding all deer, they can greatly increase regeneration success if used under the right conditions. To be effective fences need to be properly laid out, erected at the appropriate time, checked frequently and maintained. Two types of exclosures are currently being installed, high tensile electric (seven or eight strand) and 8-foot woven wire. Many factors must be considered when determining the type of fence to use.

High tensile electric fence is less expensive to install than woven wire, easier to dismantle and most of its components are reusable. This style fence requires more frequent checks, maintenance and vegetation control. The longer these fences remain up, the less effective they become. There are always some deer that will penetrate this style of fence. It is commonly used in the northern hardwood forest type where some deer can be beneficial in controlling fire cherry and other undesirables. It is also used in oak forest types occasionally when black gum is problem. Black gum sprouts are highly preferred and easily damaged by deer browsing. Where black gum is a major mid-story species, abundant sprouting is almost a sure thing following a harvest. Use of an electric fence will allow deer browsing to control the black gum sprouts without undue harm to the oak regeneration.

Woven wire fence is more effective at excluding deer for a longer period of time and usually requires less maintenance. This type of fence is more expensive to erect and more difficult to dismantle than electric fence. Most of the materials are not reusable. It is commonly used for areas that either fenced prior to final harvest or in the oak forest types, which require a longer regeneration cycle. It is also the preferred option in areas that are natural travel corridors such as saddles. These areas are usually very good sites and should be protect.

II. General Information

A. Justification & Prioritization

A deer exclosure should be considered if deer browsing is a problem, or expected to be a problem when the following results are expected: failure of the stand to successfully reproduce itself, elimination of species from the stand, and/or a reduction in species diversity. The proposed fenced area can be a fully stocked stand or an understocked stand that has experienced some natural mortality or natural disaster. It must have already received a silvicultural treatment or be scheduled for a silvicultural treatment designed to regenerate the stand. Areas that have already had the overstory removed should receive top priority. Areas that have received a shelterwood harvest should be given second priority. Understocked areas should be given third priority and fully stocked

areas that one wants to pre-fence should be given lowest priority. When budgetary constraints are an issue, site quality should also be taken into account with the better sites receiving top priority.

Fencing should not be done in conjunction with a fertilizer treatment. The fertilizer treatment is intended to advance the black cherry regeneration out of the deer's reach within one to two growing seasons eliminating the need for a fence.

Deer populations vary over time. Therefore, foresters should continually monitor the deer population and determine whether there is a continued need for deer exclosures.

B. Timing

Timing construction of deer exclosures after the overstory removal is very important. It can greatly affect the fences effectiveness and chances of successfully regenerating. For electric fences, if the stand has received a silvicultural reproduction treatment from spring to early fall the fence should be erected as soon after cutting as possible. Once the deer become accustomed to feeding on the newly cut area, it is much more difficult to keep them from entering the fence. This is especially true with an electric fence. If a contractor erects the fence, contract specifications should be written in such a way to ensure that the fence is completed within a specific time frame.

It is very important that the deer receive a good shock the first time they have contact with the fence. When this happens, they are less likely to attempt future penetrations. During late spring, summer and early fall, the energizer system output is at its highest and ground conditions are best for the deer to be fully grounded and receive the full impact of the electric charge. Frozen or snow covered surfaces prevent sufficient grounding reducing the full effects of the electric charge. For these reasons, electric fences should not be constructed from November through mid-March, or any time when the ground is frozen or snow covered. High tensile electric fence (7 or 8 strand) should not be considered in areas where maintenance and deer penetration problems are a concern or in areas where it is anticipated that the fence will be up longer than 5 years. An 8-foot woven wire fence is recommended for fences that will be in place longer than 5 years.

Woven wire deer exclosures should be erected as quickly as possible following the overstory removal, but it is not as important as an electric deer fence. The fence should, however, be erected before the next growing season following harvesting. This protects any new sprouts from browsing.

C. Layout and Planning

Planning for the fence should begin when the reproduction treatment is proposed. Good planning will reduce the amount of maintenance required, the number of years the fence will be in place and reduce costs for construction and removal. All of these will increase the chance of success.

Whenever possible, keep fences at least one tree-length away from the treatment boundary. There is an increased chance of blow down at the edge of harvests. If the area has not yet received the final removal cut this

should be taken into account. You must make sure that all the trees inside the fence that you want cut can be felled without destroying the fence.

Avoid natural features like rock outcroppings, steep slopes and wet areas. These areas create problems that increase installation costs and make them more difficult to erect.

Keep the fence straight with as few corners as possible. Allow the fence contractor to deviate from the proposed fence line if there is a good reason to do so. When a change in direction is necessary an attempt should be made to round the corners. This will help increase the effectiveness of the fence, allow for ease of removal and reduce costs. Avoid inside corners and indented areas. Deer are more likely to penetrate fences at these locations.

D. Construction

Any dead, dying, or potentially damaging tree that has the potential to fall across the fence line should be felled prior to any wire being strung. These trees are known as hazard trees. Someone should walk the fence perimeter and mark the hazard trees for the contractor. Make sure that all the hazard trees have been cut prior to allowing the contractor to proceed. During logging operations potential hazard trees should be removed at least one tree-length from the fence line. All tops and logging debris should be moved back at least 10 feet from the fence line. This will reduce construction and maintenance costs.

Walk-thru type gates should be installed to provide access (See Appendix II). Walk-thru gates should be located at any well-used or logical access or exit point of the fence. They must be a maximum of 4000 feet apart. Walk-thru gates may also be painted with bright colors for easier visibility. Signs should also be put up around the fence indicating the location of the walk-thru gates.

Vehicle gates should be erected only if there is a need to pass through the fence for other state forest activities or if there is a need to enter the fence to remove the overstory (See Appendix II). The standard vehicle gate should be 16 feet in width. These gates should be locked with a chain to ensure that someone doesn't open them and leave them open.

After the fence is completed, someone needs to measure the fence with a hip chain by walking the perimeter of the fence. If the contractor does not agree with the measurement, check the accuracy of the hip chain by measuring a known distance. This can be done easily on woven wire fences by measuring between the splices on rolls of wire on the fence. One roll of wire is approximately 330 feet long. For electric fences measure some distance with your loggers tape and compare with the hip chain. If the hip chain is accurate, measure the fence again and go with the average of the two measurements.

If the contractor agrees with your initial measurement, there is no need to measure the fence a second time.

E. Maintenance

Before installing any fence, a commitment must be made to provide experienced manpower for periodical inspections and maintenance after the installation of each fence. Available manpower must be considered to

ensure proper maintenance. Do not install any more fences than the available labor force can maintain. During times of severe weather, heavy damage can occur. This situation requires help from a "back-up" work force to quickly ensure that all fences are performing properly. This should be done within a few days of the event.

A planned maintenance schedule is essential to the effectiveness of the fence. Your fence maintenance personnel should be divided in teams of two. This will create a safer work environment. Maintenance repairs can also be completed a lot quicker because there will not be a need to call for help when more than one person is needed to complete the job. If the district has more than one fence team, the fences should be split and divided among the teams.

A fence maintenance list should be developed listing when the last time a fence was walked and checked. It should also include a priority list of which fences to check first in case of a bad weather event. The maintenance personnel can set priorities on what fences to check first. One factor that should be considered when prioritizing is how long the fence has been up. A fence that has been up 4 or 5 years and is soon ready to come down would take a lower priority than a new fence. Some fences will have a historic pattern of problems. These fences should receive high priority. Some areas may have wet soils and be prone to wind throw. All these plus other knowledge of the maintenance personnel should be used to develop the priority list.

F. Miscellaneous

When fencing in road buffer areas, aesthetics should always be considered. The public may only accept a certain amount fencing along the road. This level of acceptance will vary from district to district depending on the forest users and their interests.

When a trail is affected in the layout of the fence all user groups should be notified. The district should work with the user groups to resolve any conflicts. Keeping these groups involved will not only educate them more about our programs, but it will positively affect our public image.

Informational and directional signs should be placed near any road entrances, near human entrances, and around the perimeter of the fence. There are several standard signs that the bureau provides to district for this purpose. Some of these signs involve location of walk-thru gates, explanation of why the fence was erected, and danger signs for the electric fences (See Appendix III). It can also be helpful to place a map of the fenced area at several locations around the fence showing that exact location in reference to the fence.

By law, the contractor must have an Erosion and Sedimentation Control Plan on site at all times. A general plan should be provided to the contractor along with the contract. For any special situations, the district should write an E & S plan and provide it to the contractor to attach to the general plan. Any seeding the district requires should be done with seed approved by the District Forester.

III. Woven Wire Deer Exclosures

A. Size and Shape

Both the size and shape of woven wire fences is important. Fences should be as square as possible. Long narrow fences can have penetration problems and they are more costly to install. Long narrow fences have a greater chance of disrupting main travel areas for the deer. If a main travel area is disrupted, deer will probably only walk so far around a fence before trying to penetrate it. The combination of a long narrow fence and the disruption of a main travel area can cause penetration issues. In the situation of a long narrow fence, the fence should be divided and a wildlife travel lane should be left between fences.

The size of the fence is also very important in its effectiveness. As stated earlier, woven wire fences are more effective than electric fences, but large woven wire fences can still have penetration problems. Woven wire fences should not exceed 70 acres normally. If the area is fairly square and slightly larger than 70 acres there should be no problem. If the area is considerably larger than 70 acres a wildlife travel lane should be left between fences.

Wildlife travel lanes should be a minimum of two chains in width. Deer prefer to travel around fence boundaries.

B. Construction

Woven wire fences are constructed by attaching two 47-inch sections of woven wire fencing material together creating a fence almost 8-feet in height. Some fences have been built using a solid 8-foot piece of woven wire. This is a more expensive option and is not recommended. Fence material should be galvanized steel wire. Aluminum wire is not authorized due to the potential for damage by porcupines. Fence material should have no more than 6 inches between stay wires, and at least 10 graduated line wires. Top and bottom wires should be 12 ½ gauge and stay wires 14 ½ gauge.

The completed fence should be at least 7 feet high. The weakest point of these woven wire fences is in the center of the fence where the two sections of fence are connected together with hog rings. Erecting the fence in the following manner will help to create a stronger fence, reducing deer penetration and maintenance costs. The fence line should be cleared as flat and level as possible. When possible the fence line should be cleared wide enough that a four-wheeler can be driven around the fence. This will help in getting materials to areas where maintenance is required. The bottom of the fence should be kept as tight to the ground as possible. The bottom of the fence should not be cut when going around anchor trees. This will ensure the bottom of the fence stays tight. The first 4” x 6” square on both sections of fence should be overlapped in the center of the fence. Then the hog rings should be alternated from top to bottom of the overlap for more strength (See Appendix II). If you are concerned about deer penetrating the bottom of the fence some dirt can be rolled up against the bottom of the fence or short sections of log can be laid in any openings between the fence and the ground. This approach will create a stronger fence that is well over 7 feet tall.

A 2” x 4” stud should be attached to anchor trees to protect them. The 2” x 4” studs should be attached to the tree with galvanized nails. The topping of anchor trees is discouraged. One and a half inch galvanized steel staples should be used to fasten the fence to the 2” x 4” stud. Line posts are required if anchor trees are not available. Post material should be 4” X 4” or 4” round treated or locust wood or steel posts weighing 2 lbs/ft.

Line posts should be at least 10' long and placed at least 2 feet in the ground. If the contractor is willing, the use of line posts should be encouraged even if there are anchor trees available. This will allow the fence line to be kept in a straighter line, which will make installation and dismantling of the fence easier. It also reduces damage to trees caused by nails. Corner posts should be at least 6"x 6" or 5" round treated or locust wood at least 12 feet long and placed 36 inches in the ground.

An adequate number of district personnel should be used along with the fence contractors work crew to drive out any deer that are inside the fence prior to allowing the contractor to close the fence. There is no need to complete the deer drive if there are not enough people to achieve the desired results. It is better to make the contractor wait to close the fence until you can get the needed personnel. Keep the following statement in mind. If you don't get 1 deer out of a 20-acre fence, it is equivalent to having the pressure of 32 deer per square mile on the regeneration in that fence. If all the deer are not driven from the fence, it is possible that it may be detrimental to the site.

A section of the fence at least 500 – 1000 feet long should be left open for the drive deer. Most of the time, no deer are inside the fenced area, but this process **must** still be completed.

The standard contract specifications for woven wire fencing are included in Appendix II.

C. Maintenance

Woven wire fences should be walked at least once a month or after a weather event. If a weather event occurs that has the potential for serious damage, other district personnel should be mobilized to help with the maintenance issues. This could include other district maintenance personnel, forest technicians, or foresters. It is very important with woven wire fences to find maintenance issues before deer find them or you will have fence with deer inside it.

If deer do happen to get inside a woven wire fence, all-practical methods should be used get the deer out of the fence unless the fence is slated for take down. First, a section of the fence should be opened up and an adequate number of district personnel should attempt to drive the deer out of the fence. If this fails and it is near hunting season an attempt should be made to notify hunters that there are deer in the fence. If after hunting season and there are still deer inside the fence, a deer depredation permit can be applied for from the PA Game Commission. If possible any deer removed from a fence should be donated to 'Hunters Sharing the Harvest' or a similar organization. The best time to try to remove deer from the fence with a deer depredation permit is following a fresh snowfall. This makes tracking the deer a lot easier.

See Appendix II for a list of maintenance tools and materials that should be kept with the fence maintenance personnel at all times. Appendix II also contains a list of helpful maintenance hints.

IV. High Tensile Electric Deer Exclosures

A. Size and Shape

The size and shape are extremely important to the effectiveness of electric deer fences. As state earlier in this document, this style of fences is less effective than woven wire. Therefore, large and/or long and narrow fences will not be very effective at deterring deer.

The size of an electric fence should be kept to 50 acres or less. If the area is larger than 50 acres or exceptionally long and narrow, the fence should be divided and a wildlife travel lane left between fences. If an area that is divided into two fences, both fences may be powered by one energizer. In areas where there is extremely high deer pressure a smaller fence will be more effective. In areas with an extremely high deer pressure or are fairly large, a woven wire fence should be considered.

The wildlife travel lane should be a minimum of two chains in width. Deer prefer to travel around fence boundaries.

B. Construction

High tensile electric deer fences are constructed using 14 gauge galvanized high tensile steel wire. The charging system should be 120-volt AC or a 12-volt DC. Seven or eight-strand wire can be used depending on preference and conditions. Wire spacing is described in the standard contract specifications for high tensile electric fencing in Appendix III. Fence voltage must be 6000 volts or higher.

The fence line should be cleared wide enough that plants will not encroach on the fence. Although some vegetative management along the fence line will still need to be done, this will help to reduce fence line maintenance until the vegetation becomes reestablished.

Two-inch by two-inch pressure treated stickers with insulators should be used to attach the fence to anchor trees (See Appendix III). These stickers can be attached to the anchor trees using galvanized nails.

The same style walk-thru gates used on woven wire fences may be used on electric fences. A small section of the fence around the walk-thru gates should be constructed of woven wire (See Appendix III). Power for the electric fence can be carried from one side of the walk-thru gate to the other by overhead insulated wire.

The following is some information on the electronics of the fence:

1. Energizers

Fences can be operated using a 120-Volt AC system or a 12-Volt DC system. The cost of a 120-volt system is higher than the 12-volt DC system. If an electrical service is nearby it may be worth the extra cost, because this system is more reliable and maintains consistently higher voltages. If electrical service is pursued consider placing it where it can be used for future fences. Specifications and diagrams for setting up a 120-volt system are described in Appendix III. Protection must be installed to reduce potential damage to the energizer during power surge events or lightning strikes. Consider installing surge suppressers on the

breaker panel and energizer. The recommended 120-volt energizer that has a minimum stored energy rating of 6 Joules or higher (e.g., Kencove K-6 or Gallagher M800).

The 12-volt energizer system is the only option for most areas because of the lack of commercial power. A 12-volt deep cycle marine battery is required to power the energizer. Fences with a perimeter of less than 3500 feet require an energizer with a minimum stored energy rating of 1.3 Joules (e.g., Gallagher B150 Energizer). A solar charging unit is installed to recharge the battery. A 20-watt solar panel is sufficient to keep the battery charged (e.g., Solarex SX-20) on fences smaller than 3500 feet. The solar panel on fences larger than 3500 feet should have a minimum output of 60 watts (e.g., Solarex MSX-60) and should be powered with a Gallagher B600 Energizer. See Appendix III for information on the proper placement of the solar panel.

Charge controllers are recommended for solar panels to prevent overcharging during periods of maximum sunlight or energizer malfunction. A low voltage disconnect (LVD) is recommended to protect the battery from damage due to freezing. The LVD shuts down the system when the battery voltage drops below a preset level (usually 10.5 to 11.5 volts). It will not let the system start up again until the battery voltage recovers to 12.5 volts. Charge controller/LVD units are available (e.g., Trace Engineering). The C12 model is recommended because the low voltage setting is adjustable. The LVD should be set at 10.5 volts.

To reduce the chance of direct lightning strikes, the charging system should be placed in a box constructed of wood or other non-conductive material and mounted on a treated or locust wood post. The roof of the box should be sloped at a 45° angle and the solar panel mounted directly to it. To prevent damage from porcupines wrap the bottom 2 feet or more of the post with sheet metal. Some mechanism should be constructed on this box to lock. This will reduce vandalism.

2. Grounding System (120-Volt AC and 12-Volt DC Systems)

A good grounding system is very important for the fence to work properly. Grounding is difficult to obtain in typically dry, rocky and glaciated soils. Drill or dig holes for all grounding rods 3 to 5 inches in diameter at least 4 feet deep. Use a mixture of absorbent clay (e.g., petro sorb, kitty litter) and rock salt around the grounding rods to ensure proper ground. Fill each hole with a mixture of absorbent clay (i.e., 2/3 by weight) and rock salt (1/3 by weight). Push the 4-foot galvanized or stainless steel rods down into the center of the hole. Add water to moisten the mixture. Under most conditions this makes an adequate grounding system that is easy to remove when the fence is dismantled. During drought conditions it may be necessary to water the grounding system to keep it working. Grounding rod spacing and placement specifications are described in the Appendix III.

3. Lightning Protection (120 and 12-Volt Systems)

Lightning can damage fence energizers. The amount of damage depends on the severity of the strike. It is recommended that at least 2 lightning arrestors and a lightning choke be installed (See Appendix III). This will reduce the chance of damage if the fence is struck by lightning. One lightning arrestor, with its own grounding system, should be installed at the high point along the fence. Another should be installed between the fence and the choke. For added protection install another between the choke and the energizer. All the above grounds must be at least 66 feet from the energizer ground.

4. Wire Charging

Many distributors of high tensile fencing systems recommend that every other wire be grounded to improve the effectiveness of electric fences. This is very effective in discouraging persistent deer from penetrating fences.

The following should be considered when determining the number of grounds that will be established. Fences will need to be checked more frequently to ensure that they are working properly. One large limb or tree can shut down an entire fence. If a hot wire comes in contact with a grounded wire the entire fence will be dead.

If the wires parallel to hot wires are grounded, increase the load on the charging system. A severe drain to battery/solar panel powered systems would occur even during periods of maximum sunlight.

It is recommended that one or more of the wires be grounded for short periods (e.g., 2-3 weeks). These grounds should be established when the fence is first erected to “train” the deer and at other times when deer penetration becomes a problem. One option is to bait the deer into the fence so they get shocked right away. This can be an extra deterrent to the deer.

C. Maintenance

Fence maintenance is very important to ensure success. Fences must be charged continually with a minimum of 6000 volts so that deer receive a shock whenever the fence is touched. If this is not done, deer will be more persistent at fence penetration.

Maintenance begins as soon as the fence is erected. The person in charge of maintenance should be on site when the fence is installed. This will ensure that he is completely familiar with the fence and any potential problems that may occur.

The person in charge of fence maintenance should develop an inspection schedule to ensure that all fences are checked at least once a month. All fences should be checked thoroughly during these monthly visits and most importantly after damaging weather events (e.g., wind, lightning, heavy snow, etc.). At these times, additional manpower may be needed to return fences to working order as soon as possible. Set a high priority for checking the newest and largest fences first. Keeping deer out of these fences is both critical and problematic. It is important that each fence be checked at least monthly until it is removed or the silvicultural treatment has been determined to be a success.

The following should be checked during every visit:

- Battery voltage
- Fence voltage
- Solar panel voltage
- Lightning arrestors
- Lead and ground wires
- Walk around fence, with the power on, looking for:
  - Missing/broken insulators
  - Listen for arcing
  - Bottom wire at proper height
  - Wires at proper spacing and tension
  - Lightning arrestors in working order
  - Vegetation shorts

Most fences require an energizer with a minimum stored rating of 5.5 Joules (e.g., Gallagher B600). This energizer has three power settings that are helpful in reducing battery drain during periods of reduced sunlight. The following are the settings and recommended times for each:

- Low power setting – November thru February
- Medium power setting – March thru April and September thru October
- High power setting – May thru August and immediately after the fence is put into service

During the wintertime after a snow or ice event, the solar panel should be checked and cleaned of snow and ice to keep it charging. Also, if the snow is covering the bottom wire of the fence, it should be disconnected to help lessen the drain on the battery.

A vegetative management plan will need to be developed for use along the fence line of electric fences. Herbaceous and small woody growth along fence perimeters can cause shorts. Periodic applications of herbicides may be required to keep the fence lines clear. Placing fences under the forest canopy can retard this growth. When control measures are necessary, apply a foliage application of glyphosate or glyphosate-sulfometuron methyl mix according to label directions (i.e., Accord, Oust). The recommended time to treat woody vegetation is from July 1 until the first frost. The spring/early summer flush of herbaceous vegetation may require control earlier than July 1. Blackberries should be controlled before they grow too large. Six to eight foot canes become a big problem when they fall over fences.

D. Fence Dismantling

When dismantling fences some materials may be salvaged. They can be used for new installations and maintenance. With electric deer exclosures the solar panel, energizer, battery, battery box, stickers with insulators, tightners, wire, and vehicle & man gates may be reusable. With woven wire primarily just the vehicle gates, man gates, and possibly some posts may be reusable. Any unusable materials should be the contractor's responsibility to dispose of properly.

CHAPTER X
COMPETING VEGETATION TREATMENT GUIDELINES

I. Introduction

These guidelines are intended to provide direction in the control of competing vegetation. For the purposes of these guidelines, competing vegetation is defined as any vegetation that interferes with the establishment of acceptable tree regeneration as part of a prescribed silvicultural treatment. Recommendations are for target species – beech brush, striped maple and ferns - that have been identified by research to be a problem and for treatments that have proven to be effective. Targeting of other species and use of other treatments may be proposed but will require additional information and justification for approval. All potential treatment methods that would control the target species should be considered. Precisely targeted treatments are generally preferred over broad spectrum applications if they are cost effective. In choosing a control method, foresters should try to achieve the best balance of effectiveness, cost efficiency and environmental acceptability.

II. General

A. Areas Qualifying for Treatment

1. Areas scheduled for a silvicultural treatment designed to regenerate the stand.

AND

2. The SILVA /FM-T-36 Competing Vegetation Treatment Analysis (CVTA) indicates that control of competing vegetation is necessary. Any area where competing vegetation is a problem on more than 30% of the plots will qualify for treatment. The minimum number of plots to be taken is as follows:
   - 10 to 50 acres – 20 plots
   - 50 to 75 acres – 30 plots
   - 75+ acres - 40 plots

   It is not mandatory that areas meeting these criteria be treated if, in the judgement of the forester in charge, the area is likely to regenerate satisfactorily without treating the competing vegetation.

AND

3. A PNDI review of the area is negative. In the event a “hit” is encountered, the area will either be modified in accordance with the recommendations of the Ecological Services Section, scheduled for an alternate treatment or abandoned.

B. Goal of Competing Vegetation Treatment

1. The goal is to remove sufficient competing vegetation to permit establishment of tree seedlings of the quantity and quality considered necessary for successful stand regeneration under SILVAH guidelines.

2. The goal will be judged to have been met if, following the treatment, the SILVAH/CVTA indicates that 85% of the plots are free of competing vegetation. SILVA/CVTA should be taken one year following the treatment to determine if the target species has been adequately controlled. A second set of plots should be taken 3 to 5 years following treatment to determine reproduction response and assess re-establishment of competing vegetation. In the event that the treatment goal has not been met, the forester in charge will assess the situation, determine the cause of the failure and schedule appropriate action which may include additional treatment. Follow-up treatments should be approved by the silviculture specialist.

C. Aesthetic Buffer Zones

1. Roads

a) Road buffer zones may be treated if they meet the requirements in Section A. Width of buffers will conform to the state forest resource plan.

b) The aesthetic impact should be considered, particularly along heavily used roads.

c) Road buffer zones that are treated should be posted with an appropriate explanation.

d) Precautions should be taken to alert persons using the road to treatment operations when appropriate.

2. Trails

a) Trail buffers may be treated if they meet the requirements in Section A. Width of buffers will conform to the state forest resource plan.

b) Trail buffer zones that are treated should be posted with an appropriate explanation.

c) Precautions should be taken to alert visitors to treatment operations when appropriate.

3. Streams, Spring Seeps and Vernal Ponds

a) Broadcast herbicide application with riparian buffer zones is prohibited. Width of buffers will conform to the state forest resource plan.

b) Riparian buffer zones may be treated by other means if they meet the requirements in Section A.

D. Size of Treatment Areas

1. The maximum size of a treatment area is limited to the maximum size of reproduction cuts for the district. Larger areas may be treated with proper justification and approval.

2. Minimum size for treatment is 10 acres. Smaller areas may be treated if they are in close proximity to larger blocks or in other situations with proper justification and approval.

3. In layout of treatment areas, the location of fences, gates, travel corridors and other future activities should be considered.

E. Slope and Terrain

1. Slope and terrain should be suitable for operation of the equipment normally used in the recommended treatment. When heavy equipment is used, rocky areas, wet areas and areas with excessive amounts of down timber should be avoided.

2. If the treatment requires heavy support equipment, the work site must have reasonable access (1/4 mile) for that equipment. The distance may be greater if the project requires a minimal number of trips between the support equipment location and the work site.

3. If the area is scheduled for a harvest prior to treating the competing vegetation, the timber sale contract should require more extensive lopping than normal and/or contain a utilization clause.

4. Large treatment areas should be stratified if contracts are slope specific. Guidelines for minimum size of treatment areas still apply.

F. Silvicultural Treatment

1. The SILVAH prescription is the guide for the coordination of competing vegetation treatments and timber harvests. Whenever practical, the SILVAH analysis should be taken during the initial stages of planning a competing vegetation treatment. If the proposed treatment deviates from the SILVAH prescription, additional justification and approval may be required.

2. Timber harvests must be scheduled to take maximum benefit of the advantage gained by competing vegetation treatments.

3. It must be determined that adequate advanced regeneration is present before the overstory removal is scheduled; or that in the professional judgement of the forester in charge, there is reason to believe adequate regeneration will become established following the overstory removal. It should never be assumed in scheduling of harvests that treatment of competing vegetation will result in establishment of advanced regeneration. It is strongly recommended that the decision to remove the overstory be deferred until at least one growing season has passed following the competing vegetation treatment.

III. Broadcast Herbicide Treatment

A. Herbicide Selection – Competing vegetation should be stratified into separate blocks for more accurate treatment whenever it is practical to do so.

1. Oust (sulfometuron methyl @ 1.5 oz. AI/A)/surfactant only – Use where grass and moderately dense fern are the primary targets. If commercial tree seedlings are present, spray late to give the seedlings the best chance for survival. If treating late to protect seedlings, a surfactant should not be used. Oust alone may not be effective when ferns are very dense.

2. Accord (glyphosate @ 13 or 26 oz. AI/A) / Oust (sulfometuron methyl @ 1.5 oz. AI/A)/surfactant Mix – Use when fern and grass are mixed with beech brush under 12 feet tall and striped maple under 8 feet tall or when fern cover is very dense. The higher rate of glyphosate should be used if striped maple is the primary target species. If retreatment is necessary due to rain, Oust need not be included in the mix.

3. Accord (glyphosate) only – Use when beech brush under 12 feet tall and striped maple under 8 feet tall are the only targets.

4. Treatment of other target species or use of other herbicides or mixes requires special justification and approval.

B. Spray Swath Width – Selection should be based on the primary target species and stem density. If stems/foliage are very dense, a more narrow swath may be appropriate. If stems/foliage are sparse, a broader swath width may be effective. Adjustments should be made in the field based on observations of the actual coverage under operational conditions.

1. For ferns, beech brush and striped maple less than 3 feet in height use an 80 foot spray swath.

2. For beech brush and striped maple 3 feet to 8 feet in height use a 60 foot spray swath.

3. For beech brush 8 feet to 12 feet in height use a 40 spray swath

C. Timing of Treatment – Selection should be made based on the primary target species. Exact dates may vary with geographical region and adjustments should be made accordingly. All spraying must be suspended following the first killing frost, when target species foliage exhibits 25% yellowing or upon cessation of growth on the ferns. Suspension of operations should also be considered if the Palmar Drought Index is below – 2. Following are the suggested spray windows for various target species.

1. Ferns – July 1 to August 30

2. Striped Maple – August 1 to September 15

3. Beech Brush – August 1 to September 30

Note: For more detailed information, see the U. S. FOREST SERVICE – SITE AND HERBICIDE SELECTION GUIDELINES

D. Other

1. Tall Striped Maple and Beech Brush

a) Beech brush over 12 feet tall and striped maple over 8 feet tall is difficult to control with a broadcast treatment of Accord.

b) If there are more than 700 stems per acre of competing species, a broadcast treatment may be used but it is likely to result in only partial control and follow-up treatment may be required.

c) Stems that survive the initial broadcast treatment may be mopped-up with a basal treatment or cut during subsequent timber harvesting operations.

d) Alternatives to broadcast treatment.

1) Mechanical treatment followed after growing seasons by broadcast treatment as recommended in the USFS Herbicide Selection Guidelines. In practice, this treatment has not proven to be consistently successful.

2) Removal in conjunction with a timber sale. This is usually only practical when the number of stems to be removed is low and the value of the timber is high.

3) Basal treatment. This is only cost effective when the number of stems to be treated is less than 700 per acre.

2. Spot Treatment/Mop-up – Appropriate in situations where a full-fledged broadcast treatment is not warranted or where a broadcast treatment has been applied and mop-up of skips or misses is needed.

a) Woody vegetation (< 3 feet tall) – 2% to 5% solution of Accord (glyphosate) applied with either a backpack or ATV mounted sprayer.

b) Herbaceous vegetation – 1% to 2% solution of Accord (glyphosate) used as a foliar spray and applied with a backpack or ATV mounted sprayer.

IV. Basal Herbicide Treatment

A. Only cost effective when treating 700 stems per acre or less.

B. Target species are striped maple, beech brush and witch hazel

C. The recommended herbicide is Garlon(Tricolpyr) in a 10%-20% solution with basal oil as a carrier.

D. Application may be done at anytime of the year if the ground is bare. Apply to stems as follows:

1. Stems less than 1” in diameter – treat the root collar and the lower 6” of the stem on all sides.

2. Stems 1” to 3” in diameter – treat the root collar and the lower 12” of the stem on all sides.

3. Stems over 3” in diameter – treat the root collar and the lower 18” of the stem on all sides.

E. Treatment of other target species or use of other herbicides or rates requires special justification and approval.

V. Mechanical Treatment

A. Recommended when herbicide treatment is not likely to be effective or is inappropriate for other reasons.

B. Target species are striped maple and beech brush.

C. Usually needs follow-up with broadcast herbicide treatment.

D. Treatment of other target species requires special justification and approval.

VI. Prescribed Fire - See Chapter 12 – Prescribed Fire

VII. Documents to be Submitted for Approval

A. Standard Projects

1. Proposal Form
2. CVTA (FM-T-36)
3. PNDI Review with Ecological Services response to any hits.
4. Map (GPS survey)

B. Non Standard Projects

1. Proposal Form
2. Non-Standard Project Justification
3. CVTA (FM-T-36)
4. PNDI Review with Ecological Services response to any hits
5. Map (GPS survey)
6. Supporting research or other documentation for proposed method, product or target species.

Chart 1

APPROVED TARGET SPECIES AND TREATMENTS

TARGET SPECIES	TREATMENT METHOD	HERBICIDE/RATE
Striped Maple	Broadcast Herbicide	Glyphosate@ 26 oz. A1/A
	Spot Herbicide	Glyphosate - 2% to 5% solution
	Basal Herbicide	Triclopyr – 10% to 20 Solution with a basal oil carrier
	Mechanical with herbicide follow-up	
Beech Brush	Broadcast Herbicide	Glyphosate @13oz.A1/A
	Spot Herbicide	Glyphosate – 2% to 5% solution
	Basal	Triclopyr – 10% to 20% solution with a basal oil carrier
	Mechanical with herbicide follow-up	
Ferns	Broadcast	Sulfometuron Methyl @ 1.5 oz.A1/A for light density. Add Glyphosate @ 13oz A1/A in heavy densities.
	Spot	Glyphosate – 1% to 2% solution

CHAPTER XI
PLANTING GUIDELINES

I. Philosophy of Artificial Regeneration on State Forest Land

The overarching goal implied in the Overview Section of the State Forest Resource Management Plan is to ensure the sustainability of natural ecological systems on state forest land. Artificial regeneration will be considered on state forest land when natural regeneration is not feasible or when necessary to maintain or restore desired tree species. In addition, the low cost and practicality of natural reproduction make it the most favored technique for reproducing state forest land.

Wildlife habitat and supplemental plantings and forest restoration will continue be viable state forest management activities where artificial regeneration can be considered. Natural catastrophic events (i.e., insect infestations, frost events, wind fall and wild fires) that are followed by natural reproduction failures and periodic silvicultural treatments that have failed to naturally regenerate adequately may be candidates for restoration. In these instances of natural and anthropogenic regeneration failures, often, the establishment of preferred regeneration can only be accomplished in a timely fashion with artificial regeneration.

To avoid monoculture and to preserve species diversity on state forest land, the bureau is currently recommending that conifer plantings be limited to 25 acres. Species approved for planting on state forest land are native or naturalized hardwood or conifers unless otherwise approved by the Ecological Services Section. Under-planting by way of enrichment plantings of white pine in stands designated for harvesting is encouraged to re-establish sites that are in area where the prevalent pre-settlement forest contained the hardwood white pine community type.

Bureau of Forestry hardwood planting guidelines recommend supplemental planting of harvested sites with preferred hardwood species that are not well represented in the stand. Although the hardwood planting guidelines have not been tested thoroughly on an operational scale, the techniques described in the guidelines are thought to be a practical and lower cost substitute for hardwood plantings. The establishment of hardwood monocultures is both expensive and unattractive under ecosystem management guidelines and will not be considered as a viable silvicultural treatment.

With the adoption of ecosystem management, the objectives of traditional tree improvement programs have been altered for state forest land. A reduced emphasis has been placed on the timber and fiber production with increased emphasis on the maintenance and protection of the ecosystem and its component parts. Because trees are long-lived concern has been expressed among natural resource managers about the effects of tree planting stock. The issue relates to seed origins and zones relating to seed orchard material and its effect on the genetic diversity in tree populations. This concern is focused on how planting genetically selected trees may reduce genetic diversity, reduce the adaptation of the planted species and if changing the genetic component of forest trees will have an effect on other biological diversity of the system. Several studies comparing the genetic diversity of natural stands and genetically improved seedlings have reportedly had comparable results.

The limited amount of planting that takes place on state forest, in the range of 1000-1500 acres per year should not adversely effect genetic diversity of a species given the length of the bureau's stand rotations. The areas planted will

also be monitored over its rotation for possible problems. Adaptive management techniques of monitoring preferred genotypes across representative landscapes would be established to evaluate their long-term adaptability and performance.

The Bureau of Forestry will maintain its present tree improvement direction and reforest state forest land with seedlings derived from bureau and other native seed orchards. The Bureau of Forestry will strive to populate future orchards with trees from Pennsylvania seed sources that contain more than the current average of 20 individual clones or genotypes. The genetic diversity of future seed orchards should increase by as much 100 percent.

Genetic improvement is generally measured by incremental gains of such characteristics as yield, diameter, height growth and other desirable characteristics over time. This may be 20 to 50 percent of the natural rotation age of the tree species being bred. The economic rotation of a genetically improved forest stand is well before the species reach full maturity. The biological rotation for white pine can be as long as 200-400 years. It is doubtful if significant genetic gain would be expressed at these long rotations. The bureau's focus for tree improvement and breeding programs should be on tree characteristics that are important to juvenile and early growth and survival. Moreover, over the next decade we expect to be concentrating on improving our success with artificial regeneration techniques particularly with preferred hardwood species. Less attention will be focused on optimizing seed sources.

II. General Planting Guidelines

The following guidelines are to be followed for planting projects funded by the regeneration fund. These guidelines are meant to assist in the layout and implementation of tree planting programs on state forest lands.

A. PNDI searches are required for all planting projects on state forest land.

B. The most important factor is to be objective; do not try to force trees to grow or compete on sites where they will not perform. There is a considerable amount of cultural literature available for all species available for planting on state forest land. It is important that this information is reviewed during the planning, planting and maintenance stages of tree planting projects. These guidelines may be modified for other hardwood plantings. It is imperative that the practices used on state forest lands be biologically and ecologically sound. Planning is important. A site evaluation must be done to expect satisfactory results. The following elements should be considered during this process: soils, aspect, competing vegetation, hydrology, mammal depredation, overstory competition and other relevant factors.

C. Supplemental planting to improve species mix and introduce seed sources is the main focus of the bureau's tree planting program on state forest land. Groups or widely spaced plantings should be used to supplement existing regeneration. The regeneration fund was not established to develop plantings. Large-scale plantings are low priority and will only be considered to rehabilitate areas where regeneration efforts have failed.

D. Twenty to fifty hardwood seedlings per species, per acre are sufficient to supplement existing regeneration in most situations. Conifer plantings may require more trees due to closer spacing requirements. If survival rates fall below 80 percent before the next growing season reinforcement planting may be necessary.

E. Native species have proven survival records and perform well with proper maintenance and when planted on the appropriate site. Non-native species are **not to be planted** without permission from the Ecological Services Section.

F. Plantings to enhance wildlife habitat in accordance with guidelines established in the Fauna Section of each State Forest's Resource Plan.

G. Site preparation recommended for the site /species and maintenance are extremely important:

1. Cleanings, whether mechanical or chemical (**see herbicide guidelines**), may be necessary during the first few years after the planting.

2. Fencing (**see fencing guidelines**) is usually necessary to protect seedlings from deer damage.

3. The use of tree shelters is not recommended due to their extremely high cost. But in certain instances, planting may be required to supplement the natural reproduction of a harvested site. Fencing has been seen as a more cost effective and maintenance reducing method of protecting seedlings from herbivore damage. Some cases have led to the use of tree shelters over fencing due to practicality. If fencing is not used tree shelters should be used to protect planted seedlings. Five-foot tree shelters have effectively eliminated browsing. While tree shelters can protect seedlings from browsing they may suffer from the effects of other mammals. Bears have caused significant damage to tree shelters and stakes in some areas. Other mammals, rodents, have also caused significant damage to seedlings planted in tree shelters by girdling or feeding on young seedlings. Frost pockets should be avoided because tree shelters have a tendency to concentrate frost. Tree shelters may be installed where appropriate to protect seedlings from both large and small animals.

H. Long-term maintenance is important and must be considered for all planting projects.

I. Direct seeding may be an option. There has been some successful application of this practice on a limited scale. Direct seeding proposals should be limited to small and manageable areas until more information and practical results are achieved. It is important to make sure mineral soil is exposed. Direct seeding should be considered as supplemental planting to improve species mix and introduce seed sources. As stated above for tree planting, supplemental seeding is the main focus of the Bureau of Forestry's tree planting program on state forest land.

J. Post-planting evaluations are recommended one, three, and seven years after planting to verify the effectiveness of all planting projects. This evaluation should document survival, growth, insects/diseases and other conditions and problems observed on the project. These evaluations need not be complicated procedures, but should adequately document problems and include photographs. Permanent photo plots are highly recommended to document the successes and/or failures for future program planning and justification. Photo plots must use the same point, same azimuth, and same time of year each time photos are taken.

K. Rehabilitation sites are to be planted in such a manner so that a natural forest setting is achieved. To achieve this hand planting is desired over machine planting. Machine planting may be acceptable in instances where large acreages are being planted back to trees following natural or man-made disturbance.

III. Hardwood Planting Guidelines

A. Introduction

Early results of demonstration and research plantings of red oak have indicated that rapid height growth and high survival of planted red oak can be accomplished reliably over a large area of the state. Our best planting results have been in the Ridge and Valley Region and areas south of this province. Planting on sites where late spring frosts are common, particularly on the Allegheny Plateau, have resulted in significant seedling mortality and suppression of height growth. Based on these early results, planting red oak in clearcuts is not recommended in the Allegheny Plateau Region. Tests to determine if tree shelters can alleviate planting problems on the Allegheny Plateau are too recent to provide the kind of long-term data needed to make reliable recommendations.

In the Ridge and Valley Region and including portions of the Michaux State Forest and Tuscarora State Forest, early height growth has been excellent and survival has been achieved both with and without tree shelter protection

Four important reasons for these successful plantings are:

- adequate protection from deer browsing by either tree shelters or fences
- effective control of competing vegetation by annual applications of herbicide for the first two to three years after planting
- planting in full sunlight
- the absence of damaging late spring frosts

The financial costs of achieving successful plantings are high, particularly in the case with tree shelters; therefore, planting should be done on high quality oak/Allegheny hardwood growing sites. Maximum return on investment is likely to occur on these productive sites as they traditionally produce the highest value saw timber. Planted hardwoods require more cultural care during the first several years after establishment to ensure a high probability of success. Once hardwood seedlings become well established and are in a free-to-grow position, there is every reason to believe that they will continue to grow and become successful competitors with adjacent natural reproduction.

B. Planting Strategy

The Bureau of Forestry's planting strategy for oak is to maintain former oak stands as oak stands or stands that have an oak component. A realistic goal for the Bureau of Forestry's red oak artificial-regeneration program is for approximately 80 percent of the original planted stock to survive in the overstory as dominant and/or co-dominant stems twenty years after planting.

The following recommendations for seedling establishment can be used both for non-sheltered seedlings within a deer fence, or tree-sheltered seedlings protected, or not protected, by a deer fence. It is recommended that 20 to 50 planted seedlings per acre be planted to meet the desired red oak regeneration objective. Seedlings should be planted on sites immediately after harvesting as reinforcement or supplemental plantings. Spacing of seedlings within a group planting should be such that all seedlings can successfully develop into crop trees. It is important that all seedlings in the group be easily located for future maintenance. A spacing of 10-15 feet between seedlings is recommended.

Each seedling should be revisited for vegetation control during the first and second, and possibly the third, growing season. Time and expense devoted to post-planting maintenance will be less for group plantings than for individual seedlings planted randomly across the site.

The number of groups planted per acre is dependent upon the total number of seedlings desired per acre, and the number of seedlings per group. The decision as to how many seedlings to plant per acre and the number of seedlings per group should be made by the forester in charge.

Ground verification of each proposed group-planting location is necessary to ensure its suitability for planting. This includes determining if there will be adequate sunlight for all seedlings, whether the soils are too wet or rocky, and if existing vegetation would pose a threat to early seedling growth. If one of these criteria is not met, move the group-planting site, plant fewer seedlings in the group, or eliminate the group planting altogether.

C. Hardwood Seedling Planting Guidelines

Extreme care is to be exercised prior to any planting. This involves the proper transportation, storage, and carrying of seedlings. Seedlings are to be transported in covered vehicles that have a heat barrier between the floor surface and the seedlings. If pick-up trucks or other trucks are used to transport seedlings they must have some type of material or lift to keep the seedlings from coming in contact with the bed of the truck. Excess heat is generated by the exhaust and drive system of the truck that will increase the temperature of the seedlings. This may cause the seedlings to be killed or severely damaged. Covered vehicles are to be used or tarps of sufficient size are necessary to prevent seedling from be desiccated by wind. Seedlings are to be stored in a cool moist location at the planting site or other sufficient site so as not to allow excessive temperature build-up in the bundles. Seedlings should not be stacked more than three bundles deep to allow for dissipation of heat. An air conditioned building/trailer, cold cellar, or cooler is recommended to keep seedlings that may not be planted in two days. Seedlings are to be carried in waterproof bags or containers during planting operations so as not to

cause the seedling to become desiccated. Some type of root anti-desiccant may be used to assist in preventing of the desiccation of the roots.

Standard planting practices are to be used as a general recommendation for the planting of all seedlings. This may be accomplished with use of the standard planting tools and some specialty tools in specific instances. These may include the use of the planting bar, hoedad, dibble, mattock, or other special tools. The four-inch chainsaw-driven planting auger can used to quickly and efficiently plant oak seedlings. The depth of the planting hole should be about eight to ten inches. Stuffing or cramming the seedlings into the planting hole causes balling, twisting and "J" roots. This results in slow growth or death, of the seedling. To minimize unnatural root development root prune the taproot or taproots to eight to nine inches from the root collar. When planted, the seedling root collar should be at, or just below, the ground line to ensure that all roots are covered with soil. Refill the planting hole with mineral soil. Do not use mineral soil that contains rocks, visible clumps of herbaceous vegetation and other organic material (e.g., duff, leaves) to refill the planting holes. Often times when planting holes are located in rocky soils, insufficient soil is available to properly plant the seedling. In these cases, other holes nearby can be dug to get needed mineral soil. The soil around the planted seedlings must be tamped sufficiently to maximize soil contact with the roots and prevent air pockets around the root system. Seedlings should be planted no more than 20 degrees from the vertical. This will ensure that height growth will start from a bud on the seedling stem, and not from dormant buds on the seedling root collar. In the case of oak seedlings, large (2-0) oak planting stock with a minimum root collar diameter of 9/16 inch is recommended.

1. Direct Seeding Oak

The bureau has had limited experience with direct seeding with tree shelters. Early results of this method of oak regeneration look encouraging. Successful direct seedlings have been done from April through June in the Ridge and Valley Region and sites south of this province.

Techniques for direct seeding in tree shelters are as follows: Acorns are collected in the fall prior to planting. These acorns are stratified in the seed cooler until germination is induced. The radical emerging from the acorn indicates successful stratification. Germinated acorns must be transported to the planting site in small hand coolers. Ice should be added to the cooler to prevent heating and dehydration of the acorns. At the planting site, acorn-planting areas are prepared by scarifying the soil; bare mineral soil must be exposed. This may be accomplished by hand or the use of a track machine with the use of a root rake or other device. If the area is not fenced a tree shelter is recommended to protect the seedling. The tree shelter stake is driven into the ground adjacent to the scarified position. The tree shelter is placed over the scarified spot, sealed with mineral soil as described above, and then fastened to the stake with the plastic ties. Three germinated acorns are dropped into the shelter and then pour mineral soil into the top of the tube so that approximately 1 1/2 to 2 inches is deposited over the acorns. Mineral soil that contains visible clumps of herbaceous vegetation should not be used. This herbaceous vegetation can sprout and seriously compete with the emerging seedlings.

Direct seeding trials have been made with two-, four- and five-foot shelters. Fourth-year height growth and survival of direct seeded plantings using five-foot shelters are comparable with non-sheltered (2-0) bare rooted seedlings. However sheltered direct seeded red oak requires more than four years in a shelter before an acceptable number become self-supporting.

One promising technique to reduce the time it takes for seedlings to become self-supporting is direct seeding in two-foot shelters within deer fence exclosures. The two-foot shelters, although too short for long-term deer protection, provide good short-term protection from rodents and promote increase height growth of the developing seedlings.

In a Michaux Forest District direct seeding study that compared height and survival performance in two- and four-foot shelters, the average height after five years was 5.3 and 5.6 feet for the two- and four-foot shelters, respectively. Survival for both the two- and four-foot shelter types was 96 and 82 percent, respectively. All of the seedlings in the two-foot shelters were self-supporting. However, slightly more than 50 percent of the seedlings in the four-foot shelters were self-supporting. Based on the results, large-scale plantings by this technique cannot be recommended until more information becomes available. Trial plantings of this technique are encouraged to gain needed information to assist with determining potential application.

2. Installation of Tree Shelters

Tree shelters should be erected over the planted seedlings during, or immediately after the seedlings/seed are planted. Drive the tree shelter stake into the soil approximately 12 inches about two to three inches from the base of planted seedling. Place the tree shelter over the seedling and seal at the ground line by tamping the shelter into the soil approximately one inch or by placing mineral soil around the base of the tree shelter. Attach the shelter to the stake with the attached plastic fastener. When fully erected, the tree shelter should not be any more than five degrees from vertical.

After the seedlings have emerged from the tree shelter and have grown large enough to be self-supporting, detach the plastic tie from the stake and slit the tree shelter plastic vertically from top to bottom. Do not remove the slit tree shelter from the tree.

3. Competition Control and Deer Protection

Based on the Bureau of Forestry's three-year growth and survival of the red oak progeny tests on the Michaux and Tuscarora Forest Districts, favorable height growth and survival can be obtained without tree shelter protection. Seedlings in this test were protected by deer fence at the establishment of the test. In addition, 2% glyphosate (Accord) was applied on three separate occasions on competing vegetation within the test plot and on a strip approximately five to six feet wide around the test plot. These three herbicide applications effectively eliminated all woody competition from the site and subsequently accelerated

seedling height growth. Based on these results, it is recommended that an area of between six and eight feet in diameter around each planted seedling be treated with similar herbicide applications.

Herbicide applications can be made with low volume backpack sprayers. This type of spray unit allows the applicator to spray accurately only competing vegetation adjacent to the seedling. If the planted seedling is accidentally sprayed, herbicide damage can be avoided by immediately removing the sprayed foliage from the seedling. Spraying herbicide on the seedling stem should be avoided. Newly planted seedlings without tree shelters are often difficult to relocate because they blend in with the surrounding vegetation. Mark individual seedling locations with plastic flagging or wire flags to ensure that seedlings can be accurately relocated and to avoid accidental spraying.

Maximum deer browsing height is about five feet. Seedlings planted within a deer fence may need at least four to five years of protection before they reach a height where deer browsing will no longer a problem.

In certain instances, planting may be required to supplement the natural reproduction of a harvested site. In some cases deer fencing may not be a practical option. When fencing is not an option, tree shelters should be used to protect planted seedlings. Five-foot tree shelters effectively eliminate browsing and appear to be the most practical solution.

The planting strategies and vegetation control procedures outlined above can be integrated effectively with the tree shelter/tree-planting scheme. The following must be considered for this option to be effective. Herbicide treatments and follow-up maintenance of the tree shelters will be required annually. This includes replacing broken or damaged plastic straps, re-establishing the seal between the ground and shelter, resetting stakes, replacing broken stakes, and fixing or replacing shelters damaged by animals.

Based on studies of tree shelter plantings, it is likely that the shelters will have to be maintained for four or five years. This maintenance period ensures at least 80 percent will obtain diameter growth necessary to be self-supporting.

4. Long-term Monitoring of Hardwood Plantings

Sampling surveys to monitor height growth and survival should follow all plantings. These surveys provide information on the success of the planting efforts and provide important information for improving future planting practices. Monitoring perhaps 10-15 percent of the group plantings per harvested stand, up to a period of 20 years, is necessary to properly evaluate the long-term success of the planting program.

5. Summary

The objective of the Bureau of Forestry's hardwood planting program is to supplement natural reproduction. The use of natural regeneration techniques will remain the standard regeneration technique. Present recommendations are for proposed plantings to be done on recently harvested stands, planting will only be a small part of the overall regeneration program for the Bureau of Forestry.

These recommendations, although based on short-term results, reflect possibly the best results achieved with artificial regeneration of hardwoods.

The Bureau of Forestry's genetic tests of red oak are showing impressive short-term growth rates. However, genetic gains will not be realized without adequate cultural care and animal protection. Post-planting care of seedlings is essential for successful long-term results. Great deliberation in terms of selecting high quality sites, maximum cultural care, and deer protection must be made to produce desired results.

The Bureau of Forestry's focus has been on bare-rooted planting stock and probably will remain in that direction because of the satisfactory results outlined above. Direct seeding, in combination with tree shelter protection appears to have some promise, particularly on sites in the Ridge and Valley Province.

IV. Conifer Planting Guidelines

Conifers were a significant component of the original forests of Pennsylvania, and the primary species harvested across the state from the early to the late 1800's. In many areas of Pennsylvania, conifer ecosystems have been disturbed to the point that the species is no longer sustainable. The earlier, unregulated harvesting essentially eliminated conifer seed sources and subsequent fires destroyed all advanced reproduction in many areas of the state. It is apparent, from historical documents that conifers co-evolved with hardwoods over much of Pennsylvania. The presence of natural conifer regeneration in the understory of mature hardwood stands on many areas of state forest land supports this assumption. Conifers are adaptable species over many sites. White pine and hemlock are a long-lived species and fits well into the bureau's old-growth forest management system. Managing for old-growth conifers, seed sources should be maintained to encourage natural reproduction of conifers in future stands.

The objectives of the conifer regeneration program is to reestablish a mixed hardwood-conifer stands by under-planting; in certain instances where regeneration objectives have not been achieved after final harvest, to establish plantings of 5-25 acres. Details and recommendations for establishing the species in this manner are not complete. In the case of plantings, site preparation and post planting care will follow closely that given for the under-planting scheme. Planting density for plantings (800-1200/ac.) will be different than for under-planting (100-200/ac.). The higher planting densities under the planting scheme will require future pre- and commercial thinning to maintain growth and vigor of the stands.

A cursory review of the most recent literature indicates that the lake states region of the country is where the majority of white pine regeneration efforts are presently ongoing. The techniques being used are natural regeneration and planting. Direct seeding has not received much work, although some feel it still is a viable system for regenerating conifers. The main argument against direct seeding is the length of time the seedlings will be exposed to deer browsing and adjacent, competing vegetation.

Site preparation is the most important requirement to ensure satisfactory results. Early growth and development of under-planted and open-planted conifers are severely restricted by the shading effect of low ground cover. Site preparation will, in many instances, involve both mechanical removal of understory hardwood seedlings and saplings, and pre-planting applications of herbicide to remove interfering woody and herbaceous ground cover. A summer or fall

application of herbicide immediately prior to spring planting is the most practical way to control unwanted vegetation. Failure to control competition prior to planting will require subsequent release treatments. Chemical release information is not available for all conifers. An unacceptable amount of white pine mortality has been reported when glyphosate was used for post-planting release. Since white pine is a preferred browse for deer, fencing must be installed to protect planted seedlings for an estimated 5-7 years, or until seedling heights are sufficiently above browse height.

The influence of moderate shade from high overstory crown cover does not appear to be inhibiting. Overstory crown closure should be somewhere between 40 and 60 percent. Many stands on state forest land in need of remedial regeneration are in this category.

Group plantings of white pine are recommended in the understory of hardwood stands. Four to five group plantings per acre with approximately 20 to 25 seedlings per group with spaced 8 to 10 feet are recommended. This planting scheme will make it easier to locate these plantings for assessment and annual maintenance to ensure the trees to remain in a free-to-grow position. This planting scheme somewhat mimics the occurrence of white pine as described in the primeval forests of Pennsylvania. Historical records indicate that white pine infrequently occurred as pure stands, but rather as random individuals scattered throughout the stand. The position of individual planting groups in the stand should be totally within openings in the canopy to maximize available sunlight.

The size and quality of planting stock is an important aspect for successful planting. Penn Nursery is currently producing 2-0 and 3-0 seedlings. Because most under-planting on state forest land is done by hand, the larger 3-0 seedlings, with better-developed root systems, may be the preferred stock. If the area is suitable for machine planting, 2-0 planting stock may be the only option since some wild land planting machines cannot handle the larger 3-0 planting stock.

CHAPTER XII
PRESCRIBED FIRE FOR FOREST REGENERATION

I. Guidelines

A. Introduction

The purpose of these guidelines is to focus on the use of prescribed fire as a silvicultural tool for the establishment of fire adapted species, the control of competing vegetation or the maintenance of certain stands for regeneration of commercial species. Fire has been a regular component of the landscape since humans first moved into the area that is now called Pennsylvania. They too, used fire for many purposes but one benefit was the development and perpetuation of the oak-hickory-chestnut forest to feed themselves and the wildlife population. An emerging hypothesis holds that periodic, low-intensity surface fires were crucial to the perpetuation of mixed-oak forests for millennia. This hypothesis holds that (1) periodic, low-intensity surface fires were common prior to European settlement due to Native American burning practices; (2) oaks are directly and indirectly adapted to this disturbance regime; and (3) cessation of that regime is at least partly responsible for the intractable, widespread oak regeneration problem. The US Forest Research Lab in Warren, PA, Ohio group and Morgantown WV are conducting extensive research into the use of prescribed fire for forest management in the hardwood forests of the northeast.

Since fire is inherently dangerous, it is strongly recommended that fire should be used only after other options have been explored and fire is deemed the most effective. There is still much to be learned about the use of fire as a silvicultural tool, and as more research is conducted these guidelines will be amended.

Definition: *Prescribed fire – to deliberately burn wild land fuels in either their natural or their modified state and under specific environmental conditions, which allows the fire to be confined to a predetermined area and produces the fire line intensity and rate of spread required to attain planned resource management objectives. SAF Dictionary of Forestry*

B. Species adaptation

Some species are often referred to as “fire adapted”. These species exhibit evidence that fire has been fundamental in their development, and that they are adapted to take advantage of the opportunity afforded by fire. Fire applies selective pressure in a stand, often reducing or eliminating non-fire adapted species. In addition, species may be fire adapted at one stage of life, and be susceptible to fire damage at other stages of life. This thought should be in mind when considering a prescribed fire to benefit a target species. Regeneration may be fire adapted for a variety of reasons. Some species have the ability to stump sprout, after having the stem killed by fire. Other species rely on serrotenous seeds to be opened by fire. Bare mineral soil following a fire may also benefit

seed germination. It is important to have a basic understanding of the regeneration strategies of a species when planning a prescribed fire, and to take advantage of these traits whether for control or enhancement.

The following is a list of some species and their regeneration strategies following a fire. It is understood that this is not a complete list of fire-adapted species, but is an example of fire-adapted strategies.

Oak, Hickory, aspen, pitch pine table mountain pine: *established seedlings can re-sprout following stem kill, seeds can take advantage of thinner organic layer and drier site conditions.*

Chestnut: *ability to stump sprout*

.

Virginia Pine: seeds can take advantage of thinner organic layer and drier site conditions. This tree will not re-sprout following a fire.

Fire can also be a detriment to non-fire adapted species regeneration. Seedlings and saplings of thin bark and/or those with shallow roots often re-sprout poorly following a fire and their vigor is severely reduced compared to fire adapted species. The smaller a seedling is when it is top killed by a fire, the more effect fire will have on its vigor and sprouting potential. In some cases, smaller seedlings may even be killed completely, where as saplings will almost always resprout. This is an important fact to remember when using fire to control vegetation. If planning to use fire to control undesirable, competing vegetation, it should be used prior to the sapling stage. In addition, non-fire adapted species must be considered when planning a prescribed fire, if they make up a desirable regeneration component. The following is a list of some examples of commercial species that are not fire adapted.

- Tulip Poplar
- Red Maple
- Sugar Maple
- Birch
- Sassafras
- Cherry
- Ash
- Seedling and sapling white pine
- Seedling and sapling hemlock

For more information on the effect of fire on a species, visit the U. S. Forest Service's Fire Effects Information System: http://www.fs.fed.us//database/feis/index.html

C. Oak Management

Prescribed fire will probably be used most commonly for the enhancement of oak. There have been many recent studies showing a positive correlation between prescribed fire and oak. When proposing a burn for

enhancement of oak regeneration, a silvah-oak prescription should be included that agrees with the recommendation to burn. If silvah-oak does not agree with the recommendation, some other reasonable justification may be used if approved by the silviculture section. The attached outline, A Shelterwood-Burn technique for Regenerating Productive Upland Oak Sites in the Piedmont Region by Brose, Van Lear and Keyser is recommended as a prescription for using fire in the enhancement of oak. A spring burn with moderate intensity is recommended for both site preparation and control of competing vegetation.

1. Site Preparation and Oak

Prescribed Fire can be used to reduce duff to prepare a site for seedling establishment. In Pennsylvania, the duff layer will only burn to mineral soil under drought conditions. Prescribed fire should NEVER be used under drought conditions. Mechanical means are recommended to achieve a bare mineral soil condition. Fire may be used to reduce fuel and slash to prepare the site for artificial regeneration plantings.

Fire may be used to control inhibiting vegetation that is impeding oak establishment. The species to be controlled should be a species susceptible to fire.

Thought must be given to acorn crops when prescribing a fire, if oak establishment is the primary objective. A poorly timed fire, may wipe out a recent bumper crop of acorns before they can establish themselves. Fire should be used prior to a large crop, or only after enough growing seasons have passed to allow seedling establishment, unless some other reason justifies a burn.

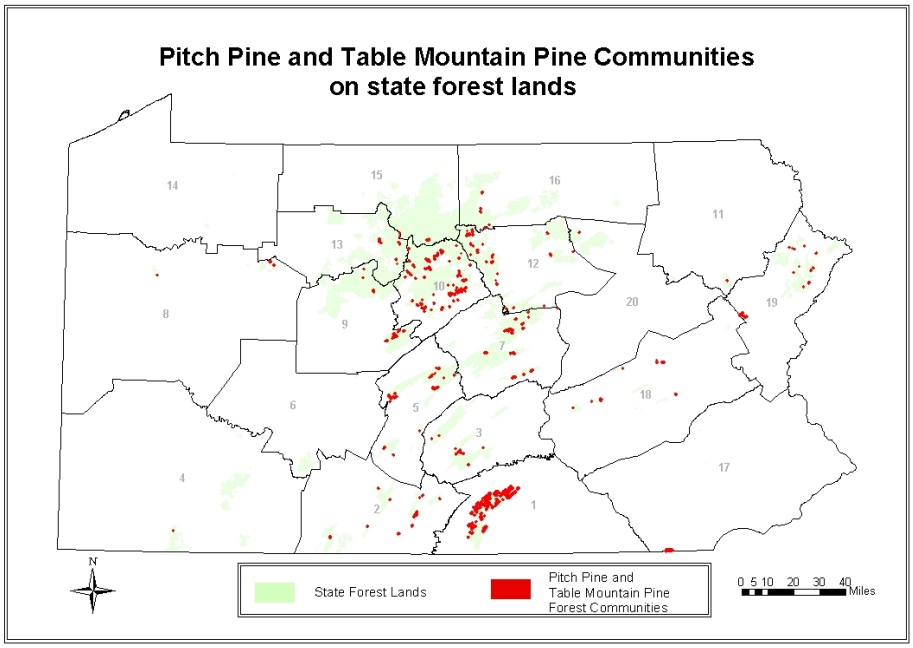
2. Competing Vegetation

Fire can be used to control competing vegetation when interfering with established or competitive oak seedlings. Seedlings must be established well enough to allow them to re-sprout following a fire. In addition, a significant oak component should be present in the regeneration so that a positive effect will result from the burn.

D. Pitch Pine and Table Mountain Pine Regeneration.

Table Mountain-Pitch Pine forest communities occur on approximately 12,410 acres of state forest land or about ½% of all state forest land. 602 forest stands have been identified. Many of these stands have mixtures of Table Mountain and pitch pine, but some stands only contain one of these two pine species. The stands average 20 acres in size with the largest community being just over 500 acres in size. These communities occur primarily on xeric ridgetops and southwest facing mid-slopes. As can be seen in the map below they are a widespread but patchy component of Pennsylvania's state forests.

These Table Mountain-Pitch Pine communities are ecologically important. They add to the overall diversity of State Forests. Table Mountain pine is endemic to the Appalachian Mountains and reaches its northernmost limit in Pennsylvania. For these reasons they should receive special consideration in forest management.



Due to better fire control methods in the 20th century and high deer populations the relative abundance of these communities is declining through out its range. In the southern Appalachians this once common community is now less than 5% of the forest (Williams, 1995). Of these forests, a Virginia study found that only 2.4 % of these stands are in the seedling-sapling age classes (Bechtold, et al., 1987). In aging Table Mountain-pitch pine communities, chestnut oak and other hardwoods grow into the main canopy following non-fire disturbances such as ice storms. Many of the stands gradually succeed to hardwoods in the absence of fire and careful management.

The table mountain-pitch pine communities grow and reproduce better than other trees on the driest of sites, with thin duff layers (Williams and Johnson, 1982) and with open canopies (Zobel, 1969). Some Table Mountain and pitch pine communities can be self-sustaining on highly drought-prone sites. These stands would occur on the very poorest of Table Mountain and pitch pine sites with soils as thin as 4 to 16 inches. On these extreme sites periodic droughts eliminate hardwood competitors before they can replace the pines and change seedbed conditions (Barden,1988). These types of very poor sites represent only a small proportion of the sites that Table Mountain-pitch pine communities are found on. No fire is necessary on these sites. For most Table Mountain and pitch pine stands, one of the best ways to create and maintain healthy self-reproducing stands is through prescribed burning.

There are several silvicultural characteristics of both Table Mountain pine and pitch pine that make these species fire-dependent. Without fire, hardwood leaf litter and particularly oak leaf litter layers, build up. The thick leaf litter forms an impervious layer that small pine seedling radicals can not easily penetrate to reach the moist soil layers beneath. Exposed mineral soil is the preferred seedbed for both Table Mountain and pitch pine. Prescribed fire will seldom remove the entire duff layer but the leaf litter and duff thickness can be reduced. Besides preferring thin leaf litter layers, the seedlings of both Table Mountain pine and pitch pine species are

intolerant of shade and develop best on open sites. Fire top kills the usually thick shrub layer in these stands and, if the fire is intense enough, it can kill much of the canopy. Table Mountain pine and pitch pine seedlings will not thrive unless given full sunlight. Another characteristic of these pines is that as trees get older they become increasingly tolerant of drought conditions. These drought conditions can kill many of their hardwood competitors. Also, both species of these pines can have cones that require heat to open and disperse their seeds. Cone serotiny is common in Table Mountain pine stands but is more unusual in pitch pine stands. Table Mountain pine cones only require a moderate amount of heat to open (as little as 100 degrees F). This is the lowest level of serotiny for any pine in North America (MacIntyre, 1929). It is not unusual for some cones to partially open on a hot summer day in an exposed canopy allowing some seed dispersal during the warm months of the year. However, most of Table Mountain pine's seed is stored in cones that open following a fire when seedbed conditions are best. Non-serotinous pitch pines typically release their seeds in the fall, while serotinous individuals only release seed following a fire. A final characteristic of both these pine seedlings is that they can resprout from dormant buds following a fire. Both pines also exhibit a basal crook on the main stem just below or just above ground level on young seedlings that help protect dormant buds from fire. Therefore, fire serves at least four main functions in perpetuating a Table Mountain-pitch pine community. It destroys leaf litter layers, opens the canopy, releases seeds and top kills much of the competing vegetation (Zobel, 1969).

When considering a burn on State Forest land Oak SILVAH overstory and understory plots should be taken. These will document and summarize the stand conditions prior to the fire. The prescription writer portion of SILVAH should not be used since Oak SILVAH was not intended to prescribe treatment for these types of stands. When preparing a stand prescription there are a number of research papers on the topic. Two excellent sources of information include:

"Response of southern Appalachian Table Mountain pine and pitch pine stands to prescribed burning," N.T. Welch, T.A. Waldrop, and E.R. Buckner, 1999, Forest Ecology and Management 136 (2000), 185-197 and "A comparison of fire intensity levels for stand replacement of Table Mountain pine," Thomas A. Waldrop, Patrick H. Brose, 1998, Forest Ecology and Management 113 (1999), 155-166

These articles describe successful and unsuccessful prescribed burns for regenerating Table Mountain-pitch pine communities in the southern Appalachian mountains of Virginia and Georgia. Both conclude that burns of sufficient intensity to kill much of the main canopy are important. Burns of lesser intensity do not allow enough light for the pine seedlings to compete with the hardwoods. One possible solution is to perform a seed tree cut, followed with a prescribed fire. Crown fire burns that are too intense are not only difficult to implement safely but also consume much of the seed stored in cones in the canopy. Ideally the fire should be of moderate high-intensity. It should reach into the crowns, but not be carried through the crowns. The shrub layer should carry the fire. This type of prescribed burning takes careful planning to implement safely.

E. Shortleaf pine and prescribed fire

Shortleaf pine has many of the same silvicultural requirements as pitch pine. Shortleaf pine requires abundant light, and thin duff to successfully regenerate and grow. This can be accomplished through a seed tree cut, followed by a prescribed fire to reduce duff.

Shortleaf pine is not a strong competitor and usually dies out in the presence of hardwood competition. However, shortleaf pine, like pitch pine and oak, has the ability to resprout after being top killed by fire. This ability is due to the basal crook and dormant buds found on the root collar of shortleaf pine. Shortleaf pine has been observed putting up multiple sprouts after being top killed. These sprouts act as a thermal barrier for the dominant leader in the event of repeated fire. A fire to control hardwoods may have the desired effect of reducing competition. It is recommended that fire be excluded from pole stands of shortleaf pine, since the stem is very susceptible to fire. It is only after the bark has become thick in older, saw timber size trees, that shortleaf pine can resist damage from fires of moderate intensity. (*Silvics of North America, Volume1 and USDA Forest Service's Fire Effects Information System)*

F. Prescribed fire for the management of aspen

Aspen is the most widely distributed tree species in North America. This short-lived, early successional tree requires periodic disturbances to remain established as a component of the forest.
Aspen regeneration is readily obtained in even-aged stands provided the existing aspen over story is not decadent. After a harvest cut, a prescribed fire can be a great aid to the establishment of the aspen. Fire helps insure adequate temperatures for aspen root suckers which are more effective in regenerating a stand than seedlings. For aspen to produce root sprouts, soil temperature at the roots must be 64 to 95 F. The removal of some of the insulating litter and vegetation as well as the blackening of the soil surface increases the temperature of the soil for some time after a fire. Without disturbance, aspen –"the phoenix tree"- cannot reproduce and will be replaced by other species. Fire provides such disturbances. (Fire Effects in Northeastern Forests: Aspen USDA Forest Service General Technical Report NC-102)

G. Prescribed Fire Vegetation Monitoring Plots

1. Background

Prescribed fire is becoming a more commonly used tool in promoting oak regeneration, site preparation, and other vegetation management activities. As the BOF moves forward in developing a prescribed fire program, it's important that we monitor our efforts and make adjustments as we learn more about what results are produced. The purpose of collecting vegetation data prior to and following prescribed burning is to monitor our relative success at achieving our prescribed fire goals. As we learn more about the use of prescribed fire, we may be able to indicate specific situations that are more successful in attaining burn objectives. In addition, we may find situations that are more risky for prescribed fire over other treatment methods.

These protocols are meant to be more detailed than other vegetation data collection protocols, because prescribed fire may produce unintended results. We will be able to examine the response or introduction of invasive plant species, native vegetation, and how well oak competes against the competition with the introduction of fire. We are also interested in how other commercial species respond to fire in terms of regeneration height growth. Silvah plots are also still required with a recommendation to burn a stand. Silvah requires more plots be taken than the Prescribed Fire Vegetation Monitoring Plots, but to save time the Prescribed Fire Vegetation plots can also be used for some of your Silvah Plots. This information should be kept in both any timbersale folder associated with the burn and the compartment folder. See appendix for Prescribed Fire Vegetation Monitoring Plot Forms.

Vegetation monitoring data will be required to be submitted with the burn plans for all proposed burns on State Forest Lands that have silvicultural objectives. The burn plans will not be reviewed unless the monitoring data is submitted. This information is not needed for warm season grass burns.

2. Data Collection Protocol

Data should be taken before the prescribed fire (pre-burn) and then two and five years after the prescribed fire (post-burn). If the burn is planned for the spring, the pre-burn data should be taken the growing season before, as most vegetation is not visible yet during our spring fire seasons. Pat Brose's work suggests that data taken immediately after a prescribed fire is not generally useful for showing patterns in vegetation response, which is why the first post-burn data collection should be after two growing seasons. Try to complete the monitoring during a time of year when much of the influencing vegetation can be recorded, such as late summer.

Determine how many plots are required for your area:

- Burns **1-15 acres** will require **5 plots**.
- Burns **16-25 acres** will require **10 plots.**
- Burns **over 25 acres** will require **10 plots plus 1 for every 5 acre increase.**

Determine plot locations in a random manner to make sure most of the area is covered, but you will still be able to relocate the plots for post-burn monitoring. Here are two suggestions for marking your permanent plots:

- Use a metal rebar stake for the pre-burn vegetation collection. Mark using florescent spray paint. If the site is to be logged, you may replace the metal rebar with marked wooden stakes after the prescribed fire to protect logging equipment.
- Use a wooden stake with some flagging or florescent spray paint and pile rocks around the base, which will protect the stake from being destroyed during the prescribed burn and will help you relocate for post-burn monitoring.

Coordinates at each site should be recorded in the plot data. Photo points should be taken at every 5th plot and facing north for consistency.

Record the specific species whenever possible, when you are recording vegetation plot data. However, if the species is not known, you may group into categories, such as 'grasses' or 'honeysuckle'. Don't hesitate to record a species you think is important to capture, such as an invasive plant, even if it's not one of the top 5 dominant species.

Vegetation data for prescribed fires will be collected in three segments:

- Regeneration: This is mainly to examine the height response of regenerating tree species to prescribed fire.
- Vegetation cover: This is mainly to examine the height and percent cover response of other species to prescribed fire.
- Overstory: This is mainly to examine any potential mortality or fire-induced damage on overstory trees.

a) Height and density of regeneration in a 6' radius.
   Examples of species to include:
   - Oaks (can indicate competitive or established for SILVAH cross-walk)
   - Maples
   - Birch
   - Cherry
   - Pines
   - Tree-of-heaven and other invasive trees
   - PNDI species if known, such as shortleaf pine

b) Percentage vegetation cover in a 26' radius.

   1) Record the top 5 most dominant species in the plot. Include other species if they are of concern, such as a fire-resistant invasive.
   2) Examples of species to include:
      - Grasses
      - Ferns
      - Mountain laurel, blueberry, spicebush and other shrubs
      - Invasives, such as barberry, mile-a-minute, or stiltgrass
      - Vines, such as grapes or poison-ivy
      - Herbaceous species that may respond to fire, such as fireweed, pokeweed, or pink lady's-slipper

- PNDI species if known

c) Overstory using a 10-factor prism.
   1) Include any tree greater than 5” DBH
   2) Record DBH to the nearest inch
   3) Indicate any fire-induced damage on the tree
      - Slight
      - Moderate
      - Severe

H. No burn situations.

It has been decided to include a set of no burn situations in these guidelines. If one of the following situations or conditions exists, it is strongly recommended that prescribed fire be avoided.

1. Northern Hardwood Stands – Thin bark species are highly degraded by fire scars.
2. Any stand under timber sale contract – Fire may degrade the buyers timber.
3. Future pulpwood sales – Pulpwood with charcoal is unusable for paper making.
4. Recently planted areas – Fire may kill the recently planted trees or destroy the tree shelters.
5. Where a fire may adversely effect established desirable vegetation
6. Stands of high quality veneer – May degrade timber value.
7. Heavy fuels (slash piles) piled against desirable species– The increased fire intensity will damage or kill it.
8. Where fire may release an undesirable species.
9. Any burn outside of the written prescription.

I. Other uses of fire not covered under the regeneration guidelines.

1. Herbaceous openings

Fire may be used to enhance or maintain the quality of herbaceous openings and food plots. Fire may also be used to control certain invasive species. For further guidance and information, contact the ecological services section.

2. Burns for insect/disease control

Fire may be used to control insects and disease. Penn Nursery currently uses fire to control weevil damage in its white pine seed orchards. Any burn made to control insects or disease should be in consultation with the Division of Forest Pest Management and through the area entomologist.

J. Burn Plans

A prescribed fire is a deliberate act that requires a thorough and well-written plan. The burn plan is a site-specific document that serves as a contract between the Agency Administrator (District Forester) and the Burn Boss. This plan includes all of the information needed to implement the prescribed fire. The size and complexity of each prescribed fire will determine the level of detail that is required in the fire plan. All burn plans in Pennsylvania are required to address 24 specific elements. A template of a burn plan with these elements and the Pennsylvania Prescribed Fire Standards are available from the Division of Forest Fire Protection.

A plan must be filed with the Division of Forest Fire Protection and the Department of Environmental Protection at least 25 working days prior to the earliest possible date that a burn could occur.

Vegetation monitoring data will be required to be submitted with the burn plans for all proposed burns on State Forest Lands that have silvicultural objectives. The burn plans will not be reviewed unless the monitoring data is submitted. This information is not needed for warm season grass burns.

K. The Timing of a Burn

It is recommended that a backing fire with moderate flame intensities will accomplish much of what is in these guidelines. The more important aspect is the timing of the burn. For the reduction of hardwood competition with oak, or hard pines, a spring burn is recommended at the time of leaf out. A spring burn catches weaker competitors at their most vulnerable time. Many of the nutrients are in the stem, with little reserves left in the shallow root systems. Trees with well-developed roots systems like oak, hickory, and pitch pine can resprout easily and are free to grow with out competition. For hardwood reduction to establish regeneration, a spring or fall burn is the recommended time. Forest District #8 has had success with reducing striped maple by burning at both times of the year.

To reduce duff for hard pine regeneration, a seed tree cut should be performed first to allow adequate sunlight to the forest floor. Waiting a until the following spring would allow adequate drying time for tops and biomass, so that when a burn is performed it may be intense enough to reduce the duff layer. This should create the ideal conditions for pitch, shortleaf, and table mountain pine regeneration.

Burning for aspen should be conducted during the dormant season. Aspen has a higher sprout success whenever it is injured or cut during the dormant season. There is a danger that fires performed during leave on conditions could be a detriment to aspen and as such should be avoided.

II. Techniques

A. Firing Techniques:

GENERAL: Various firing techniques can be used to accomplish a burn objective. The technique chosen must be correlated closely with burning objectives, fuel, topography and weather factors to prevent damage to

forest resources. Atmospheric conditions should be favorable for smoke to rise into the upper air and away from smoke sensitive areas such as urban areas, highways and airports.

Types of fires:

The name for the type of fire depends on the direction of the fire in relation to the wind. This is a brief introduction with more detailed information available under separate headings.

A **BACKING FIRE** moves against the wind. This is the least intense, having a slow spread rate regardless of wind speed. It has a narrow flaming zone and short flames.

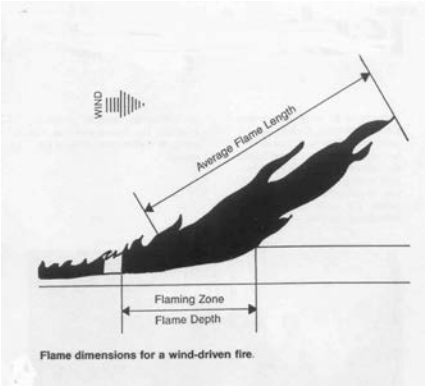
A **HEADING FIRE** moves with the wind and is the most intense because of its faster spread rate, wider flaming zone and longer flames.

A **FLANKING FIRE** moves at right angles to the wind and has an intermediate intensity. The slope of the land has an effect on rate of spread similar to that of wind.

Two or more firing techniques may be used on one burn to achieve the desired results. A solid line of fire always spreads faster and thus builds up intensity quicker than does a series of spot ignitions spaced along the same line. Intensity increases abruptly when two fires burn together.

Residence time:

Residence time is the time it takes the flaming zone to move past a given point. The residence time of heading and backing fires is often about the same because the deeper flame depth of a heading fire compensates for its faster movement. Generally, backing fires consume more forest floor fuels than do heading fires since they spend more time in one area. The total heat applied to a site may be roughly equal for both heading and backing fire. This is to be expected since the same amount of fuel is burned either way. However, the heading fire is much faster and more intense than the backing fire.



Flame dimensions for a wind-driven fire.

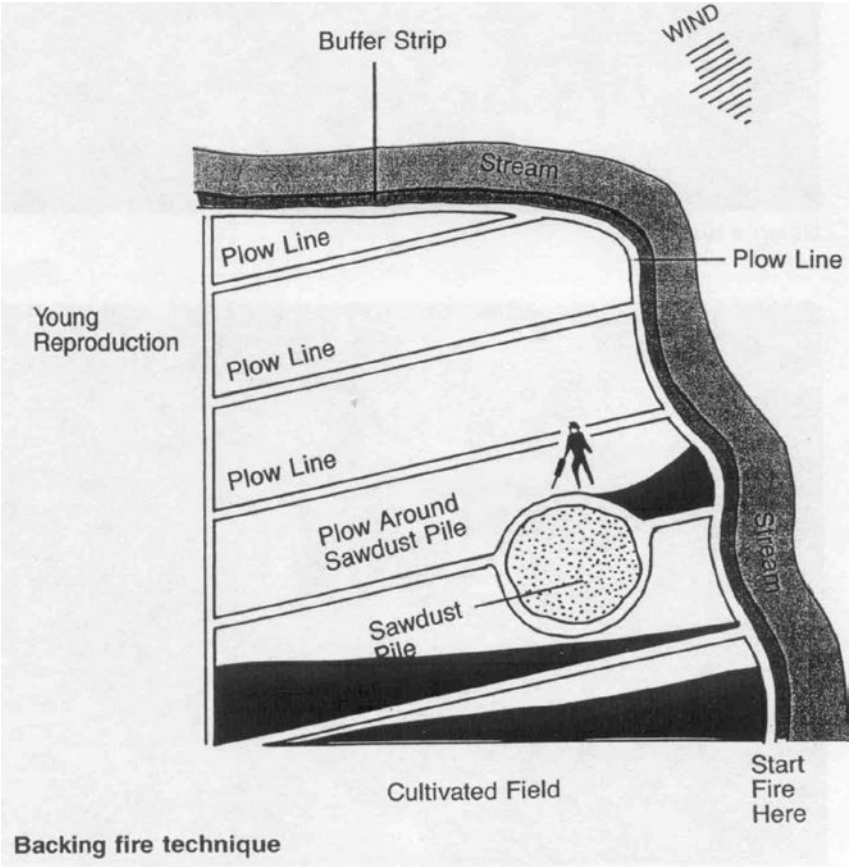
B. Backing Fire

A backing fire is started against a baseline such as a road, steam or fire line and allowed to burn into the wind. Variations in wind speed have little effect on the rate of spread for this type of fire. Such fires burn at a rate of 1 to 3 chains (66 to 196feet) per hour. Backing fire is the easiest and safest type of prescribed fire to use, provided wind speed and direction are steady. It produces minimum scorch and lends itself to use in heavy fuels.

Major disadvantages are the slow progress of the fire if large areas are to be burned. With large areas, it must be divided into smaller blocks with plow lines or fire lines. All blocks must be ignited at about the same time to complete the burn in a timely manner.

FACTORS ASSOCIATED WITH BACKING FIRE

- Must be ignited along the downwind control line
- Normally results in little scorch.
- Not flexible to changes in wind direction once interior fire lines are prepared.
- Requires steady in-stand winds. (Optimum 1 to 3 mph)
- Will not burn well if fine fuel moisture is above 20 percent.
- Requires good fuel continuity to carry well.
- A single torch person can progressively ignite lines.



Backing fire technique

C. Strip Head Fire

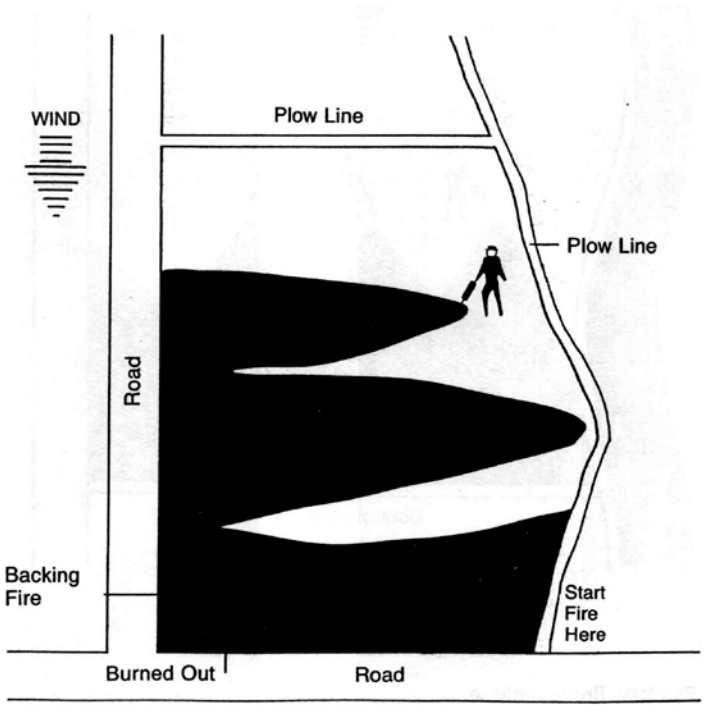
In strip-head firing, a series of lines of fire are set progressively upwind of a firebreak in such a manner that no individual line of fire can develop into a high energy level before it reaches either a firebreak or another line of

fire. A backing fire is generally used to secure the base line and the remainder of the area then treated with strip-heading fires. Stripes are often set 1 to 3 chains apart. The distance between ignition lines is determined by the desired flame length. Compensation for minor wind direction changes can be made by altering the angle of strip fire with the base line. Treat major changes in fuel type separately. An effective method of reducing fire intensity is to use a series of spots or short 1 to 2 foot long strips instead of a solid line of fire.

Caution: Be sure the fire will not escape control. First set a backing fire along the downwind control line and allow it to burn out a strip wide enough to control the heading fire.

FACTORS ASSOCIATED WITH STRIP-HEADING FIRES

- Secure the downwind base line before igniting a heading fire.
- Can be used in "flat" fuels such as hardwood leaves.
- Because fire movement is fast, large blocks can be burned.
- Can be used with high relative humidity (50 to 60 percent) and high actual fine fuel moisture (20 to 25%).
- Needs just enough wind to give direction (1 to 2 mph).
- Cost is lower than other line-firing techniques because fire progress is rapid and few plow lines are required.
- A single torch person can progressively ignite strips.



Strip-heading fire technique

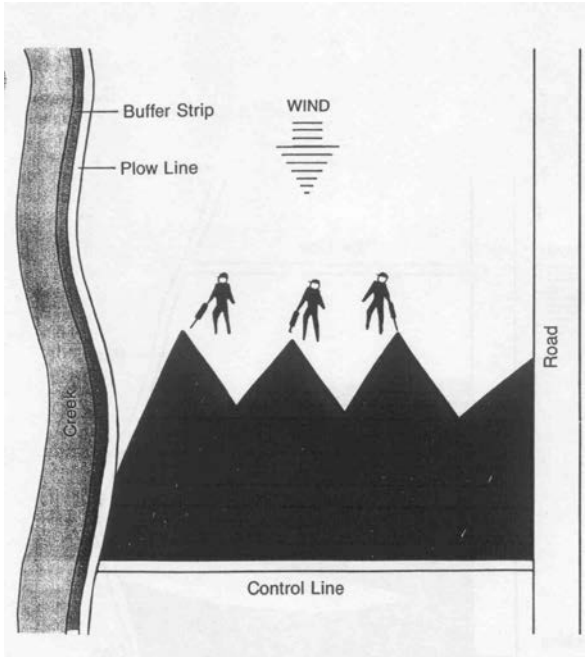
D. Flanking Fire

The flanking-fire technique consists of treating an area with lines of fire set directly into the wind. The lines spread at right angles to the wind. This technique requires considerable knowledge of fire behavior, particularly if use by itself. It is used quite often to secure the flanks of a strip-heading fire or backing fire as it progresses. It is sometimes used to supplement a backing fire in areas of light fuel or under more humid weather conditions. It is useful on a small area or to facilitate burning a large area in a relatively short time when a line heading fire would be too intense.

This method of firing can stand little variation in wind direction and requires expert crew coordination and timing. For safety, all lines of flank fire should be ignited simultaneously and all torch people should keep abreast of one another. If only one or two torch people are available, this technique is usually altered to set the ignitions lines 45 degrees into the wind.

FACTORS ASSOICATED WITH FLANKING FIRES

- Always secure downwind base line first.
- Fuel loading should be light to medium – less than 8 tons per acre.
- Wind direction MUST be steady.
- Allows fast area ignition.
- Needs few control lines.
- In areas with high under story, multiple torch people are needed and coordination is VERY important. Use radio communication whenever torch people cannot see one another.
- Useful in securing flanks of other fire types.



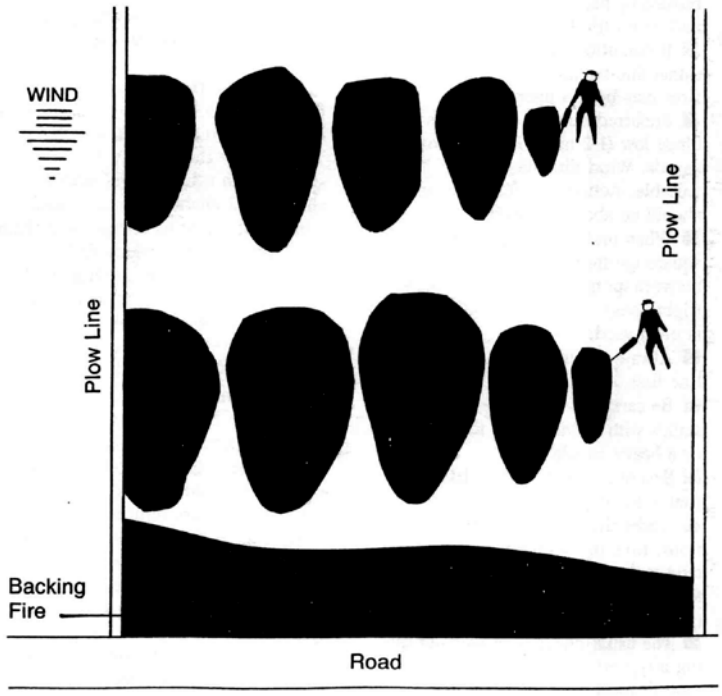
Flanking fire technique

E. Point Source Fire

When properly executed, a grid of spot ignitions will produce a fire with intensity much greater than that of a line-backing fire but somewhat less than that of a line-heading fire. Timing and spacing of the individual ignitions spots are the keys to the successful application of this method. First a line-backing fire is ignited across the downwind side of the block and allowed to back 10 to 20 feet into the block to increase the effective width of the control line. A line of spots is then ignited at some specified distance upwind of the backing fire and the process continued until the whole block has been ignited. Widening the interval between ignition points along a line decreases fire intensity.

FACTORS ASSOCIATED WITH POINT SOURCE FIRES

- Assume much of the area will be burned by heading and flanking fires and very little by backing fires.
- Preferred burning conditions include low (1-2 mph) in stand wind speeds. Wind direction can be variable. Fine fuel moisture should be above 15 percent.
- Always secure the down wind base line first.
- Costs are low because firing is rapid and no interior control lines need to be constructed.



Grid or point source ignition technique

F. Center and Circular (Ring) Fire

This technique is useful on cutover areas where a hot fire is needed to reduce or eliminate logging debris prior to seeding or planting. This procedure may cause severe tree damage as the flame fronts merge. Once the base line is secured, the entire perimeter of the area is ignited and the flame fronts allowed to converge. One or more spot fires are often ignited near the center of the area and allowed to develop before the perimeter of the block is ignited. The convection generated by these interior fires creates indrafts that help pull the outer circle of fire toward the center.

Pre-Work Conference

Timber Sale Number :_____ _____ Date:_____

Attendees:_____ _____ _____

Applies	Discussed	Subject	Section	Comments
		Road Construction	15(a)	
		Road improvement		
		Road Maintence		
		Gate Installation		
		Gate Locks (Buyers)	15(a)	
		E & S plan on site	Exhibit D	
		Loggers name/phone number		
		SFI Certified Crew Leader	17	
		Loggers Wear Safety Equip.	16	
		Fire Extinguisher Present	19(k)	
		Oil Spill Kit	18©	
		Loggers Have Copy Sale Map/Contract		
		Logging Equip. Restrictions		
		Logging Restriction Dates		
		Log Landings (size/constr.)		
		Brush/cutoff piles/chipping residue		
		Skid Road Locations		
		Approve Skid tr. Built w/ Dozer		
		Skid Road Maintence	15(k)	
		Rutting & when to shut skidding down		
		Wetlands, Spring Seeps present ?		
		Block Payments Due - Prior to Cutting	7(b)	
		Cutting Block Order	12©	
		Cutting starts in back of Block		
		Trees painted/Designated	Exhibit B	
		Brush Cutting requirements		
		Minimum Topwood Size	8(d)	
		Firewood Cutting		
		Felling Unmarked trees	11(g)	
		Hiking Trails kept open		
		Cutting Dead trees		
		Lopping Tops and Slash	13	
		Stump Heights	12(g)	
		Deer Fences/ Corridor (Blocks?)		
		Snowmobile Hauling Restrictions	15(d)	
		Snowmobile Plowing Restrictions		
		Weekly Forester Inspections		
		Problems -- Tell Loggers or Forester?		
		Block Termination	12(d)	
		Buyer Suspends Operations	32	
		Gas Lease Information/Pipelines	29	
		Sale Expiration Date		

Appendix II

Installation & Maintenance Information

Woven Wire Fence

Woven Wire Fence Installation

Installation Tips:

If you are new to Woven Wire Fencing, visit area where they have been in use for several years. All maintenance people need to be trained in the new procedures used.

Layout of fence and sale should leave ample trees to be used in the fence installation. Trees left should be healthy and of substantial size (6+ dbh)

Layout should also allow for enough room for a dozer road around the fence, later to be used by ATV to check fence.

Avoid wet areas which will be disturbed during installation. Avoid Rock beds or out cropping's if possible.

Avoid over cutting on ridge tops which will cause Wind Tunnels and potential blow down areas.

Avoid short lived trees to be used on fence line. (striped maple, fire cherry, etc.)

Avoid disease prone trees to be used on fence line such as Beech.

Avoid Fences which directly border private land….leave a buffer if possible to help in the removal of hazard trees.

Cut or insure the fence contracted cuts all hazard trees within tree height of fence prior to installation.

Place walk through gates on Trails, Roads, and Signs informing forest visitors of fence purpose and unrestricted access. AKA Hunting, Trapping, Hiking allowed.

DEER DRIVE:

Prior to closing up a fence a deer drive is required to insure all deer are out of the exclosure. Leave a minimum of 300 feet to drive deer out. Select a location to leave the opening that will assist in the drive. Bottoms of hills, drainages, natural trails work best.

Avoid attempting to drive deer uphill.

Avoid fencing operations during "early fawn season" (Late May to Late June) Deer often use the fenced area to drop fawns and driving them out will not work.

Once you are sure no deer are in area…close up ASAP, never leave this opening overnight. If so you will need to drive again.

FENCE INSPECTION:

Once fence is complete it should be inspected before signing off to contractor.
Items to look for are: Hazard trees, Proper materials, Bottom of fence in contact with ground, Post spacing, and Hog rings.

Maintenance Tips:

Maintain accurate maintenance records of fences. This should include when the fence was walked and the worked performed. Also need to have a comments section so that others are informed of work needed and condition of fence. Schedule maintenance of fences by area will help to reduce travel time. Check for tracks or signs of deer in fence. Make available to all crewmembers and supervisors.

Safety Concerns:

Driving Conditions, ATV Use, Walking conditions on rough terrain, Strains, Sprains, and cuts. Eye injuries, Chainsaw operations, and poisonous snakes.
Always wear the proper safety equipment.
Safety Glasses are required when working with Woven Wire Fences.
Leather Gloves are recommended.
Work with a partner during chainsaw operations….Chaps, Hardhats, and Ear protection is required.
ATV Helmet and Gloves when operating an ATV
Snake Chaps in area of know dens or feeding sites.
Carry a portable radio if working alone in remote area.

Checking Procedure:

Woven Wire fences need to be walked or driven around at least once a month under perfect weather conditions.
After a weather event, (Wind, Snow, Heavy Rain) fences need to be checked as soon as possible. Priority should be made to do major repairs first (deer proof the fence) and address minor repairs at a later time.
ATV's are very useful in checking for major damage.
Deer proof repairs can consist of removing a tree on the fence and propping up with prop sticks, wire tying an opening closed, or filling an opening with logs or slash.
Final repairs should be addressed after all fences have been checked and made deer proof. Wires spliced and use of a daisy tightner to repair stretched top wire.
Prop Sticks staples to fence line.
Over damaged areas replaced with new wire… (Cut section from tree to tree and replace)

Deer Fence Maintenance
Woven Wire

Equipment Required:

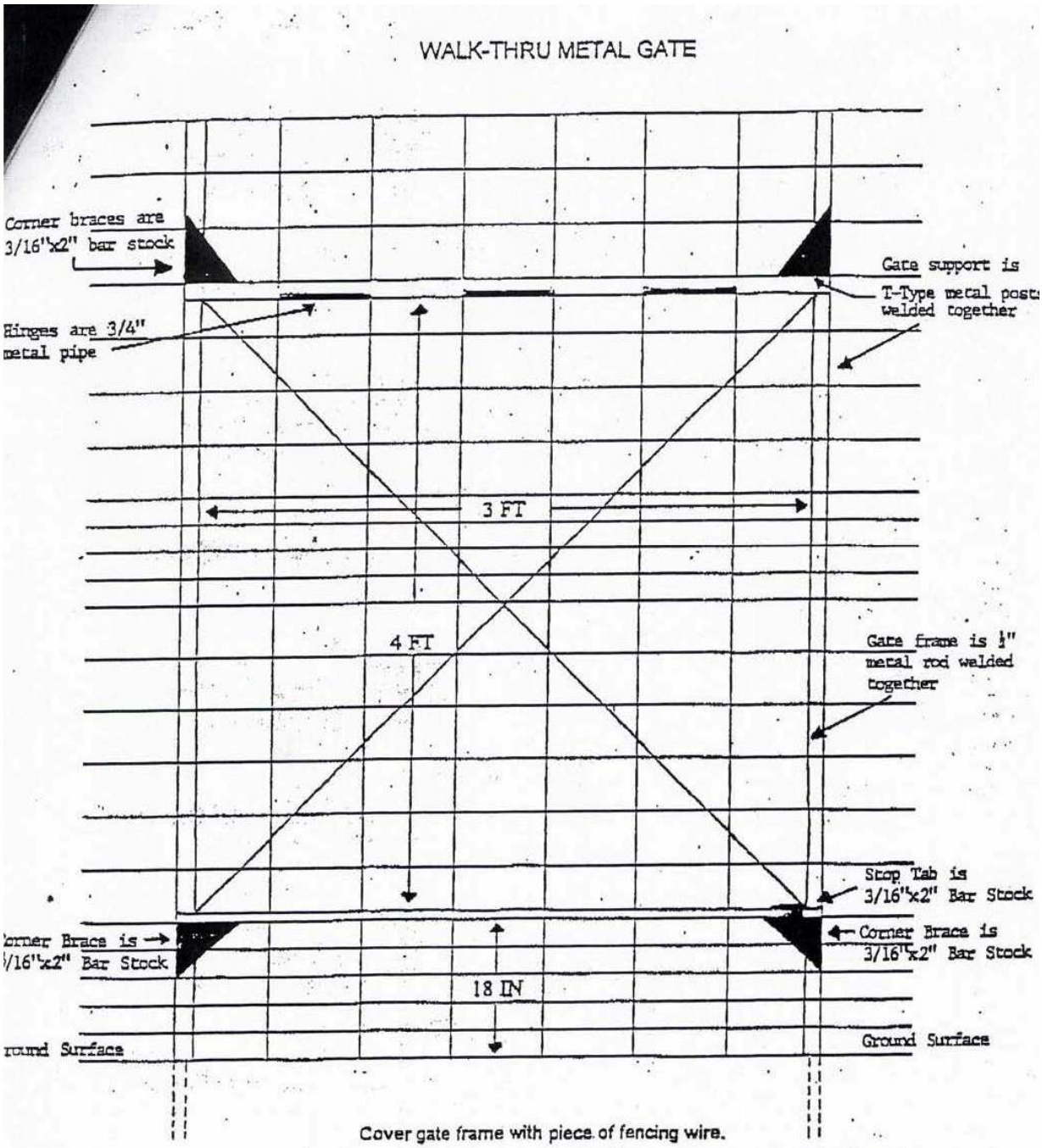
Chain Saw & Wedges
Wire Cutters
Pliers
Hammer
Hog Ring Pliers (Self Feeding)
Nail Puller (Claw bar)
Daisy Tightner Tool
Crimp Tool
Chain Grab Tightening Tool

Safety Equipment:

Chaps, Helmet & Gloves
Safety Glasses
Snake Chaps
ATV Helmet
First Aid Kit
Portable Radio

Supplies:

Daisy Tightners
Hog Rings (Self Feeding)
12 Gauge Crimps
4 Gauge Crimps
12 Gauge Wire
14 Gauge Wire
Fence Nails (1 ½ Inch)
Fence Nails (1 Inch)
20 p Nails
Wire Ties
Mechanics Wire (20 Gauge Soft)
Medium Size Gripples


WALK-THRU METAL GATE
Corner braces are 3/16"x2" bar stock
Hinges are 3/4" metal pipe
Gate support is T-Type metal posts welded together
3 FT
4 FT
Gate frame is ½" metal rod welded together
Stop Tab is 3/16"x2" Bar Stock
Corner Brace is 3/16"x2" Bar Stock
Corner Brace is 3/16"x2" Bar Stock
18 IN
Ground Surface
Ground Surface
Cover gate frame with piece of fencing wire.
Build gate to swing outward only. Tab or length of gate stops gate from swinging inward.

Picture of drive thru gate.

Picture of drive thru gate.

Picture of overlap between two sections of fence material. Also, the picture shows the alternate hog rings.

Picture of overlap between two sections of fence material. Also, the picture shows the alternate hog rings.

Appendix III

Installation & Maintenance Information

Electric Fence

Electric Fence Installation

Installation Tips:

7 Wire Systems are recommended. Wired as follows: Bottom 2 wires HOT, 3rd wire grounded to energizer system, 4,5,6 Hot, and Top Wire not connected

Bottom Wire should be disconnected when snow covers it, 2nd wire also if needed.
Placing Insulators on 2 X 2 Stickers will eliminate trees growing into insulators.
Avoid oversize fences or those that cross Natural Trails, Saddles and Haul Roads. Consider using 2 fences to avoid such situations. The 2 fences can be fed by one energizer system.
Hazard Trees (Dead, Dying) within a tree height of fence should be removed before fence installation.
Bottom strand of wire should be 4" to 8" above the ground, the other strands of wire should be 10" apart.

Energizer Systems:

Solar Panel, Energizer, C-12 controller, 12 Volt Deep Cycle Battery, Ground Rods, 2 Lightning Arrestors, 1 Choke, Mounting Box, Porcupine Shroud.
Place solar panel in a position to access un-obstructed sunlight. Northern end of a landing works great. Panels should be mounted at approx 45 degrees angles and facing due south.
Ground System should utilize wet areas if possible. Rock salt and Petro-Sorb mixture (50/50) can also be used to help earth ground in dryer locations. 3rd wire of fence connected into the ground system.
Feed line should be #12 Insulated / Stranded wire. It is less likely to carry an electrical surge from lightning. Most times the wire will heat and melt under such a charge.
1 Lightning arrestor and Choke placed inline on fence feed to protect energizer system, 1 lightning arrestor connected to top wire of fence to also protect energizer system.
Electric Fences are best used when the regeneration goal is less than 5 years. After that they become less effective and maintenance burdens. If the plan requires more than 5 years consider using Woven Wire Fence.

120-VOLT AC FENCE ENERGIZER HOOK-UP

Material List:

Plywood Box 18"x18"
1/2" Conduit
2 Waterproof Conduit Connectors
12 Gauge Wire
G.F.I. Receptacle
Waterproof Outlet Box (Outdoor)
30 Amp. Breaker
110 V. Energizer
3 Ground Rods
3 Ground Rod Connectors
Lightning Coil
Lightning Arrestor
Lag Bolts - To secure box to pole

Box Hook-up

1. Mount the plywood box on a pole next to the main panel in-line with the side knockout plugs. Install the waterproof outlet box inside the plywood box.
2. Install a waterproof conduit connector in the feed panel and the other in the water proof outlet box. Connect the two with 1/2" conduit.
3. Install the G.F.I. receptacle and connect to a 30-amp breaker using 12-gauge wire.
4. Mount the 100 Volt energizer inside the plywood box. A standard grounded plug should be wired to the unit and plugged into the G.F.I. receptacle.
5. The energizer should be grounded by connecting three strands of fence wire to 3 ground rods set away from the power unit. The ground rods should be set approximately 33 feet apart.
6. Connect the fence feed line to the energizer. Make sure the wire is insulated so that it does not come in contact with the waterproof outlet box.
7. Install the lightning coil and arrestor on feed line. Make a connection to the strands of the fence to be charged.

Use a separate ground rod for the lightning arrestor. Do not use the grounds for the energizer.

Maintenance Procedure & Tips

Maintain accurate records of Fence Voltages and Dates checked. Variations in voltages can help in the troubleshooting. Dates can help in the scheduling of fences due to be checked. Have a comments section to inform others of work needed and condition of fence. Make available to all crewmembers and supervisors.

Safety Concerns:

Driving Conditions, Walking Conditions on rough terrain, Strains, Sprains, and Cuts, Eye injuries, Bees in Battery Boxes or ground nests, Chainsaw operations, and Poisonous snakes

Always wear the proper safety equipment;
Safety Glasses are required when working with High Tensile Wire. Leather Gloves are recommended.
Work with a partner during chainsaw operations. Chaps, Hardhats, and Ear protection is required.

Snake Chaps in area of know dens or feeding sites.
Carry a portable radio if working alone in remote area.

Checking Procedure:

Read fence voltage and compare to previous readings….any variation is an indications of possible problems.
Read top wire Voltage, Small trickle charge voltage is normal, but voltages matching those of the hot wires indicate wires are crossed or tree or trees on fence.
Low Voltages on all wires indicate all wires twisted or Tree on fence to the ground. Normal but low readings usually indicate problem with energizer system.
Power Settings. Energizers are equipped with H, M, L settings. These are used to help put less drain on the systems during winter months or long periods without sunlight.
High Setting should be used as soon as possible in the spring to eliminate browsing of new buds and "train" deer.
Check condition of Battery by readout on C-12 controller, If the battery isn't reading 12 + volts by afternoon, consider switching in newer battery or changing the energizer setting. Frequent changing of batteries is not normal and other problems with the energizer system need to be addressed.
Walk Fence…WITH POWER ON…..Look for anything touching the wires, Broken insulators, Worn corner lags, Missing T-post clips, Snapping noise which indicates a short to tree or earth.
Items to carry while walking are:
Hammer, Insulated Pliers, Insulators, Nails, Wire Ties, T-post clips, Hand Snips.
Fences that become grown in with vegetation should be sprayed with Herbicide and a pre-emergence agent. AKA Round-up Pro & Oust.
After the vegetation is dead it must be removed from touching the fence….wet dead vegetation will also cause a short.
Hazard trees should be removed when they pose a threat to falling on the fence. Preventative work eliminates major repairs.

Inspect Fences on a regular schedule, always after weather events such as Wind Storms, Rain, Snow, Lightning, etc.

Deer Fence Maintenance

Electric Fences

Equipment Required:

Chain Saw & Wedges
Wire Cutters
Pliers
Hammer
Screwdrivers
Nail Puller (Claw bar)
Small Axe
Daisy Tightner Tool
Crimp Tool
Wire Strippers
Brush Cutters
Brush Snips
Weed Whips
Multi-Meter (D.C. Low Voltage)
Fence Meter

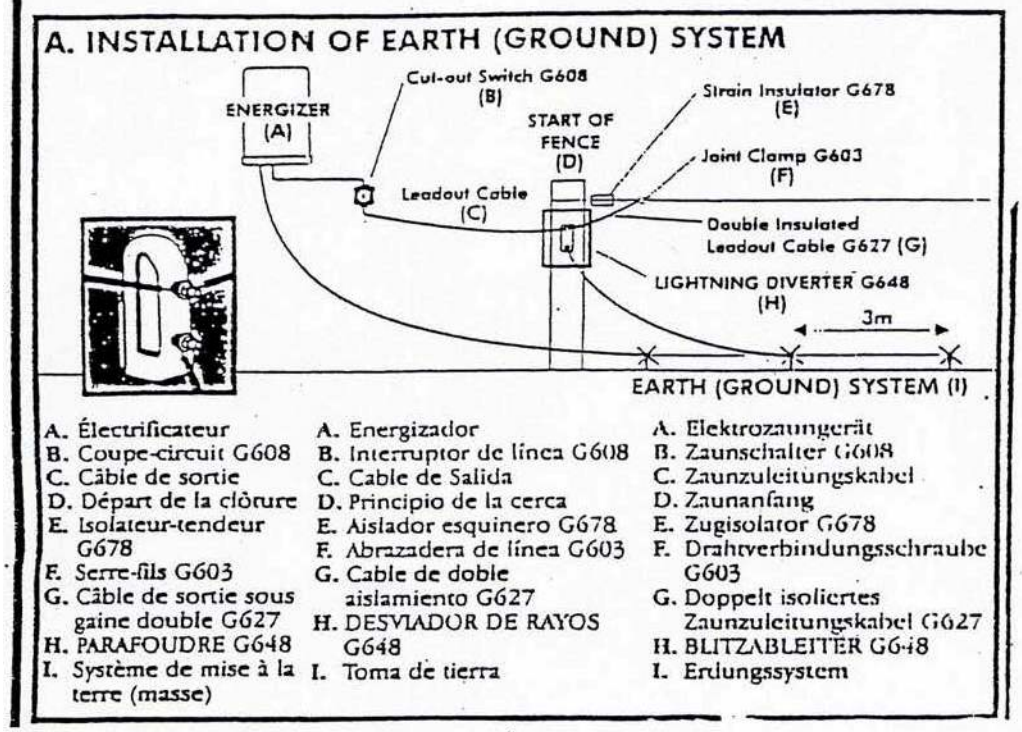
Safety Equipment:

Chaps, Helmet & Gloves
Safety Glasses
Snake Chaps
ATV Helmet
First Aid Kit
Portable Radio

Supplies

Daisy Tighners
14 Gauge Crimps
14 Gauge Wire
Fence Nails (1 ½ Inch)
10 p Nails
Mechanics Wire (20 Gauge Soft)
Post Clips
Insulators
Wire Ties
Wire Nuts
Wire Clamps
Insulated Wire (12 Gauge)

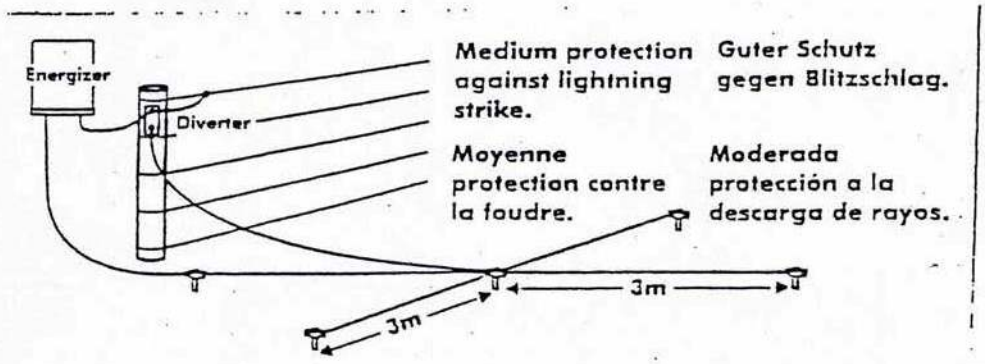
FIGURE 1



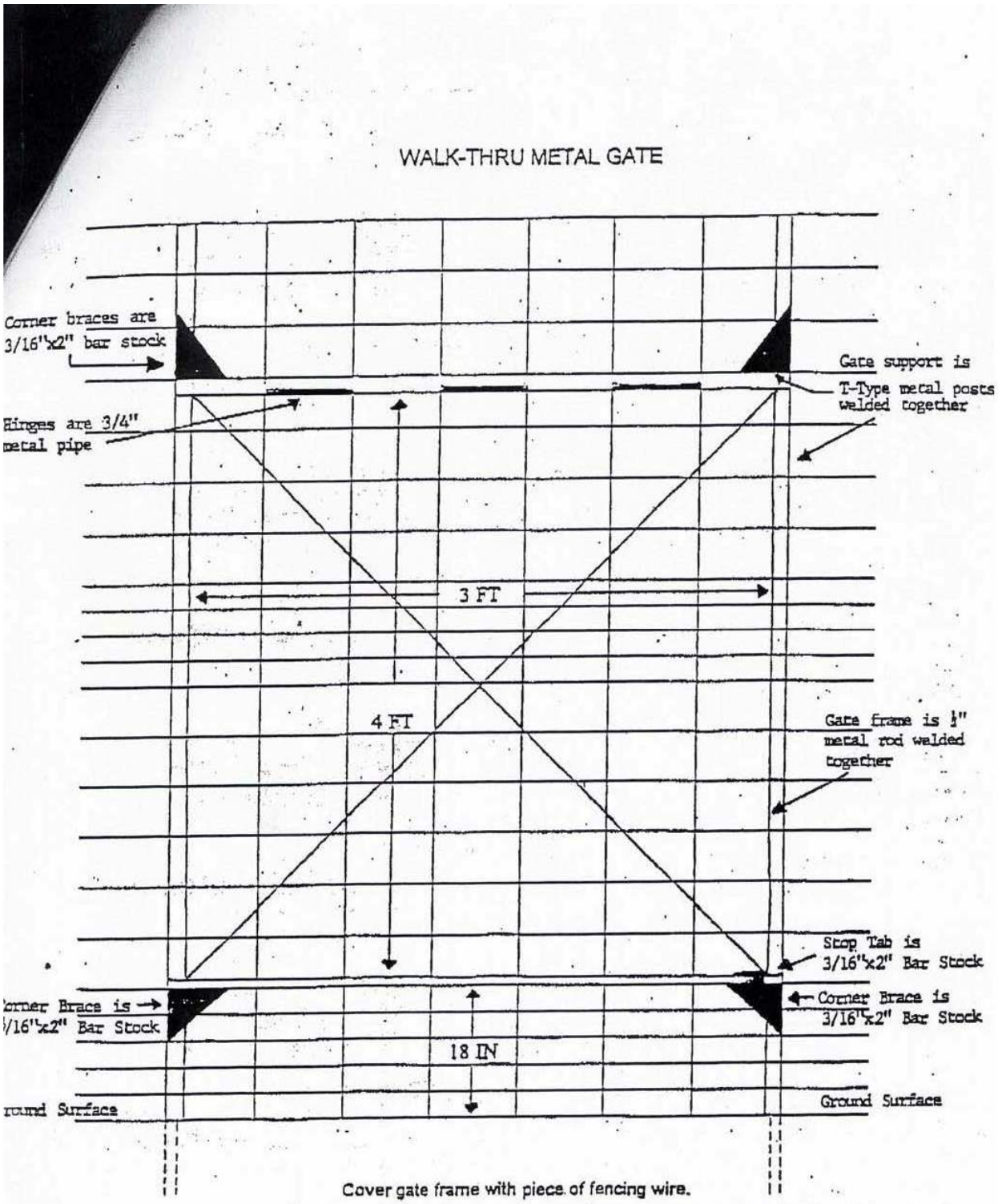
A. Électrificateur
B. Coupe-circuit G608
C. Câble de sortie
D. Départ de la clôture
E. Isolateur-tendeur G678
F. Serre-fils G603
G. Câble de sortie sous gaine double G627
H. PARAFOUDRE G648
I. Système de mise à la terre (masse)

A. Energizador
B. Interruptor de línea G608
C. Cable de Salida
D. Principio de la cerca
E. Aislador esquinero G678
F. Abrazadera de línea G603
G. Cable de doble aislamiento G627
H. DESVIADOR DE RAYOS G648
I. Toma de tierra

A. Elektrozaungerät
B. Zaunschalter G608
C. Zaunzuleitungskabel
D. Zaunanfang
E. Zugisolator G678
F. Drahtverbindungsschraube G603
G. Doppelt isoliertes Zaunzuleitungskabel G627
H. BLITZABLEITER G648
I. Erdungssystem



Picture of man gate setup on electric fence.



Cover gate frame with piece of fencing wire.

Build gate to swing outward only. Tab or length of gate stops gate from swinging inward.

Picture of vehicle gate on electric fence.

Appendix IV

BOF Species Codes

	SPECIES	
01	**White Pine**	
02	**Misc. Spruce**	
03	Not Used	
04	Not Used	
05	**Fir**	
06	**Hemlock**	
07	**loblolly Pine**	
08	**Shortleaf Pine**	
09	**Pitch Pine**	
10	**Virginia Pine**	
11	**Red Pine**	
12	**Cedar**	
13	Not Used	
14	Not Used	
15	**Scotch Pine**	
16	**Larch**	
17	**Misc. Conifers**	
18	**Table Mtn. Pine**	
19	**Norway Spruce**	
20	**Sugar Maple**	
21	**Red Maple**	
22	**Silver Maple**	
23	**Red Maple**	**Pulp**
24	**Mixed Oak**	**Pulp**
25	**Northern Hardwood**	**Pulp**
26	**Mixed Hardwood**	**Pulp**
27	**Conifer**	**Pulp**
28	**Aspen**	**Pulp**
29	Not Used	**Pulp**
30	**Red Oak**	
31	**Black Oak**	
32	**Scarlet Oak**	
33	**Pin Oak**	
34	**S. Red Oak**	
35	**Water Oak**	
36	**Shingle Oak**	
37	**Willow Oak**	
38	Not Used	
39	Not Used	
40	**White Oak**	
41	Not Used	
42	**Bur Oak**	
43	**Swamp White Oak**	
44	**Overcup Oak**	
45	**Post Oak**	
46	Not Used	
47	Not Used	
48	**Chestnut Oak**	
49	Not Used	
50	**Yellow Birch**	

	SPECIES
51	**Sweet Birch**
52	**River Birch**
53	**Paper Birch**
54	**Beech**
55	**White Ash**
56	**Black Ash**
57	**Green Ash**
58	**Basswood**
59	**Yellow Poplar**
60	**Hickory (Species)**
61	**American Elm**
62	**Misc. Elm**
63	**Bigtooth Aspen**
64	**Quaking Aspen**
65	**Sweet Gum**
66	**Black Gum**
67	Not Used
68	**Black Walnut**
69	**Black Locust**
70	Not Used
71	**Butternut**
72	**Black Willow**
73	**American Chestnut**
74	**Hackberry**
75	**Sycamore**
76	**Black Cherry**
77	Not Used
78	**Honey Locust**
79	**Yellow Buckeye**
80	Not Used
81	**Flowering Dogwood**
82	**Persimmon**
83	**American Holly**
84	**Cucumbertree**
85	**Balsam Poplar**
86	**Cottonwood**
87	**Willow (Species)**
88	**Magnolia (Species)**
89	Not Used
90	**Hornbeam**
91	**Serviceberry**
92	**Hophornbeam**
93	**Gray Birch**
94	**Mulberry**
95	**Pin Cherry**
96	**Sassafras**
97	**Sourwood**
98	**Chinkapin Oak**
99	**Miscellaneous**