HOWARD COUNTY

FOREST CONSERVATION MANUAL

June 7, 1999

HOWARD COUNTY

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CHAPTER I

INTRODUCTION

In the 1991 session, the Maryland General Assembly passed the Forest Conservation Act (SB 224), a law that requires all local jurisdictions to establish and enforce controls on the disturbance of wooded areas when properties are developed. The Act has been incorporated in the Annotated Code of Maryland as Natural Resources Article, Section 5-1601 to 5-1603.

In establishing its own program, Howard County must comply with the numerous standards and procedural steps that the State law specifies. Nevertheless, each local jurisdiction is given leeway to incorporate the basic requirements of the Forest Conservation Act into its own procedures and requirements for approval of subdivision plans, site development plans or grading permits.

This manual presents the Howard County program for implementing the mandates of the State Forest Conservation Act. The fundamental requirements of the Howard County program are contained in Subtitle 12 of the Planning, Zoning and Subdivision and Land Development Regulations. Many other development requirements must be coordinated with the requirements of Subtitle 12. To guide developers and their consultants in complying with the County program and in coordinating such compliance with other regulatory requirements, this manual:

- Explains the basic concepts and requirements of the State Forest Conservation Act and the resulting County regulations;
- Clarifies basic program goals such as priority areas within which trees should be preserved;
- Explains in detail the procedures to be followed at each stage of the submission and approval process when forest conservation plans are required; and
- Provides guidelines and standards for implementing specific actions required as part of an approved forest conservation plan.

The forest conservation program implements many of the policies and actions of the 1990 General Plan on protecting trees and other natural vegetation and promoting environmentally sensitive design. Additional urban forestry and landscape design measures are needed to carry out other General Plan policies regarding protection of scenic roads, community enhancement by landscape design, and such issues as use of

landscape design in historic preservation. Forest conservation activities are not to be confused with landscaping measures, but both can and should complement each other. Both seek to increase the role trees and other vegetation (natural or introduced) play in improving the quality of developed areas.

CHAPTER II

KEY CONCEPTS: FOREST CONSERVATION PROGRAM

The State Forest Conservation Act is long and very detailed. Nevertheless its main intentions are quite easy to summarize:

- When developing a site, keep intact as much of the existing forest resources as possible (retention).
- If trees must be cleared, replant woodlands (reforestation).
- On sites where no or very limited forest resources now exist, plant new forest stands to create the minimum level of forest cover specified (afforestation).

Before presenting the details of the Howard County Forest Conservation Program, it is necessary to understand some of the basic concepts and procedures that the Forest Conservation Act mandates must be part of our local forest conservation program.

Many of these terms and concepts can be further clarified by referring to *Appendix A*, a glossary of select definitions from the State Forest Conservation Manual and the County Planning, Zoning, and Subdivision and Land Development Regulations. This chapter focusses on the most important and innovative concepts that the State Forest Conservation Act mandates all local programs incorporate.

APPLICABILITY

All requests for approval of subdivision plans, site plans, grading permits or County road and utility projects shall comply with the procedures and requirements of the Howard County Forest Conservation Program except for the following as detailed in Section 16.1202(b) of the County Code:

- Development activities on single lots smaller than 40,000 square feet, as long as any such cutting, clearing or grading does not include any area already subject to previously approved forest conservation restrictions.
- Development activities on a single lot of any size if the total area of forest to be cut, cleared or graded does not exceed 40,000 square feet, if these areas are not subject to previously approved forest conservation restrictions, and a declaration of intent is filed.

- Projects with preliminary plan, sdp, or grading permit approval prior to December 31, 1992. This exemption does not apply to expansion of the limits of disturbance shown on such plans or to sdps for build-out of non-residential subdivisions.

- A planned unit development which has preliminary development plan approval and 50% or more of the land is recorded and substantially developed before December 31, 1992;

- A planned business park of at least 75 acres which has preliminary plan approval before december 31, 1992, and which meets the intent of this subtitle by retaining forest in high priority locations (floodplains, wetlands, wetland and stream buffers, steep slopes, and/or wildlife corridors);

- Agricultural preservation subdivisions and any agricultural activity, including agricultural support buildings and structures unless it involves clearing 40,000 square feet or greater of forest within a one year period.

- Resubdivisions that create no additional lots, exempt divisions and plat corrections.

- Minor subdivisions that create one additional lot and have no further subdivision potential, based on the existing zoning.

- Any routine maintenance of existing public rights-of-way for utilities or roads.

- Any agricultural activity, including support buildings and structures, involving the clearing of 40,000 square feet of forest or more per year if a declaration of intent is filed. Agricultural activities include Christmas tree farms, orchards and tree nurseries.

- Commercial logging and timber harvesting operations carried out in accord with required State and local timber harvest permit procedures, if a Declaration of Intent is filed.

- Subdivision to permit a real estate transfer that does not involve a change in land use, additional development or redevelopment and declarations of intent are filed.

DECLARATION OF INTENT

State regulations call for filing a Declaration of Intent when exempted activities will be carried out.

The Declaration of Intent serves two purposes. First, filing a Declaration of Intent notifies those responsible for the forest conservation program that any cutting or clearing resulting from the exempt activity does not require a forest conservation plan. Second, filing a Declaration of Intent results in a written reminder to all parties that the exemption from forest conservation obligations is contingent on no subsequent activity regulated by the forest conservation program occurring within five years of completing the exempted activity for which the Declaration of Intent was filed.

If a request for a non-exempt activity (subdivision, site development plan or grading permit) is made within five years of completing an activity that is the subject of a Declaration of Intent, the forest conservation obligations of the proposal will be retroactive to cover the forest resources that existed at the time the Declaration of Intent was filed. In other words, reforestation may be required for cleared forest resources that existed on the site when the Declaration of Intent was filed.

For example, a site has 70 acres of net tract area that are all forested. A timber harvesting permit application and a Declaration of Intent are filed for commercial logging. Some 60 acres of trees are cut; 10 acres remain intact. However, within two years the owner applies for approval to subdivide. The forest conservation obligations of the proposed subdivision would be calculated on the basis of the original 70 acres of forest community, not the 10 acres that survived.

Appendix B contains a sample format to be used when filing a Declaration of Intent. Exhibit 6-4 outlines the process for obtaining a timber harvesting permit. Timber harvesting permits will not be approved for the cutting or clearing of land that is in the subdivision or site development plan review process until the forest conservation plan is determined to be technically complete, thereby establishing the forest conservation easement boundaries.

FOREST

A forest is a natural ecological community dominated by trees but including understory plants such as shrubs and ground cover. Such areas are also animal habitats, since they provide food and shelter for a variety of species. To be fully effective as a complex environmental community, woodland areas need to be large enough to provide space for a variety of plant and animal species, to afford protection from outside intrusions and to

be able to mature and regenerate themselves. The State's Forest Conservation Act has defined forest areas to be at least 10,000 square feet or about 1/4 of an acre.

The State law singles out some individual trees for special consideration (e.g. State Champion trees, trees more than 30" in diameter, trees associated with historic sites). But the emphasis of the Act is on forest communities, and the priorities of the Howard County Forest Conservation Program reflect this emphasis.

NET TRACT AREA

The net tract area concept mandated by the State Act is based on an assumption that floodplains are already adequately protected from disturbance. The focus of the Act therefore is on those areas not covered by floodplain protections. All calculations and retention priorities only apply to the net tract area (i.e. the portion of a site not in the floodplain).

In rural areas, the net tract area concept is further refined to exclude not only any floodplain areas, but also all areas not part of the proposed subdivision or not undergoing any land use change.

FOREST RETENTION PRIORITIES

Although all forest stands have environmental value, priority areas for retention must be established for development sites. Some clearing is often unavoidable to permit the land uses allowed by zoning. The basic intent of the forest conservation program is to keep any losses to a minimum. When choices must be made, however, the program favors protecting forest stands that help protect sensitive areas such as wetlands, steep slopes or stream buffers. The emphasis of the program is on protecting sensitive areas and on maintaining large contiguous undisturbed forest stands rather than on saving trees as isolated or aesthetic resources.

All the areas listed below are considered priority areas for retention. They should be left undisturbed unless the applicant can demonstrate to the Department of Planning and Zoning that reasonable efforts to protect them cannot be implemented, that the uses allowed by right cannot occur without such disturbance, or that forest planting in an alternate location would have greater environmental benefit. In any case, all requirements regarding preservation of steep slopes, stream buffers, wetland and their buffers will be enforced as required by other sections of County regulations.

1. 100-year floodplain and stream buffer areas.
2. Wetlands and wetland buffers.

3. Trees and other vegetation identified on the Federal and State rare endangered species lists and threatened and critical habitat areas.
4. Steep slopes 25% and greater.
5. Forest contiguous with the sensitive areas above or other existing forest stands.
6. Property line and right-of-way plantings such as hedgerows and mature tree buffers, particularly adjacent to scenic roads.
7. State Champion trees, trees 75% the size (diameter) of State Champion trees, and trees 30" in diameter.
8. Trees and other forest resources closely associated with a historic site.
9. Isolated forest stands or tree groves of less than 10,000 square feet that will be enlarged to meet minimum standards for forest.
10. Specimen trees not part of any of the above.

FOREST STAND DELINEATION

Projects that are subject to the forest conservation program require a forest stand delineation. A delineation is a qualitative and a quantitative description of all the existing forest and other vegetation on or immediately adjacent to the site. The delineation documents the different types of on-site forest resources and describes their individual characteristics (e.g. dominant species, maturity, condition, etc.). It also shows the relationship of forest resources to the priority retention areas cited above.

The forest stand delineation is later used to evaluate the potential impacts on forest resources of a specific subdivision or site development proposal. Details on the requirements for an acceptable forest stand delineation and an example of such an analysis are described in *Chapter III.*

FOREST CONSERVATION PLAN

A forest conservation plan is required for all activities subject to the forest conservation program. While the program recognizes that clearing may be necessary to implement the land uses permitted by the zoning ordinance, the development proposal must respond to the retention priorities of the forest conservation program and its primary goal that disturbance of existing forest resources be minimized. The forest conservation plan is thus both a product and a determinant of the overall development proposal. *Chapter IV* describes the required elements in a forest conservation plan submittal and provides an example of such a plan.

REFORESTATION

The forest conservation program establishes reforestation requirements to compensate in part for the loss of forest resources within a development. Determining reforestation obligations calls for an accurate quantitative analysis of the clearing and grading impacts of a proposed development. The amount of reforestation required depends on many factors, but the two most significant are the amount of trees on site and the intensity of the proposed land use.

Several variables enter into the calculation of reforestation obligations:

- Size of the net tract area (i.e., the area of the total site minus 100-year floodplains and preservation parcels).
- Amount of existing forest areas within the net tract area.
- Amount of these existing forest areas that will be retained.
- Reforestation threshold for the land use proposed.
- Extent of clearing above or below the reforestation threshold.

When these variables are entered into the calculations, the results show whether the development will require reforestation or not and if so, how much. If reforestation is required, the forest conservation plan must show in detail where and how this will be accomplished.

Because it is an important but easy-to-misunderstand concept, a large section of *Chapter IV* is devoted to the reforestation threshold concept and sample calculations.

AFFORESTATION

Having little or no forest on-site does not exempt a development from the requirements of the forest conservation program. Because the State law mandates the use of forest resources to increase the environmental quality of all developed areas, developments on sites without sufficient forest resources must include areas where new forest resources will be added. This afforestation is not a compensation for destroying existing resources, but an obligation to contribute to an increase in the overall forest resources of a development. Afforestation should not be confused with landscaping. The afforestation requirements are for creating new forest communities, not aesthetic enhancement.

PRIORITY LOCATIONS FOR REFORESTATION AND AFFORESTATION

Similar to priority areas for retention of existing forest resources, the program also cites priority areas for reforestation and afforestation. The most appropriate locations for these

new forest plantings are where they will protect, enhance or restore environmentally sensitive areas within the proposed development. The priority locations for reforestation and afforestation areas are:

1. 100-year floodplains and stream buffers.
2. Wetland and wetland buffers.
3. Critical habitat areas and forest corridors for wildlife movement, where practical a minimum 300 feet in width.
4. Steep slopes of 25% or greater and slopes of 15% or greater with a soil K value greater than 0.35.
5. Areas adjacent to existing forest stands.
6. Land use or right-of-way buffers, particularly adjacent to scenic roads.
7. Infill plantings between small forest and tree stands.

The Department of Planning and Zoning may approve lower priority locations for reforestation and afforestation on this list when such locations better achieve the intent of the program or County land use regulations. Alternately, if off-site planting would have greater environmental benefit, the Department may approve off-site planting in high priority locations within the county, preferably within the same sub-basin or watershed.

Chapter V details required and recommended reforestation and afforestation practices.

PREFERRED METHODS FOR REFORESTATION AND AFFORESTATION

A preferred sequence of reforestation and afforestation methods establishes priorities for implementation of new plantings. While preferred methods range from enhancement of existing areas to preparation of a site for natural regeneration, specific site conditions may determine when more preferred methods may not be appropriate and less preferred methods may be approved.

1. Selective clearing and supplemental planting.
2. On-site planting with transplanted or nursery stock that is greater than 1.5 inches diameter breast height.
3. On-site planting with transplanted or nursery stock using whip and seedling stock.
4. Landscaping in accordance with the amount (20% maximum) and criteria cited in *Appendix F*.
5. Off-site planting with transplanted or nursery stock that is greater than 1.5 inches diameter breast height.
6. Off-site planting with transplanted or nursery stock using whip and seedling stock.
7. Natural regeneration.

MEETING PROGRAM GOALS OFF-SITE

Retaining existing stands or creating new forest resources within a development may not always be practical or result in significant forest communities. Therefore, it may be necessary or more environmentally beneficial to fulfill forest conservation requirements at another Howard County location. Such locations are preferably within the same watershed. Such off-site mitigation may occur when the County determines that on-site retention, reforestation or afforestation is unreasonable or where reforestation or afforestation would result in stands that would be small, ecologically isolated or in low priority locations.

Off-site mitigation areas are usually identified "as needed". However, in order to encourage larger forest plantings in high priority locations, the Department of Planning and Zoning May approve the establishment of a Forest Mitigation Bank. Mitigation easement rights may be purchased by a developer when the Department determines that forest conservation obligations can be met off-site and that the mitigation bank has met all requirements.

MINIMUM SIZE FOR FOREST STANDS

Forest stands of at least 10,000 square feet are the minimum size acceptable to meet the requirements of the program. This does not mean that small clusters or individual trees cannot or should not be saved, but that the retention or creation of such plantings does not result in the establishment of forest communities. There are, however, exceptions wherein smaller stands can meet the obligations of the forest conservation program.

DIFFERENCES FROM OTHER APPROACHES

Before presenting the detailed requirements and guidelines, it is important to state (or restate) how the basic concept and goals of the forest conservation program differ from the approaches of many traditional tree preservation or landscaping ordinances.

1. The State Forest Conservation Act is not a tree preservation act. While some individual trees may be affected by a forest conservation program (e.g. champion trees or those associated with historic sites), the emphasis is on forest communities. This means forest areas of at least 10,000 square feet that are a minimum 35' wide.

2. There are no fixed minimum forest retention requirements that must be adhered to. The goal is no more clearing of forests than necessary.

Mandated reforestation thresholds are not minimum requirements. Rather, the reforestation threshold concept is an accounting device for calculating whether and how much reforestation may be required to compensate, in part, for whatever clearing may be unavoidable.

3. The program not only controls loss of existing forest resources, it also requires creation of new forest communities where trees are absent or minimal. The afforestation requirements are minimum standards.

4. Reforestation and afforestation are not landscaping as it is usually practiced. Reforestation and afforestation create new forest communities that will replace to some degree the forest resources that have been lost during recent decades of increased land development. Their primary purpose is environmental, not aesthetic. Reforestation and afforestation stands will require special management and initially may not look attractive. Not all locations within a development may be appropriate for reforestation and afforestation.

CHAPTER III

FOREST STAND DELINEATION

PURPOSE AND APPROACH

All activities requiring a forest conservation plan require a forest stand delineation to map and describe the existing forests and related environmental resources on the site. The information presented in the forest stand delineation becomes the basis for decisions regarding retention, reforestation and afforestation.

Most of the information in a forest stand delineation concerns trees, the dominant species in a forest community. Nevertheless, the emphasis of the program on forest communities requires some description of the understory plants and ground cover, the age or succession stage of the forest community, and other characteristics of on-site vegetation. The relationship of existing forest resources (or the absence of such cover) to soil types and environmentally sensitive areas such as wetlands, steep slopes and stream buffers is necessary to evaluate the retention, reforestation or afforestation proposals included in the required forest conservation plan.

The forest stand delineation requirements described in this manual are relatively simple to implement, yet detailed enough to adequately assess forest resources. Additional detail may be requested when specific conditions warrant.

SUBMISSION REQUIREMENTS

The forest stand delineation submittal shall include:

Forest Stand Delineation Plan Sheet

The plan shall be at the same scale and use many of the same base data sources as the initial subdivision or site development plan submission; shall use criteria or definitions as required by the Howard County Subdivision and Land Development Regulations; and shall show the following information:

- Property boundaries.
- Topographic information.
- 100 year floodplains and net tract area of site.
- Current forested and unforested areas, forest stand locations and tree lines extending off-site.

- State Champion trees, trees 75% of the size (diameter) of State champion trees and trees 30" in diameter or larger.
- Steep slopes: 25% and greater and 15%-25%.
- Critical habitats. (To be identified on 1992 Maryland Resource Inventory or as made available by the Natural Heritage Program in consultation with DNR). If rare, threatened or endangered species are identified on site, the forest stand delineation will be sent to DNR by the Department of Planning and Zoning for review and comment.
- Perennial and intermittent streams and stream buffers (75' from stream bank in residential zoning districts and 50' in all other districts).
- Soils.
- Non-tidal wetlands and 25' buffers.
- Existing buildings, structure including walls and fences, roads and trails, utilities and easements.
- Adjacent land uses.
- Historic sites. (Federal historic register or County or State inventories).
- Site vicinity map. The map shall include the location of the site within a square mile indicating major roads, land uses and forest cover. (Source: County 1" = 600' topographic maps)

Classification of Forest Stands and Other Vegetation

The required information about the vegetative plant communities must be obtained by field observation.

All on-site vegetation shall be classified by plant community types. The following list is a guideline. Each of these categories can be further subdivided into different stands depending on species groups, size groups, cover types, etc. Forest associations typically in this region are listed in *Appendix D*. *Exhibit 3 - 1* shows how a site can be divided into a range of different plant communities. Since there can be several types of forest or other plant communities within the same project, they can be identified by symbols (e.g., F-1, F-2).

- Forest (**F**)
- Wetlands (other than forested) (**W**)
- Abandoned field (**AF**)
- Open field, pasture or meadow (not including lawns) (**OF**)
- Hedgerow (**H**)
- Tree groups and specimen trees (typically without stratified understory, lawns or landscape beds may occur beneath) (**T**)
- Lawns, playfields and other turf areas - non-agricultural (**L**)
- Crops (areas actively tilled periodically to plant and harvest agricultural products) (**C**)

- Orchards (**OR**)
- Tree nurseries and Christmas tree farms (**N**).

These individual communities must be identified on the forest stand delineation plan sheet. *Exhibit 3 - 1* is a typical example of such a plan sheet.

Forest Stand Analysis Tables

Data collected by the field investigation shall be tabulated and summarized for each stand. *Exhibit 3 - 2* is an example using the required format. A worksheet is provided in *Appendix C*. The information detailed on the forms shall describe:

- Type of community/association: in accord with the classification system discussed above.

- Area: the acreage of the community, measured to the nearest 1/10 acre.

- Soil information: soil types, typical forest cover for the soil type and woodland suitability index. The typical cover is the type of plant community likely to be present if the area has been undisturbed. It is cited as the last sentence of the first paragraph of the written descriptions of each soil type in the Soil Survey of Howard County, Maryland. The Soil Survey also assigns a woodland suitability index for each soil type.

- Habitat value: the relative value of the stand as a source of food, cover or breeding area for multiple species. The Soil Survey provides a habitat value assessment for each soil type based on cover type and open, woodland or wetland situation.

- Existing vegetation: dominant species, including canopy and understory species, with approximate percentage.

- Stand characteristics: size range, average age and typical condition of dominant species

- Forest areas in sensitive environments: area of forests, measured to the nearest 1/10 acre in floodplain, wetland and wetland buffer, stream buffer and steep slopes.

Forest Stand Delineation Narrative

The forest stand delineation must include a written summary describing each vegetative community. In general, the written summary shall assess the significance of the

EXHIBIT 3 - 1
FOREST STAND DELINEATION PLAN SHEET
EXAMPLE

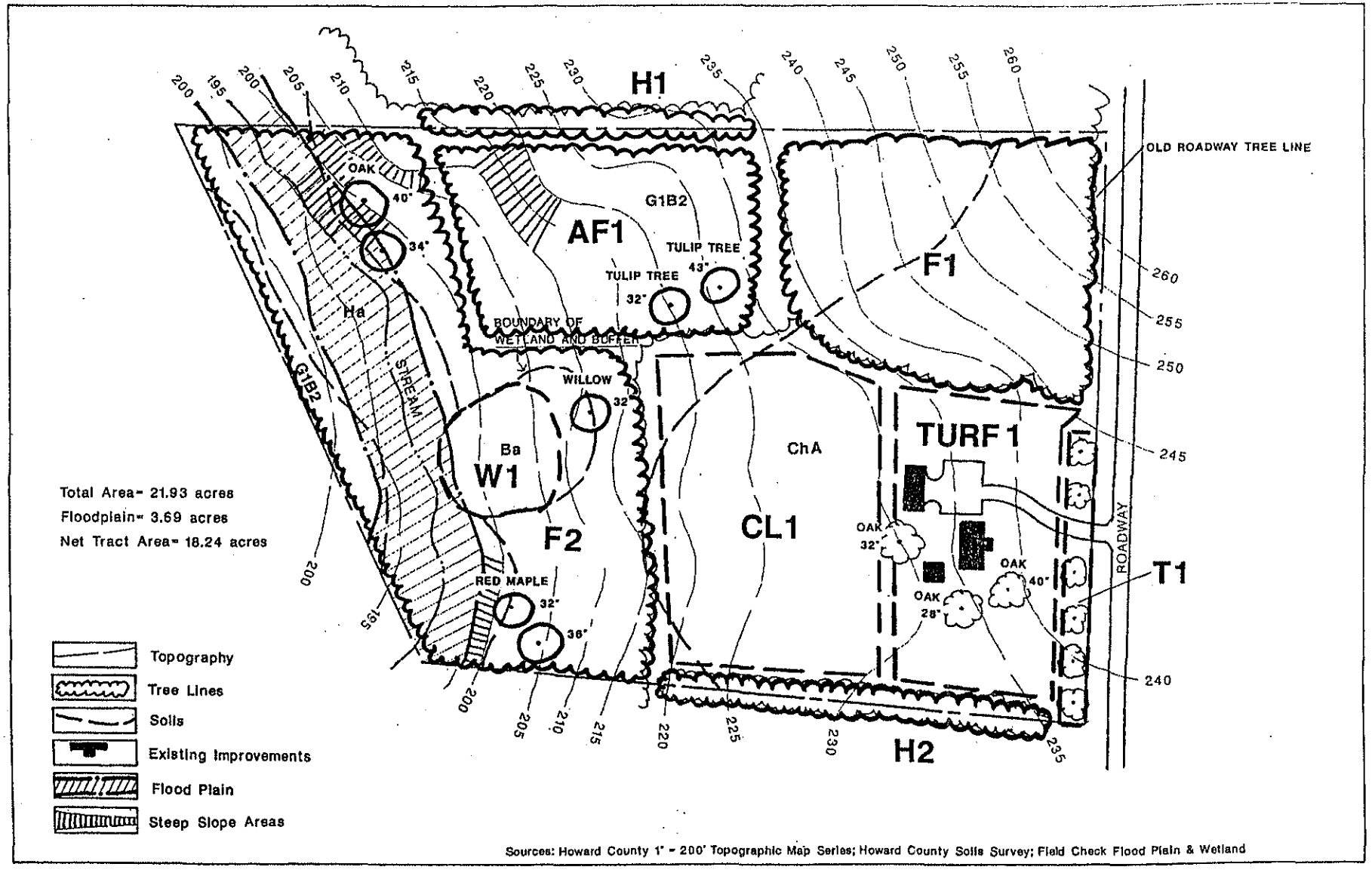


EXHIBIT 3 - 2
FOREST STAND ANALYSIS TABLE

Applicant: _____ Project Name: _____ Submission No. _____

KEY	A. TYPE OF COMMUNITY	B. AREA	C. SOIL INFORMATION			D. EXISTING VEGETATION (Dominant Species and Approx.%)	E. STAND CHARACTERISTICS			F. FOREST AREA IN SENSITIVE ENVIRONMENTS (Acres)	G. HABITAT VALUE
			1. Soil Types	2. Typical forest cover for soil type*	3. Woodland Suitability Index		1. Size (Diam)	2. Age	3. General Conditions		

information required by the forest stand delineation table and note any special characteristics of the vegetation. The level of detail for such descriptions may vary with the relative size, importance or complexity of the stand. The following information shall be included in the narrative when relevant:

- Forest structure: degree of canopy closure, character of forest floor (shrubs, herbaceous, downed material, etc.), presence of exotic or invasive species.

- Stand condition: evaluation of each stand with reference to stand structure (dominant species, understory species), potential to withstand disturbance, potential for transplant material, comments on evidence of past management.

- Woodland suitability: Soil Survey guidance about degree of productivity (as measured in height), seedling mortality, windthrow hazards, degree of competition from other species, ability to use equipment to manage tree stands, and which species are likely to be most suitable for planting.

- Relationship to other environmental features: forest stand location in reference to floodplains, wetlands, slopes, soils, habitats, land uses, etc. The effect of existing or proposed development on habit values should be noted.

- Typical cover: comparison of the typical cover for the soil group to the existing cover. This information may be used as a guide for selecting species to be used in reforestation or afforestation.

- Retention priority areas: relation of the forest stand to the forest retention priority areas listed in *Chapter II.*

- Potential problems: including higher than average probability of erosion if disturbed, poor soils for reforestation or afforestation, or soils prone to saturation or flooding which can affect growth of certain species. Soil Survey information is an easy to use resource for flagging potential problems or opportunities; i.e., as an indicator of potential problems if disturbance of forest cover occurs or of the inherent ability of the soil to support good forest growth. Explanations should be provided if soils have been seriously altered or if Soil Survey data appears to be in error.

Exhibit 3 - 3 is an example of a forest stand delineation narrative.

EXHIBIT 3 - 3
FOREST STAND DELINEATION NARRATIVE
EXAMPLE

Stand F-2

Stand F-2 is a mature mixed hardwood forest whose dominant species are successfully reproducing themselves, a sign of its long term viability. The understory is typical of mature mixed stream valley forests with a large percentage of dogwood and laurel on the upper areas and spicebush and other species typical of lowland/floodplain environments closer to the stream. Because of the dense canopy, ground cover is relatively sparse. Few signs of distress were found although some oaks have signs of past gypsy moth damage.

Approximately 60% of Stand F-2 covers environmentally sensitive areas. This, together with it inherent high quality, makes Stand F-2 a high preservation priority.

Stand AF-1

Stand AF-1 is a mix of trees typical of middle succession growth on abandoned farm fields. Because the canopy cover is not completely closed, the understory is very dense with some hardwood saplings but with greenbrier, honeysuckle, english ivy and poison ivy dominant in most areas. No environmentally sensitive areas are covered by Stand AF-1.

Because it is on well drained upland soil, Stand AF-1 could in time become a high quality mixed forest stand linking stands F-1 and F-2 into a large forest habitat in a predominantly open area now lacking such resources. At this time, however, its preservation priority would be considered moderate.

If all or significant parts of AF-1 are to be retained by the proposed development, selective thinning of older pines and poplars and removal of invasive vines it recommended to accelerate growth of hardwood saplings and diminish nuisances with regard to its relationship to new development.

CHAPTER IV

FOREST CONSERVATION PLAN

The purposes of the forest conservation plan are to show the relation of proposed forest retention or clearing to the preservation priorities cited in *Chapter II* and to the forest stand delineation described in *Chapter III*. The forest conservation plan is also reviewed to evaluate the sufficiency and the suitability of any proposed on-site reforestation or afforestation.

As part of a development submission, the forest conservation plan must be evaluated in relation to the full range of proposed improvements and changes to existing conditions.

SUBMISSION REQUIREMENTS

A forest conservation plan must show how a proposed development addresses the retention priorities of the forest conservation program, how forest conservation is coordinated with other subdivision or site development requirements, whether the proposal requires any reforestation or afforestation, and if so, where and how such new planting will be done. All design elements and construction practices must conform to the limits of disturbance and other restrictions imposed by the forest conservation plan. Forest conservation easements must be recorded prior to beginning construction. The forest conservation plan, therefore, must be realistic since later revision will require rerecording of plats or deeds, and non-compliance carries stiff penalties. For ease of review, the forest conservation plan and all other related plan submissions must be at the same scale. The forest conservation plan submittal shall include the following:

1. Forest Conservation Plan Sheet(s)

   - Boundaries of submission
   - Tabulation of gross and net tract area
   - Existing and proposed topography
   - Boundaries of environmentally sensitive areas, including floodplains, steep slopes, stream buffer areas, wetlands and their buffers
   - Boundaries of any proposed open space areas
   - Proposed site improvements (roads, lots, structures, stormwater management, etc.)
   - All existing forest areas and other specimen trees to be retained.
   - All existing forest areas and other trees to be cleared.
   - Location and extent of any reforestation or afforestation plantings.
   - Species and planting methods for reforestation or afforestation.

- Limits of disturbance lines and all protective measures and management techniques (including easements) to maintain the environmental integrity of all forest and specimen tree retention, reforestation or afforestation areas created by the plan.

2. Forest Conservation Worksheets

- Reforestation calculations to determine if reforestation obligations are created by proposed clearing.
- Afforestation calculations if existing forest resources do not meet the required minimum for the land use.

3. Additional Documentation

- Written narrative explaining reasons for any clearing, justifying for non-conformance to retention priorities or to location priorities for reforestation or afforestation, and justifying reforestation or afforestation methods proposed.
- Construction period protection and management program.
- Post construction protection and management program.

4. Off-site Reforestation Plan or Afforestation Plan (if applicable)

- Written justification for proposed off-site location for reforestation or afforestation.
- Plan of off-site property with:
  - location and size of areas to be planted
  - planting plan depicting species and methods to be used to implement reforestation or afforestation
  - protective measures and management technique.

All forest conservation plans will be evaluated for compliance with specific forest conservation regulations and the overall program goal to minimize disturbance of forest resources. The reasonableness of the proposed forest conservation measures in relation to other zoning, subdivision and design manual requirements is a prime concern.

Applicants may submit a request to pay a fee-in-lieu for the reforestation or afforestation obligations created by the development proposal. Such fee-in-lieu payments will only be approved when the applicant can demonstrate compliance with forest conservation requirements on-site or off-site cannot be reasonably accomplished. Procedures for requesting fee-in-lieu payments are described at the end of this chapter.

The rest of this chapter explains the requirements and procedures for achieving an acceptable forest conservation plan. Because they are the most complicated aspects of the program, the concepts and techniques for calculating reforestation and afforestation obligations are discussed first.

REFORESTATION CALCULATIONS

The forest conservation plan must document all proposed clearing of forest resources to determine how much reforestation may be required. The concepts and the method for calculating reforestation requirements mandated by State law are rather complex; numerous examples, therefore, are included in this Chapter.

Thresholds and Land Use

Exhibit 4 - 1 lists the reforestation thresholds for various land use categories. The threshold varies with the intensity of the land use since it should be easier to save forest areas in very low density and low intensity developments (e.g. a rural residential development) than it is in developments for more intensive land uses (e.g. a shopping center).

The threshold concept is based on land use and does not correlate completely with zoning categories. Special exceptions, for example, may differ from the normal land use; many institutional uses may occur in any zoning district.

The reforestation thresholds cited in *Exhibit 4 - 1* are not minimums. Rather they specify the point at which one factor for calculating reforestation obligations shifts from a rather low ratio (1/4 acre of reforestation/1 acre cleared) to a much higher ratio (2 acres of reforestation/1 acre cleared). *Exhibit 4 - 2* illustrates the different results on reforestation obligations when clearing remains above or drops below the threshold levels.

Retention Credit and Break Even Point

The system for calculating the reforestation obligations also incorporates a retention credit for maintaining forest cover above the threshold figure. An applicant may deduct one acre from any reforestation obligation for each acre retained above the threshold. The credit is an incentive to clear no more than necessary, since the more forest retained above the threshold level, the less effort and money the applicant must spend locating, preparing and maintaining reforestation areas.

The retention credit provision creates a break-even point for any given proposal. The break-even point is the point where the credit provision (1 acre above threshold saved/1 acre owed) offsets the reforestation obligation clause.

EXHIBIT 4 - 1

REFORESTATION THRESHOLDS

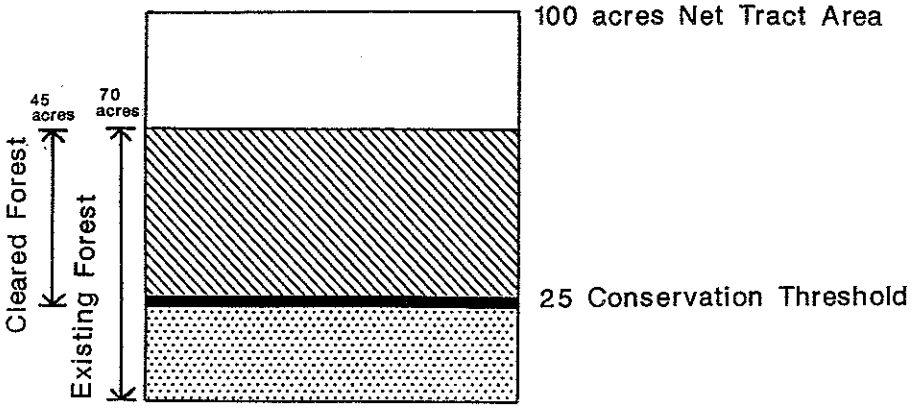
Reforestation	Land Use Threshold
A. Residential - Rural Low Density (residential lot average 5 acres or more)	50%
B. Residential - Rural Medium Density (Residential lot average 1.0 acre to 4.99 acres)	25%
C. Residential - Suburban (less than 1 acre per dwelling unit)	20%
D. Commercial/Industrial/Office	15%
E. Institutional	20%

EXHIBIT 4 - 2
REFORESTATION THRESHOLD DIAGRAMS

Clearing Up to Threshold

Reforestation Calculations:

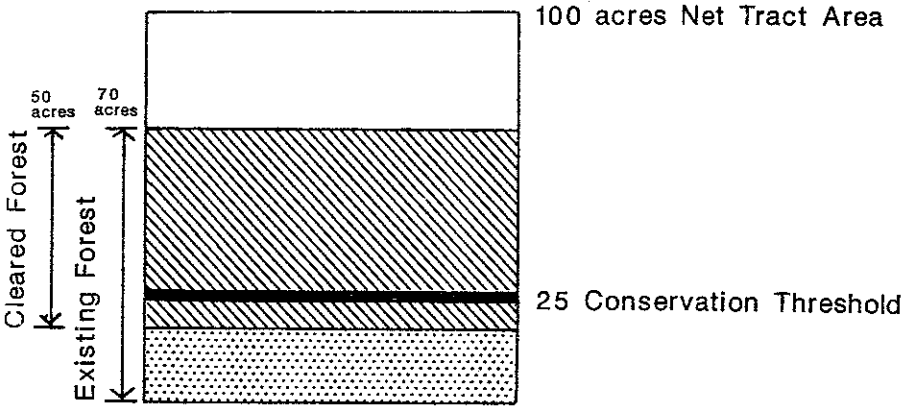
Above Threshold:	45 acres x 1/4	=	11.25 acres
Below Threshold:	0 acres x 2	=	+0.00 acres
Total:		=	11.25 acres reforestation required



Clearing Below Threshold

Reforestation Calculations:

Above Threshold:	45 acres x 1/4	=	11.25 acres
Below Threshold:	5 acres x 2	=	+10.00 acres
Total:		=	21.25 acres reforestation requirement



It is important to understand that there is no simple minimum preservation requirement for similar land uses. The starting point is always the amount of existing forest resources in the net tract area and this varies from site to site. A proposal for an all wooded site would yield a set of calculations different from the same proposal on a site only half wooded.

Sample Calculations and Illustrations

A series of sample calculations utilizing the same size site exhibit the method for calculating thresholds and show how varying the amount of clearing or the amount of original tree cover results in different reforestation obligations. An illustration is provided for each example.

- *Exhibit 4 - 3* shows how reforestation obligations are computed when clearing does not occur below the threshold.
- *Exhibit 4 - 4* shows how clearing below the threshold results in a substantial reforestation obligation.
- *Exhibit 4 - 5* shows how limiting clearing may earn the reforestation credit and cancel out any reforestation obligation.
- *Exhibit 4 - 6* shows how a fully wooded site is developed in the same way as the example in Exhibit 4 - 3 would result in a different reforestation obligation, even if clearing does not occur below the threshold.

A sample worksheet for reforestation calculations can be found in *Appendix E.*

Rural Districts

Due to the relatively large acreage involved in rural subdivisions, forest conservation requirements could be very large and conflict with agricultural use of the preservation parcel or residue, when clustering or only a portion of the original parcel is subdivided. State law provides that in rural areas the forest conservation obligations apply only to the area of actual "land use change" created by a subdivision or a development proposal, not the entire original parcel.

For example, if a 60-acre subdivision plus a 240-acre residue or preservation parcel are created out of a 300-acre farm property, the forest conservation obligation is calculated on the net tract area of the 60-acre subdivision, not the original 300-acre parcel. The average lot area of the subdivision determines the land use category: cluster lots averaging less than an acre use a 20% threshold; cluster lots and non-cluster lots averaging between 1.0 and 5.0 acres use a 25% threshold; and larger non-cluster lots would use a 50% threshold.

In some subdivisions, however, the preservation parcel or residue may have a significant amount of high priority forest worthy of retention and protection via a forest conservation

easement. In such instances, the acreage of the preservation parcel or forest resources may be taken into account in calculating forest conservation requirements. To determine the best approach, see *Appendix L: Guidelines for Rural Cluster Subdivisions*.

Coordination with Wetland Mitigation Requirements

Obligations for wetland mitigation to compensate for disturbing wetlands or wetland buffers shall be calculated separately at ratios specified by Federal or State regulations for such disturbances. These obligations must be met and forest conservation program requirements do not in any way nullify or supersede wetland mitigation requirements. However, forested wetland mitigation plantings may be approved to fulfill reforestation or afforestation obligations.

Whenever wetland mitigation plantings are proposed to fulfill all or part of reforestation or afforestation obligations, the planting must meet the minimum specifications for reforestation and afforestation cited in this manual. Plant selection, size and densities approvable for wetland mitigation may not qualify as reforestation and afforestation, especially when shrubs rather than trees are proposed as the primary plant material for mitigation.

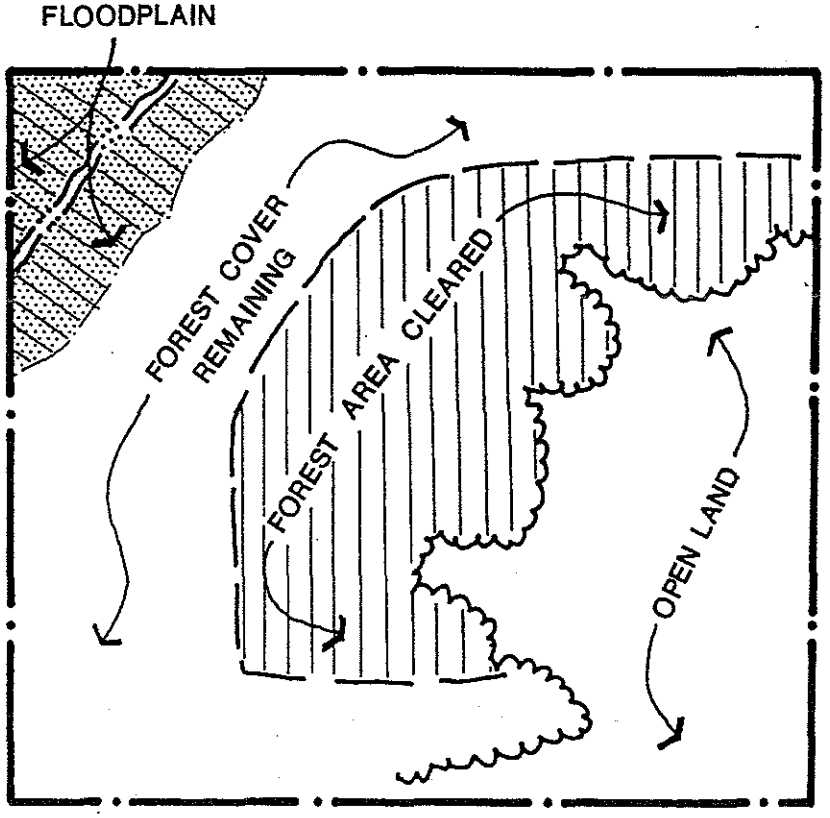
In accord with forest conservation priority locations and preferred methods, on-site planting is preferred; however off-site locations within Howard County that are approved for wetland mitigation under a 401/404 permit will be approved as off-site locations for reforestation or afforestation. Off-site wetland mitigation and/or reforestation or afforestation areas cannot also be used to fulfill the forest retention or creation obligations for the site to which they are transferred since they will already be protected by a conservation easement.

AFFORESTATION REQUIREMENTS

Afforestation is a much simpler concept than reforestation because it is a minimum requirement based on land use. Afforestation obligations occur only if existing forest cover is absent or if forest cover is less than the minimum required percentage of net tract area cited in *Exhibit 4 - 7*.

Exhibit 4 - 8 illustrates the afforestation concept. *Exhibit 4 - 9* shows how afforestation needs might affect the 40-acre site used in the reforestation examples if that site had few existing forest resources. *Exhibit 4 - 10* shows how clearing forest areas on a site that does not meet the minimum afforestation requirement creates a reforestation requirement in addition to an afforestation obligation.

EXHIBIT 4 - 3
REFORESTATION - EXAMPLE A



A. BASE DATA

Site	40.0 acres
Floodplain	5.0 acres
Net Tract Area	35.0 acres
Forest Cover on Net Tract Area	23.0 acres
Reforestation Threshold (20%)	7.0 acres

B. IMPACTS OF PROPOSAL

Forest Area of Net Tract Cleared	12.0 acres
Forest Area Remaining	11.0 acres
Forest Area Remaining Above Threshold	4.0 acres

C. REFORESTATION CALCULATION

Reforestation Debt (12 x .25) + (0 x 2.0)	3.0 acres
Reforestation Credit (11 acres - 7 acres)	4.0 acres

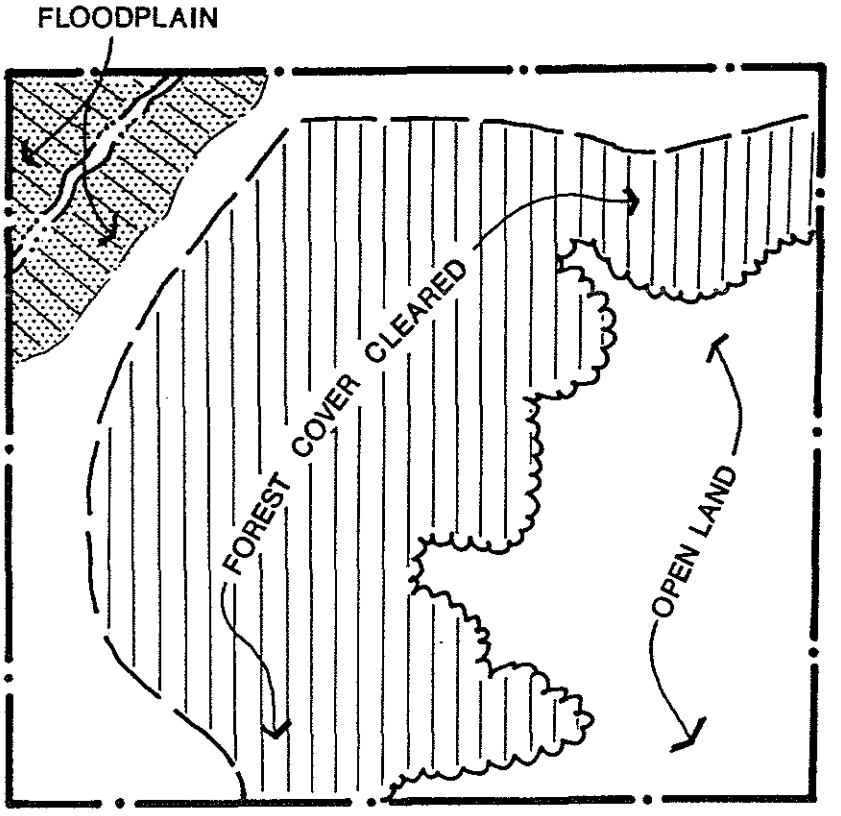
Credit exceeds obligation
No reforestation necessary

EXHIBIT 4 - 4
REFORESTATION CALCULATIONS - EXAMPLE B

EXAMPLE B: The 40 acre site is partially wooded and the proposed development clears forest areas below the applicable threshold. In this case the reforestation obligation calculation would be as follows:

A.	Calculate net tract area (total site minus flood plain) 40 acres - 5 acres	35.0 acres
B.	Add up all forest areas within net tract area	23.0 acres
C.	Based on development proposal, calculate amount of net tract forest areas to be cleared	20.0 acres
D.	Calculate forest areas remaining 23 acres - 20 acres	3.0 acres
E.	Determine land use category and compute threshold (Residential-Suburban threshold is 20% of net tract area) 35 acres x .20	7.0 acres
F.	Calculate reforestation debt (1/4 acre reforestation/1 acre cleared above threshold and 2 acres reforestation/1 acre cleared below threshold) 16 acres cleared x 1/4 4 acres cleared x 2	4.0 acres (debt) 8.0 acres (debt)
G.	Determine amount of reforestation credit (1 acre credit/1 acre retained above threshold) 0 acres retained above threshold	0.0 acres (credit)
H.	Final Result 12 acres of reforestation is required	12.0 acres required

EXHIBIT 4 - 4
REFORESTATION - EXAMPLE B



A. BASE DATA

Site	40.0 acres
Floodplain	5.0 acres
Net Tract Area	35.0 acres
Forest Cover on Net Tract Area	23.0 acres
Reforestation Threshold 20%	7.0 acres

B. IMPACTS OF PROPOSAL

Forest Area of Net Tract Cleared	20.0 acres
Forest Area Remaining	3.0 acres
Forest Area Cleared Above Threshold	16.0 acres
Forest Area Cleared Below Threshold	4.0 acres

C. REFORESTATION CALCULATION

Reforestation Debt (16 x .25) + (4 x 2.0)	12.0 acres

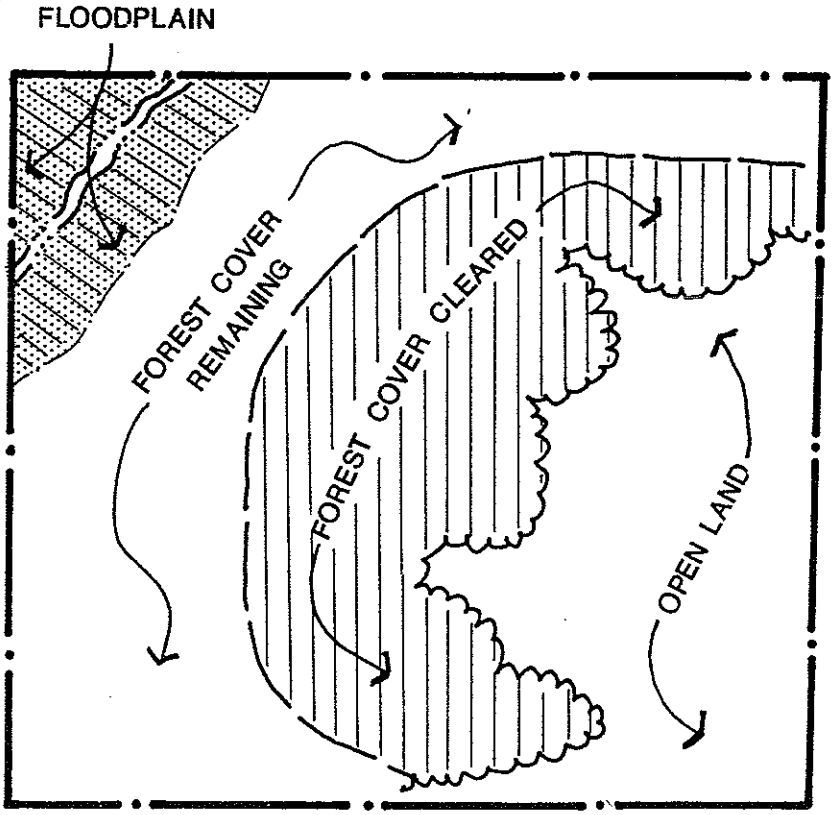
No credit available
12 acres must be reforested

EXHIBIT 4 - 5
REFORESTATION CALCULATIONS - EXAMPLE C

EXAMPLE C: The 40 acre site is partially wooded and the proposed development clears forests to the break-even point at which there will be no obligation for reforestation. For this example, the break-even point is clearing no more than 12.8 acres.

A.	Calculate net tract area (total site minus flood plain) 40 acres - 5 acres	35.0 acres
B.	Add up all forest areas within net tract area	23.0 acres
C.	Based on development proposal, calculate amount of net tract forest areas to be cleared	12.8 acres
D.	Calculate forest areas remaining 23 acres - 12.8 acres	10.2 acres
E.	Determine land use category and compute threshold (Residential-Suburban threshold is 20% of net tract area) 35 acres x .20	7.0 acres
F.	Calculate reforestation debt (1/4 acre reforestation/1 acre cleared above threshold and 2 acres reforestation/1 acre cleared below threshold) 12.85 acres cleared x 1/4	3.2 acres (debt)
G.	Determine amount of reforestation credit (1 acre credit/1 acre retained above threshold) 10.2 acres retained - 7 acres threshold	3.2 acres (credit)
H.	Final Result	
	3.2 acres (credit) minus 3.2 acres (debt) means that the debt is canceled and no reforestation is required.	0.0 acres required

EXHIBIT 4 - 5
REFORESTATION - EXAMPLE C



A. BASE DATA

Site	40.0 acres
Floodplain	5.0 acres
Net Tract Area	35.0 acres
Forest Cover on Net Tract Area	23.0 acres
Reforestation Threshold 20%	7.0 acres

B. IMPACTS OF PROPOSAL

Forest Area on Net Tract Cleared	12.8 acres
Forest Area Remaining	10.2 acres
Forest Area Remaining Above Threshold	3.2 acres

C. REFORESTATION CALCULATION

Reforestation Debt (12.8 x .25) + (0 x 2.0)	3.2 acres
Reforestation credit 10.2 acres - 7.0 acres =	3.2 acres

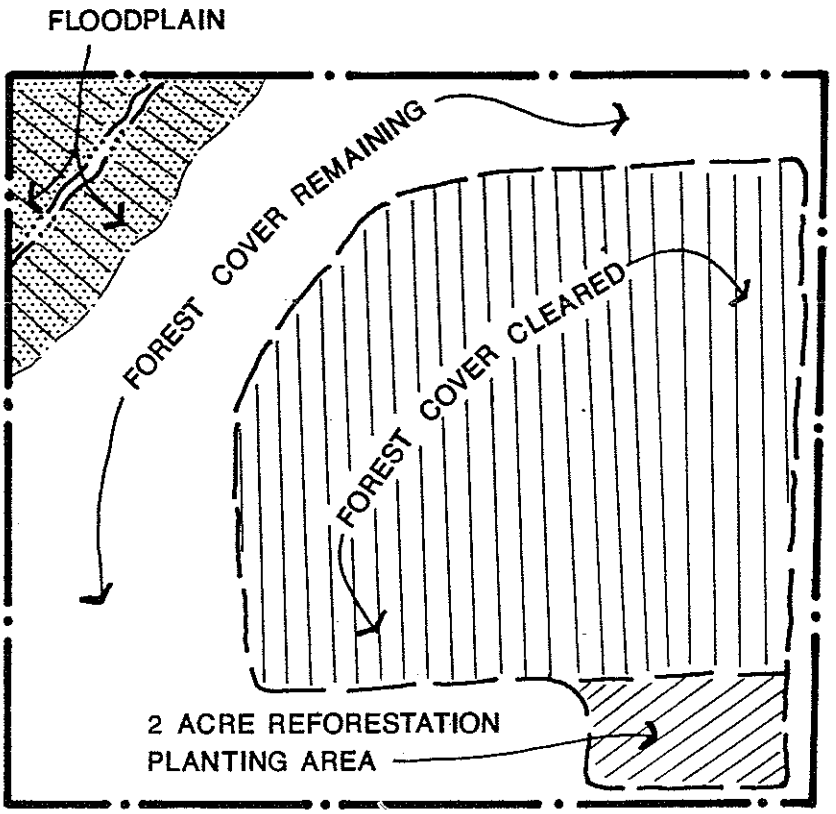
Credit cancels debt
No forestation required

EXHIBIT 4 - 6
REFORESTATION CALCULATIONS - EXAMPLE D

EXAMPLE D: The 40 acre site is entirely wooded and the proposed development does not clear forests below the applicable threshold. In this case the reforestation obligation for this proposal would be:

A.	Calculate net tract area (total site minus flood plain) 40 acres - 5 acres	35.0 acres
B.	Add up all forest areas within net tract area	35.0 acres
C.	Based on development proposal calculate amount of net tract forest areas to be cleared	24.0 acres
D.	Calculate forest areas remaining 35 acres - 24 acres	11.0 acres
E.	Determine land use category and compute threshold (Residential-Suburban threshold is 20% of net tract area) 35 acres x .20	7.0 acres
F.	Calculate reforestation debt (1/4 acre reforestation/1 acre cleared above threshold and 2 acres reforestation/1 acre cleared below threshold) 24 acres cleared x 1/4 0 acres cleared below threshold	6.0 acres (debt)
G.	Determine amount of reforestation credit (1 acre credit/1 acre retained above threshold) 11 acres retained - 7 acres threshold	4.0 acres (credit)
H.	Final Result	
	4 acres (credit) minus 6 acres (debt) means that reforestation obligation exceeds the credit earned, therefore 2 acres must be reforested.	2.0 acres required

EXHIBIT 4 - 6
REFORESTATION - EXAMPLE D



A. BASE DATA

Site	40.0 acres
Floodplain	5.0 acres
Net Tract Area	35.0 acres
Forest Cover on Net Tract Area	35.0 acres
Reforestation Threshold 20%	7.0 acres

B. IMPACTS OF PROPOSAL

Forest Area on Net Tract Cleared	24.0 acres
Forest Area Remaining	11.0 acres
Forest Area Remaining Above Threshold	4.0 acres

C. REFORESTATION CALCULATION

Reforestation Debt (24 x .25) + (0 x 2.0)	6.0 acres
Reforestation credit 11 acres - 7.0 acres	4.0 acres
Credit (4.0) - Debt (6.0)	2.0 acres

2.0 acres must be reforested

EXHIBIT 4 - 7
MINIMUM AFFORESTATION REQUIREMENTS

	LAND USE AND ZONING	MINIMUM AFFORESTATION REQUIREMENTS
A.	RESIDENTIAL - RURAL LOW DENSITY (RESIDENTIAL LOT AVERAGE 5 ACRES OR MORE)	20%
B.	RESIDENTIAL - RURAL MEDIUM DENSITY (RESIDENTIAL LOT AVERAGE 1.0 ACRE TO 4.99 ACRES)	20%
C.	RESIDENTIAL - SUBURBAN (LESS THAN 1 DWELLING UNIT/1 ACRE)	15%
D.	COMMERCIAL/INDUSTRIAL/OFFICE	15%
E.	INSTITUTIONAL	15%

EXHIBIT 4 - 8
AFFORESTATION REQUIREMENTS DIAGRAMS

Total Forested Acreage Below Afforestation Threshold

Afforestation Threshold: If the Forest Stand Delineation finds that the site has less than the required percentage of the Net Tract Area in forest cover, it must be afforested to a required Afforestation Threshold (different from the Conservation Threshold)

Afforestation Threshold:		20%
Afforestation Calculations:		
100 acres x 20%	=	20 acres must contain forest
20 acres - 15 acres (existing forest)	=	5 acres must be afforested

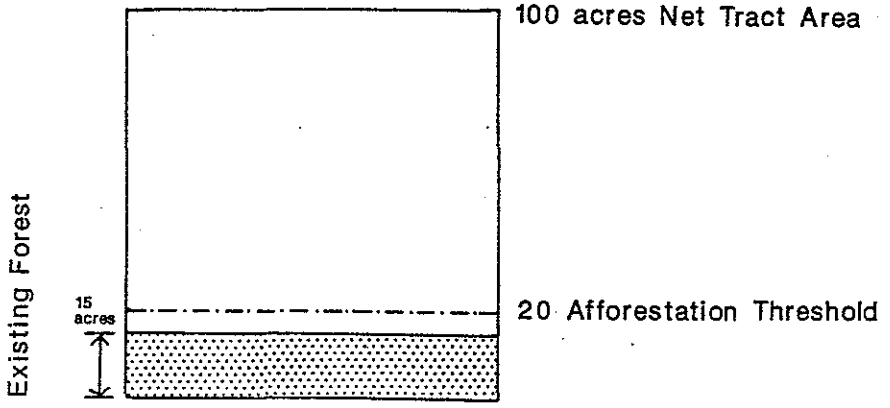
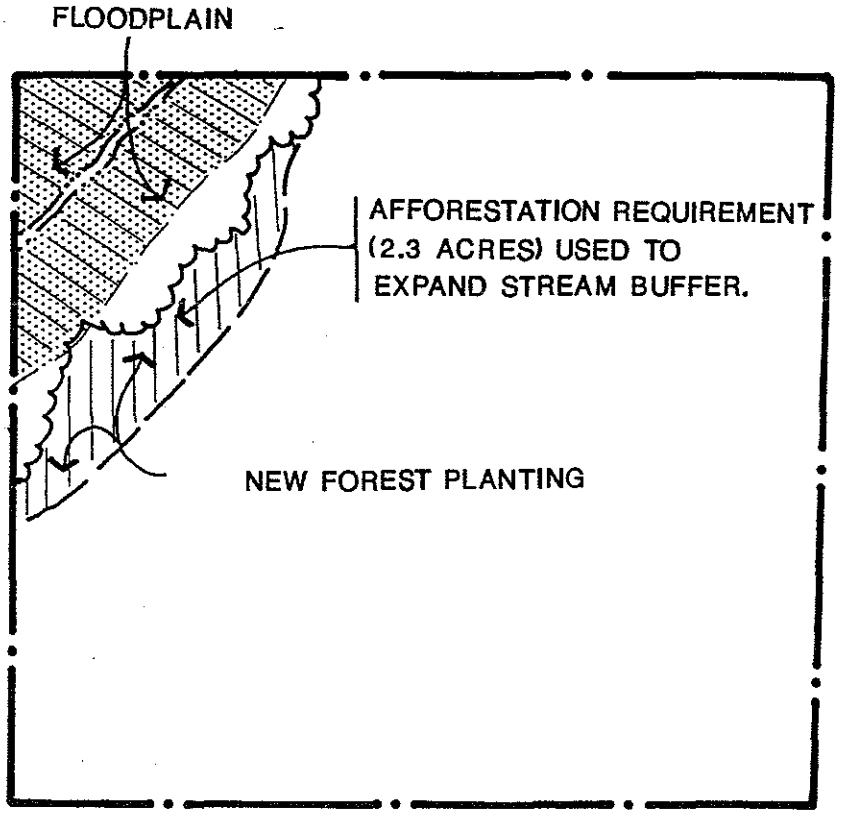


EXHIBIT 4 - 9
AFFORESTATION CALCULATIONS - EXAMPLE

The 40 acre site is largely unwooded. Applying the minimum afforestation requirement requires the following step by step procedure:

A.	Calculate net tract area (total site minus flood plain)	
	40 acres - 5 acres	35.0 acres
B.	Add up all forest areas within net tract area	3.0 acres
C.	Determine land use category and afforestation requirement (Residential-Suburban afforestation requirement is 15% of net tract area)	
	35 acres x .15 (to the nearest 1/10 acre)	5.3 acres
D.	Determine amount of afforestation needed	
	5.3 acres - 3 acres	2.3 acres
E.	Final Result	
	Given the absence of the required minimum forest areas on the property, 2.3 acres of land must be set aside for afforestation.	2.3 acres required

EXHIBIT 4 - 9
AFFORESTATION EXAMPLE



A. BASE DATA

Site	40.0 acres
Floodplain	5.0 acres
Net Tract Area	35.0 acres
Forest Cover on Net Tract Area	3.0 acres
Afforestation Minimum 15%	5.3 acres

B. RESULT

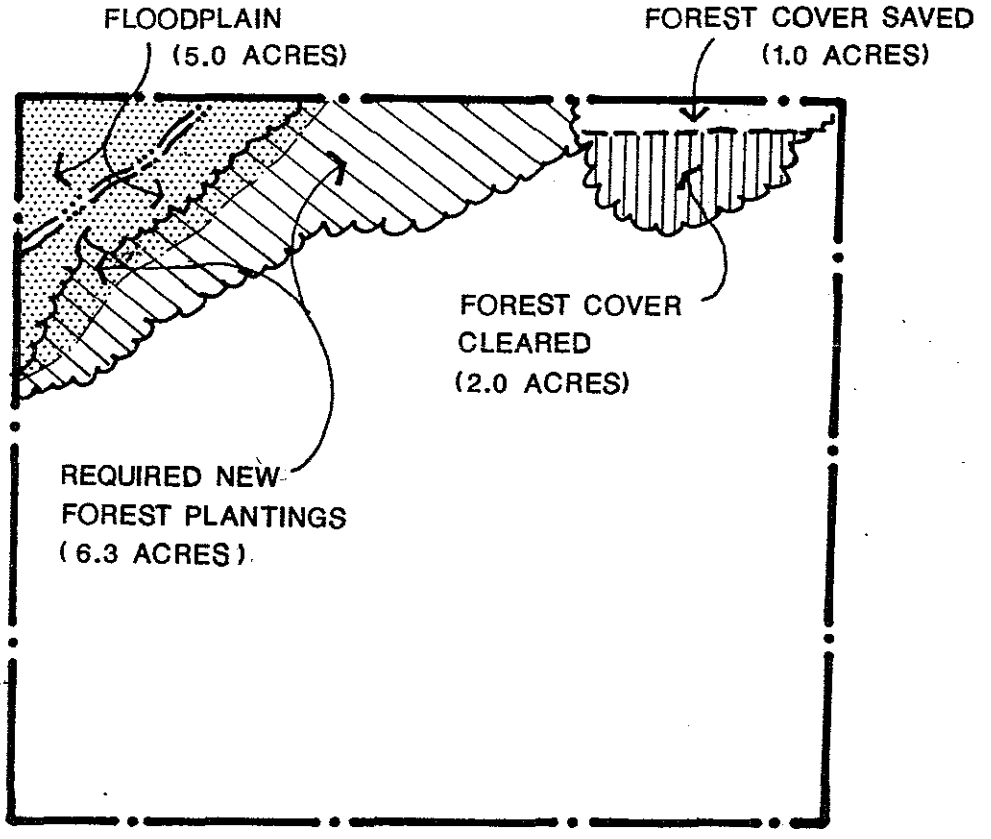
Afforestation Required 5.25 (Required) - 3.0 (Exist) =	2.3 acres

EXHIBIT 4 - 10
COMBINED AFFORESTATION-REFORESTATION - EXAMPLE

An afforestation obligation exists and the development proposal will require clearing of some or all of the few existing on-site forest resources. In this situation, the afforestation obligation must be met and a reforestation obligation for clearing below the reforestation threshold must be added to the total new forest plantings required.

A.	Calculate net tract area (total site minus floodplain)	
	40 acres - 5 acres	35.0 acres
B.	Add up all forest areas within net tract area	3.0 acres
C.	Determine land use category and compute afforestation threshold. Residential-suburban afforestation requirement is 15% of net tract area.	
	35 acres x .15 (to nearest 0.1 acre)	5.3 acres
D.	Determine amount of afforestation needed	
	5.3 acres - 3.0 acres	2.3 acres
E.	Determine reforestation obligation (all clearing is below 20% threshold)	
	2.0 acres cleared x 2.0 No Credit is Available	4.0 acres
F.	Final Result	
	2.3 acres (afforestation) + 4.0 acres (reforestation)	6.3 acres required

EXHIBIT 4 - 10
COMBINED AFFORESTATION - REFORESTATION EXAMPLE



A. <u>BASE DATA</u>	
Site	40.0 acres
Floodplain	5.0 acres
Net Tract Area	35.0 acres
Forest Cover on Net Tract Area	3.0 acres
Afforestation Threshold (15%)	5.3 acres
Reforestation Threshold (20%)	7.0 acres
B. <u>IMPACTS OF PROPOSAL</u>	
Forest Area on Net Tract Cleared (all below threshold)	2.0 acres
Forest Area Remaining	1.0 acres
C. <u>AFFORESTATION CALCULATION</u>	
5.3 (required) - 3.0 (existing)	2.3 acres
D. <u>REFORESTATION CALCULATION</u>	
Reforestation Debt (0 x .25) + (2.0 x 2.0)	4.0 acres
No Credit Available	
E. <u>TOTAL NEW FOREST PLANTING REQUIRED</u>	
2.3 Afforestation + 4.0 Reforestation	6.3 acres Total

FOREST RETENTION AREAS

The forest conservation plan must depict all existing forest areas to be retained as part of the development proposal. The size of the retained forest areas is measured to the nearest 1/10 acre. The forest conservation plan must specify the limits of disturbance for forest retention areas. Retention areas will be restricted use areas protected by easements or other legally binding mechanisms. The forest retention areas must be kept intact; violations will result in enforcement actions, mitigation penalties or both. Construction limits therefore must be drawn more carefully than the limits of disturbance traditionally presented on preliminary plan submissions. To avoid future use conflicts, forest retention areas should preferably be located in open space or rural cluster preservation parcels. Location of required forest retention on private residential lots is discouraged but may be permitted in accordance with the lot usability requirements set forth in Section 16.120(b)(4)iii of the Subdivision and Land Development Regulations.

The forest conservation plan will be evaluated in part for how effective it is in protecting the forest retention priority areas cited below. These are the areas that the developer should protect from damage or degradation during the construction and post construction periods.

1. Stream buffer areas.
2. Wetlands and wetland buffers.
3. Trees and other vegetation identified on Federal and State rare, threatened and endangered species lists and critical habitat areas.
4. Steep slopes 25% or greater.
5. Forest areas of at least 10,000 square feet not in any of the areas above, when adjacent to such areas or to off-site forest stands of more than 10,000 square feet.
6. Smaller forest areas adjacent to the sensitive areas listed above or to other protected areas such as open space.
7. Property line plantings such as hedgerows and buffers.
8. State Champion trees, trees 75% the size (diameter) of State Champion trees, and trees 30" in diameter.
9. Trees and other forest resources closely associated with a historic site.
10. Isolated forest stands or tree groves of less than 10,000 square feet.
11. Specimen trees not part of any of the above.

The minimum size of any forest retention area shall be 10,000 square feet (about 1/4 of an acre). Smaller areas should be saved for the aesthetic value they provide to a development, but such areas will not, in general, be considered forest conservation areas. There are several exceptions to the minimum size requirements, wherein forest retention credit can be obtained for preserving small stands:

- When such stands are in high priority protection areas and will be enlarged by reforestation or afforestation to the minimum size of 10,000 square feet.

- When existing forest resources are less than 10,000 square feet and with required reforestation or afforestation would still be less than 10,000 square feet.

- When preserving Champion Trees, trees 75% the size of a champion tree for that species, trees 30" diameter or greater, significant trees associated with historic sites, or hedgerows along property lines occurs in accord with the specifications for protecting critical root zones cited in *Appendix G*.

PRIORITY LOCATIONS FOR REFORESTATION AND AFFORESTATION

When reforestation or afforestation obligations occur, the forest conservation plan must locate appropriate areas for planting of new forest cover. Such new forest cover should be located where it can most effectively advance the environmental goals of the forest conservation program and will be most likely to thrive. Not all unbuilt-on-land within a development is appropriate for reforestation or afforestation. The size of the area, the initial appearance of such plantings, and their relative fragility when compared to retained mature forest areas make locations relatively isolated from the more intensively used areas of a development more appropriate than areas such as private yards, entry points, or along street rights-of-way. For these reasons, the best location for new plantings is within open space. Locating new forest plantings in open space makes proper long-term management and enforcement of use restrictions easier. Forest planting on residential lots smaller than 10 acres in size is not permitted. Forest planting is permitted on lots 10 acres or greater in size in accordance with Section 16.120(B)(4)III of the Subdivision and Land Development Regulations.

The priority sequence for selecting reforestation or afforestation sites follows. If off-site planting would have greater environmental benefit, the Department of Planning and Zoning may approve planting in high priority off-site locations.

1. Floodplains and stream buffers. Planting within 100 year floodplain areas may be used to fulfill reforestation or afforestation obligations if this will not compromise the ability of the floodplain to act as a natural storage and floodway system. Such requests will have to be coordinated with other floodplain protection requirements.

   The County requires a 75' undisturbed stream buffer for new developments in all residential zoning districts. In response to the State law, the County forest conservation program requires a 50' stream buffer in non-residential zoning districts. These buffer areas may presently not have full forest cover. Using reforestation or afforestation obligations to increase or to create new forest cover along streams is a priority.

2. Wetland and wetland buffers. Providing forest cover in or near wetland areas is of high priority. Wetlands are key wildlife habitats and creating additional natural cover can increase this habitat value. However, such planting should be done only when it will not have a negative impact on the existing wetland resources and where forest cover would normally be the natural cover.

3. Critical habitats and buffers to create forest corridors for wildlife movement. The use of reforestation or afforestation to expand areas known to be good forest habitats is highly desirable. The larger the protected interior forest, the more effectively it can keep or attract species that require a high degree of seclusion and protective cover. By expanding existing forests to a minimum width of 300', corridors for wildlife movement can be created. (See *Exhibit 4 - 11* at the end of this chapter.)

4. Steep Slope Areas. Forest cover is the best check on soil erosion, especially as the topography gets steeper. Existing County regulations protect steep slope areas (25% or greater) which are at least 20,000 square feet or which are adjacent to streams or wetlands. If these areas are not forested, they should be candidates for reforestation or afforestation. Areas somewhat less steep (15% - 25%) should also be planted, especially if located on highly erodible soils.

5. Areas Adjacent to Existing Forest Stands. Adding to existing forest stands outside the sensitive areas listed above also creates valued environmental resource areas, especially when high quality existing forests can be protected or enhanced by planting similar species. Expanding existing forests increases their habitat value and provides air and water quality benefits.

6. Infill Between Small Forest and Tree Stands. Reforestation or afforestation can be used to create a larger forest entity by closing the gaps between small forest areas or remnants of former forest areas. In this way, areas that had aesthetic value but little environmental value may be greatly enhanced and, in time, become true forest communities.

7. Property Line or Right-of-Way Buffers. As long as these areas are at least 35' wide and meet the minimum size criteria, such plantings can meet reforestation or afforestation obligations. Such situations as public road setback areas, the edge between residential and non-residential land uses, or the demarcation of rural housing clusters from active farm operations may be suitable for new forest plantings.

PREFERRED METHODS FOR REFORESTATION AND AFFORESTATION

The forest conservation plan must also select the most appropriate method to accomplish the required planting. A variety of planting options are available to meet the specific

opportunities or limitations of any given development proposal. The following is the preferred sequence of reforestation and afforestation methods:

1. Selective clearing and supplemental planting.

2. Planting with transplanted or nursery stock that is greater than 1.5 inches diameter breast height.

3. Planting with transplanted or nursery stock using whip and seedling stock.

4. Landscaping in accordance with the amount (20% maximum) and the criteria cited in *Appendix F*.

5. Natural regeneration.

The choice of methods and plant materials should be related to the specific location within the proposed development and the physical characteristics of this location. Use of seedlings may be acceptable when plantings will be away from heavy use areas, while larger trees may be more suitable near structures or active areas. Using larger material to screen less attractive techniques may be prudent when reforestation or afforestation must occur in more publicly visible areas.

Appendix F provides criteria to implement the planting methods cited above.

Three of the methods - selective clearing and supplemental planting, landscaping and natural regeneration - are concepts that require a more detailed explanation of when and how they may be used to fulfill the requirements of the forest conservation program. The following paragraphs describe specific examples of when these options are appropriate and identify the manner in which the planting must be implemented so that these methods may be judged suitable to meet reforestation or afforestation obligations.

1. Selective Clearing and Supplemental Planting. This technique is the top priority when existing forest resources can be preserved and enhanced or potential forest communities can be created from existing tree stands that do not meet the definition of forest. This can be accomplished in several ways. Selective clearing and supplemental planting along the edges of retained forests meets reforestation or afforestation obligations when it expands the total area of the forest stand. Infill planting of existing forest areas that have an incomplete canopy will receive credit as reforestation or afforestation. Large tree stands that are not true forest communities (no understory, insufficient number of trees to meet the 100/acre criteria, presence of dead or diseased trees) can be made into true forest communities by supplemental planting of trees and appropriate shrubs and ground cover. Reforestation credit will be given for the area of the tree stand brought up to forest community standards. Proposals for selective clearing and supplemental planting must meet the definition of a forest and meet the criteria cited elsewhere in this chapter for plant material size and density.

2. Landscaping. A maximum of 20% of the required on-site reforestation or afforestation can be provided in the form of landscaping that has a mix of trees, understory, and a ground cover other than turf grass. This landscaping mimics much of the ecological complexity and environmental benefits of a forest community. While native plants or cultivars are preferred, the use of more ornamental landscape material is acceptable for those situations where survival and growth rates will be better. This type of substitution may be particularly appropriate near high use areas on a site or where appearance is of concern.

3. Natural Regeneration. This technique refers to use of various methods of seeding by which forest community mixtures are broadcast and established by such techniques as hydroseeding. Natural regeneration will only be approved on sites where the regeneration process has already begun, particularly where pioneer species have invaded abandoned fields. Because of the difficulties of assessing long term survival rates and size criteria, the post-construction guarantee periods may be required to exceed the two year minimum specified for other techniques.

REFORESTATION AND AFFORESTATION PLANTING PLANS

The reforestation or afforestation plan should be included on the same plan sheet which depicts the forest retention areas, although a planting plan and specifications may be submitted as a separate plan sheet when this will make review easier. Preservation of trees and landscaping not covered by the forest conservation program can be included on the forest conservation plan sheet(s) to show how such efforts can be coordinated with forest conservation requirements.

Any reforestation or afforestation proposals shall include a planting plan and plant materials table which describe in detail:

- species to be used
- number of plants
- size of plants
- plant installation details.

Developing a planting plan requires three steps: 1) Assess the existing conditions of the proposed planting site; 2) Choose an appropriate mix of plant materials for the site conditions; and 3) Specify methods and density of planting.

Site Assessment

The priority sequence cited earlier in this chapter should be followed when selecting reforestation or afforestation locations. But other factors must also be considered in selecting locations, plant species and proper planting techniques. Past uses may dictate special treatments and limitations for the reforestation and afforestation sites. For example, past uses that compacted soils may call for intensive soil discing. Soils that have been actively farmed within the past several years may need to be evaluated for residual pesticides or herbicides.

An assessment of soil moisture should also be made at this time. Use soil survey information on depth to water table, geotechnical information from soil borings, and knowledge of proposed grade and drainage divide changes to determine likely moisture regimes of the proposed site.

Future uses of adjacent land can also influence the choice of the reforestation and afforestation sites. For example, planting adjacent to future high use areas may need larger plant stock to insure survivability. Special attention should be given to aesthetic considerations for areas immediately adjacent to buildings or roads.

Plant Selection

Plant selection should seek to integrate native forest associations into the proposed development. Species native to Maryland should be used, unless specific conditions make non-native species more likely to survive. Local genetic stock from within a 100 mile radius is preferred because of hardiness and disease resistance.

Two options for selecting the mix of plant species are suggested. The first is to utilize the Soil Survey to determine the typical forest association for each soil type and the woodland suitability index and to plant species found within that association. The second method is to evaluate the adjacent or nearby undisturbed forest stands and attempt to replicate these forest communities if site conditions permit.

Natural forests are complex, multi-species, multi-layered systems. New forest plantings, therefore, should include a minimum of 5 different tree species unless part of a landscaping plan or other forest planting plan approved by the County. The mix of species should be as follows:

- Successional Stage:
  - approximately one third pioneer species;
  - two thirds mid or late successional (climax) species

- Place in canopy:
  - 60% dominant trees
  - 40% understory trees

Plant Material Size, Density, and Planting Methods

The following densities are required for reforestation and afforestation plant materials:

- 100 2" caliper trees/acre (20' x 20' spacing)
- 200 1" caliper trees/acre (15' x 15' spacing)
- 350 seedlings or whips/acre with tree shelters (11' x 11' spacing)
- 700 seedlings/acre (8' x 8' spacing)

The spacings identified above are not meant to imply that trees must be planted in a grid pattern. A more natural appearance is desired. Planting in curvilinear rows to facilitate access for maintenance is permitted.

It is customary to plant trees of a single size for one site. In some cases, it may be appropriate to plant a mixture of stock sizes. Larger stock may be more effective than seedlings and whips in areas of high human activity or where the deer population is large. The following guidelines should be considered:

- Plant larger stock around the perimeter in order to protect interior smaller stock.
- Include larger stock deciduous and evergreen trees where respect by nearby residents is of concern.
- Mix stock sizes when no mechanized equipment is proposed for use on site.
- Mix stock size when seedlings are thoroughly mulched.
- Use smaller stock for understory trees and larger stock for overstory in a random planting.

The sizes of plant materials, including seedlings, are specified in *Appendix H* along with installation details for each category of plant material. Planting specifications on the Forest Conservation Plan need to take into consideration how the planting area is to be prepared and maintained. Control of noxious weeds, competing vegetation and deer need to be addressed. If difficult access will limit maintenance activities, it may be desirable to increase the amount of material planted in order to meet survival rates.

OFF-SITE FOREST PLANTINGS

Locations for off-site afforestation, reforestation, or retention should preferably be within the same watershed sub-basin as the development which generated the forest conservation requirements. If the developer demonstrates that this is not feasible, the Department of Planning and Zoning will approve off-site locations in the same watershed, i.e., Little Patuxent, Middle Patuxent, mainstem Patuxent, or Patapsco Rivers, or, when necessary, another Howard County watershed. It shall be the developer's responsibility to propose an appropriate off-site location for reforestation/afforestation or retention. However, if the developer demonstrates difficulty in locating an appropriate site, the Department of Planning and

Zoning will assist in site identification. The County will prepare an inventory of potential sites, including any forest conservation mitigation banks that have been approved. Alternately, when the amount of forest obligation to be relocated off-site is small, the Department of Planning and Zoning may approve payment of a fee-in-lieu of afforestation or reforestation.

The clear preference is to fulfill forest conservation obligations within the same development that creates them. Only if no reasonable on-site locations are available, will off-site locations be approved. The applicant must demonstrate to the satisfaction of the Department of Planning and Zoning that on-site planting is impractical or will be of much less environmental value than planting or retention at the suggested off-site location(s). Off-site planting or retention can be more environmentally valuable than planting on-site when it will:

- Expand or create tree cover in environmentally sensitive areas;
- Expand large forest stands already protected by a forest conservation plan or other conservation easement;
- Enhance permanently protected open space;
- Fulfill small (under 10,000 s.f.) obligations by being pooled with other such obligations, rather than creating isolated, low value forest stands.
- Retain trees in high priority locations on properties that are potentially developable (i.e. are not dedicated open space or subject to preservation easements of any kind).

Off-site afforestation or reforestation, when approved by the Department of Planning and Zoning must be equivalent in area to the forest conservation obligation that would otherwise have occurred on-site.

Off-site retention must occur at a 2:1 ratio to the forest conservation obligation that would otherwise have occurred on-site.

Off-site planting or retention requires that the applicant have a legal right to use the proposed site. The owner of the off-site property must agree in writing to the required long-term use restrictions on reforestation or afforestation areas.

When off-site planting or retention is proposed, the forest conservation plan must include a plan of the proposed off-site location that shows:

- boundaries and area of the property
- all existing improvements
- location of proposed off-site reforestation, afforestation or retention areas
- relationship of these areas to existing topography, existing environmentally sensitive areas or open space areas.
- proof of legal right to use the site and to impose restrictions on the future use of the reforestation or afforestation areas.

The scale of plans for such off-site locations can vary as appropriate but in no case should they be less than 1" - 200' nor should the topographic interval be greater than 5 feet.

OTHER REQUIRED DOCUMENTATION

The following documents are required as part of any forest conservation plan submission.

Written Statement

A written statement is required to explain 1) the necessity for any clearing of forest resources; 2) clearing areas not in accord with the retention priorities cited in the manual; 3) reforestation or afforestation locations not in accord with the priority sequence cited in the manual; 4) utilizing planting methods not in accordance with the preferred sequence of optional methods, in particular justifying that off-site reforestation or afforestation is more reasonable than on-site forest plantings; or 5) requests to pay a fee-in-lieu of reforestation or afforestation requirements.

Construction Period Protection Program

It is crucial to protect forest conservation areas from damage or degradation when approved development proposals are under construction. In addition to not clearing the trees themselves, the developer must ensure that soil is not compacted, that site drainage is not drastically altered, and that no harmful practices such as washing of equipment or storage of materials will occur where they will create stresses on future health of forest communities. Areas set aside for reforestation or afforestation must also be protected or adequately prepared for the proposed planting. Compliance with the construction period protection program is necessary to secure the release of obligations and bonds established by the developers agreement. The survival rate for afforestation and reforestation areas shall be a minimum of 100 trees per acre or at least 75% of the total number of trees planted per acre under the approved plan, whichever is greater.

To protect the integrity of forest retention, reforestation or afforestation areas the construction period protection program must specify the following:

- Limit of disturbance lines.
- Treatment of the edge of surviving forest stands to adjust them to the new environmental conditions (selective thinning, pruning, removal of species susceptible to windthrow).
- Protective measures such as fencing, signs, etc. that will prevent unpermitted intrusions into the forest conservation areas.
- Designation of appropriate areas for storage of equipment, vehicles (including employee parking), building materials, debris, etc.
- Treatments to restore or enhance suitability for planting (soil preparation, removal of noxious weeds or invasive species).
- Project construction sequence.
- Timing of reforestation or afforestation plantings during construction period and how they will be coordinated with development activities.

- Qualified professional(s) responsible for monitoring forest conservation requirements and performing any necessary construction period management, stress reduction, watering, or corrective activities.
- Installation of any permanent protective devices required by the approved forest conservation plan

Appendix G contains information on soil and forest protection techniques.

Activities that will not cause damage to forest resources may be permitted during the construction period as long as they have been specified in the approved forest conservation plan. Such activities would include:

- Maintenance activities (watering, spraying, control of noxious weeds and invasives).
- Selective thinning and pruning to remove diseased trees or damaged vegetation.
- Planting of supplemental plant material.
- Stabilization measures to check existing erosion problems.
- Trails located and built as specified in *Chapter V.*
- Passive recreation facilities.
- Utility lines installed in accord with specifications in *Chapter V* to minimize disturbance.

Post-Construction Protection Program

A post-construction protection and management program is required to give the forest resources saved or planted as part of the development proposal a high probability of achieving the survival rates required for release of surety, as well as long-term survival. Post-construction management includes:

- Maintaining necessary on-site measures (e.g. fences) to prevent unwarranted intrusions and activities.
- Removal of all temporary structures after construction.
- Periodic inspection for continued compliance with the forest conservation requirements.
- Thinning, watering, fertilizing or other required measures to ensure survival and growth.
- Removal and replacement of dead reforestation or afforestation plantings.
- Certification that specified survival rates have been met.

The post-construction protection shall be for a minimum of 2 growing seasons, but may be longer when specific conditions warrant (e.g., use of seedlings or natural regeneration). In most cases, the professional responsible for construction period supervision of forest conservation requirements should also be responsible for the post-construction requirement.

A signed agreement detailing these post-construction activities shall be submitted for approval as part of the developers agreements for the project. The agreement shall also include bonding covering all costs of the necessary protection and management activities required by the post-construction protection program.

When the developer will not be the subsequent occupant or owner of the project, post-construction responsibilities include informing new owners or occupants (e.g. residents purchasing homes within the development) of the nature of all restrictions on their use of forest retention, reforestation and afforestation areas and of the type and duration of the post-construction management activities. Such information can be conveyed by letters, signs posted on the property, submission of copies of the forest conservation plan or other methods chosen by the developer. Such communications should stress the developer's obligation for post-construction management, any rights of access needed to perform such duties and a statement citing when new owners of the property, or their common legal representative (e.g. a home owners association) will assume full responsibility for the forest areas and restrictions imposed by the approved forest conservation plan.

The minimum post-construction protection period referenced above shall go into effect upon certification of completion of the development's construction period reforestation or afforestation activities. Successful completion of the post-construction program shall be certified in writing by the responsible qualified professional and approved by the County. If a development is phased, separate agreements can be used for each separate phase, as long as completed forest conservation measures for prior phases will not be affected by construction activities for subsequent phases. For plantings to be certified as surviving a growing season, the planting must be completed by June 30. Credit is not granted for shorter segments of a growing season.

Appendix H contains the inspection certification form to be used for both initial installation certification and the final two growing season survival certification. It also includes an inspection checklist that can be used as a guide to help identify problems and maintenance activities to ensure the required survival rate is achieved.

Recordation of Restrictions and Easements

The areas for forest retention, reforestation or afforestation created by an approved plan must be permanently protected and recorded as non-developable open space or as conservation easements. These restrictions must be incorporated in a deed of easement and clearly delineated and properly dimensioned on a record plat or a plat of forest conservation easement. These restricted areas are comparable to floodplains, wetlands, or drainage easements whose integrity must be respected and maintained by all future owners. For this reason, placement of forest conservation easements on private residential lots is undesirable. When this approach is approved, lot use will be limited as specified in Section 16.120(B)(4)iii of the Subdivision and Land Development Regulations.

Use restrictions for forest conservation areas on private lots may be reinforced by such devices as land trust agreements or restrictive covenants that forbid or restrict future land use changes. Such restrictions may be desirable in instances where the property owner has agreed to retain or create forest outside the required forest conservation easement area. Since the County only has enforcement authority within the required easement, enforcement of expanded areas needs to be guaranteed by an outside entity, such as a private or public land trust or home owners association that is formally given authority to enforce the terms of such restrictions.

The need to record forest conservation plan restrictions means that development proposals must be well thought out. Subsequent revisions to approved forest conservation plans will not be possible without amending recorded plats or deeds - a time-consuming and potentially costly process.

Violation of the terms of forest conservation restrictions constitutes non-compliance and can lead to enforcement actions and penalties. It is extremely important, therefore, that future property owners be explicitly and thoroughly notified about such restrictions at the time of purchase since the owners will be subject to the restrictions and potential enforcement.

FEE-IN-LIEU REQUESTS

When exceptional circumstances dictate that on-site or off-site planting or retention is impossible or the small size of the forest conservation obligations of a development proposal make it unreasonable to implement these obligations, the applicant can request a fee-in-lieu payment into the Forest Conservation Fund. Approval of such requests may be made by the Department of Planning and Zoning after evaluating the justifications regarding the infeasibility of fulfilling the retention, reforestation and afforestation priorities.

The fee-in-lieu rate will be assessed on a square foot basis at a rate, established by the County Council.

When fee-in-lieu requests are granted, the final plat or site development plan or grading plan shall note that all forest conservation plan obligations have been met by the appropriate payment and that the site carries no additional restrictions related to specific forest conservation requirements.

REVISION OR ABANDONMENT OF RECORDED EASEMENTS

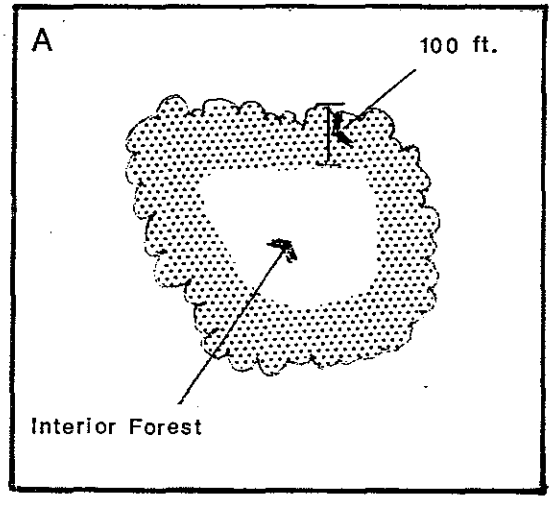
It may be appropriate in some instances to revise or abandon a recorded forest conservation easement. Requests to revise or abandon a recorded easement must be made in writing to the Department of Planning and Zoning. The request must include an explanation as to why the revision or abandonment is appropriate and what alternate means of meeting the property's forest conservation obligation is proposed.

The Department of Planning and Zoning will permit the easement or a portion of the easement to be abandoned in exchange for payment of the fee-in-lieu-of reforestation or afforestation. The fee-in-lieu rate will be assessed on a square foot basis at a rate established by the County Council.

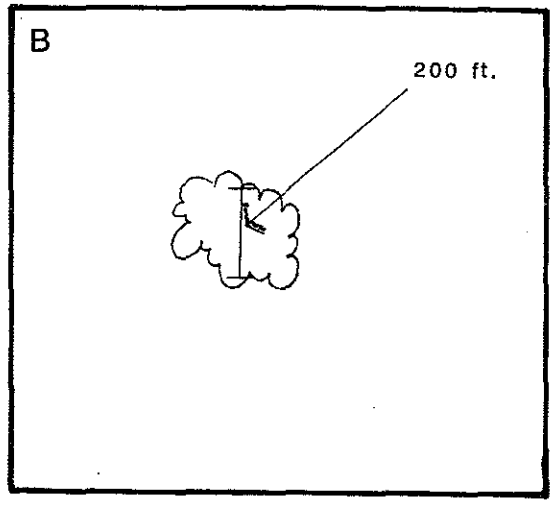
If revision or abandonment of the recorded forest conservation easement is approved, the property owner must submit the revised deed of forest conservation easement and the revised subdivision plat or the revised plat of forest conservation easement to the Department of Planning and Zoning for approval and recordation.

EXHIBIT 4 - 11
FOREST SHAPES AND HABITAT FUNCTIONS

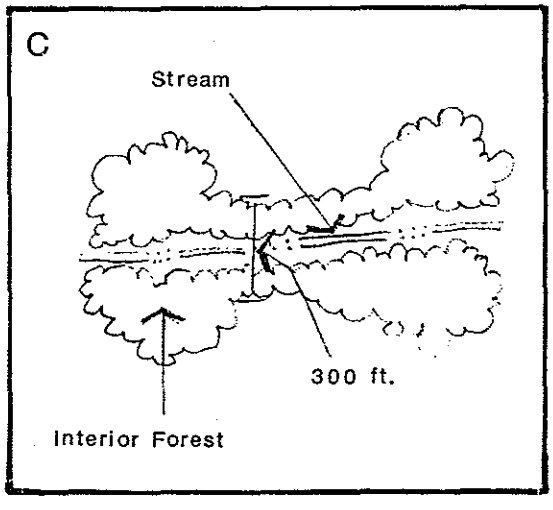
The shape and size of a forest is one of many factors which determine its function and its priority for retention. The following figures are generalizations of what one might find in forests. Scale is for comparison purposes unless indicated otherwise.



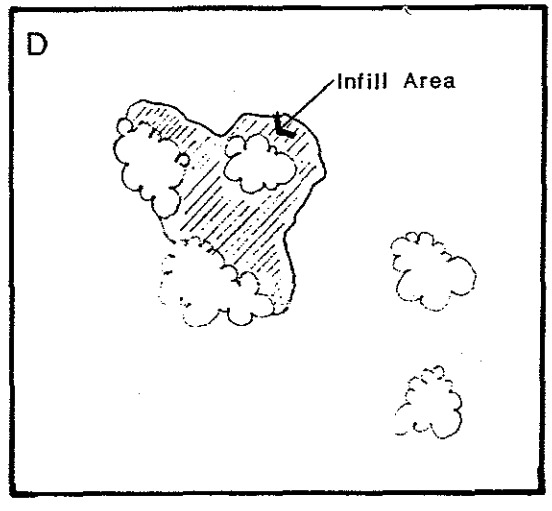
Forest A has enough interior forest to support interior dwelling wildlife and to discourage the movement of disturbed edge floral species inward.



Forest B is too small to contain a true interior habitat.



Forest C above, with a corridor of 300 feet, provides both good water quality protection and a good corridor for maintaining native forest species within adjacent interior stands as well as wildlife movement.



If retaining three fragments from the five shown in Forest D, it is better to retain closely spaced fragments and, if possible, create a large single forest stand by additional reforestation or afforestation.

CHAPTER V

IMPLEMENTATION TECHNIQUES AND PRACTICES

INTRODUCTION

This chapter sets forth the technical requirements and recommended practices for implementing an approved forest conservation plan. There are three phases for implementing an approved plan:

- Construction period: from approval of the proposal until completion of all site changes and improvements.
- Post-construction period: a minimum 2 growing season period during which inspections and forest management practices guarantee short-term survival or replacement of forest resources retained or created as part of the approved forest conservation plan. This phase ends with the release of maintenance agreements and bonds.
- Long-term management: the full assumption by owners of the obligation to protect forest conservation areas and to refrain from any activities not permitted by the approved forest conservation easement.

During the first two phases, the developer has ultimate responsibility for the integrity of all forest conservation areas. This responsibility will usually be compounded by the occupation and use of the completed project during the two growing season minimum post-construction maintenance period. The new owners or tenants must be educated about the forest conservation restrictions that come with the property.

This manual recommends best management practices for each of these three stages of implementation. *Appendix I* is a checklist of forest management procedures for each of the three phases of plan implementation. Most recommendations are presented as performance guidelines rather than mandated specifications. The purpose of including recommended practices in this chapter and in various appendices is to assist developers and their consultants in complying with the implementation requirements of the forest conservation program. The program requires that certain survival rates be achieved. Replacement obligations and bond extensions ensue if such survival rates are not achieved. Stiff fines and mitigation requirements are leveled for violations of approved forest conservation plans.

CONSTRUCTION PERIOD PRACTICES

The construction period extends from final approval of the development proposal until the release of all required guarantees specified for forest conservation requirements in the developers agreement.

Construction Period Supervision

As part of the construction period management and planting program, the developer shall designate an individual or firm to be fully responsible for implementing the requirements of the approved forest conservation plan or requesting modifications of previously approved requirements concerning planting techniques, species or maintenance needs. Those responsible for implementation of the approved forest conservation plan during the construction period shall conform to the professional qualifications cited in *Chapter VI* of this manual.

Protecting and Managing Forest Retention Areas

Forest retention stands are extremely vulnerable to damage, long term decline, and death stemming from improper design and construction practices. Saving forests and specimen trees during the construction process requires site planning, engineering practices and construction methods that respect the biological needs of trees. A few fundamental horticultural principals are the basis of the protection guidelines and requirements cited in this manual:

- A tree's root system can be large, extending well beyond the dripline of the crown. Typically, root systems are very shallow, in most cases being only 12" - 18" deep.
- Trees generally do not have tap roots.
- There are about as many roots as there are twigs and branches. If roots die, branches will die to keep the tree in balance.
- Tree roots need a balance of water and air in the soil. Air only penetrates 12" - 18" into the soil. Stress and decline in tree health results when soil is piled on top of existing roots or roots are suddenly forced to sit in waterlogged soil or overly dry soils due to topography changes during construction.
- Soil compacted to bulk densities of 1.7 gram/cubic centimeters or greater cannot support root growth. Existing roots in heavily compacted soils usually die.

- Trees growing in disturbed or tilled soils usually die back in proportion to the root area disturbed. Even minor disturbances such as tilling within the root zone for lawn installation will cause harm.

- Trees, especially large trees, may take a long time to show the effects of construction damage. Trees may die 5 or even 10 years after being weakened by construction activity. Secondary stresses such as insects, disease, or drought may kill weakened trees while the same stress would not have affected a healthy tree.

Soil Protection Zone

The soil protection zone must be protected from construction activity and other stresses (e.g. flooding) to protect the forest stand from damage. The forest retention practices for a development must address the specific needs and stresses the proposal may cause. Nevertheless, the need to define the soil protection zone (critical root area) for forest areas is the one factor common to all retention efforts.

The extent of the root system is quite large. The ratio of root expansion to crown spread can be 2:1 or larger on open grown specimen trees and can be significantly larger (up to 5:1) for trees growing in the interior of forest stands. Furthermore, the minimum requirement for root protection varies from species to species and from soil type to soil type. For open grown trees, it is generally accepted that protecting the soil within the dripline of the tree is adequate to save the tree in most cases. For trees that have been part of forest communities, however, the soil protection zone may have to be modified to reflect a more complex relationship between crown spread and root growth.

Techniques for management of the soil protection zone are described in detail in *Appendix G*.

Best Management Practices During Construction

Many of the construction period measures cited in the manual are for areas that should not be disturbed. The desire to protect areas within the limit of disturbance can be easily nullified by poor construction site management. The required construction period management program must therefore specify how construction activities will be managed to protect forest retention areas. The following should be depicted on site construction documents and/or forest conservation plans; they shall also be itemized in the developers agreement.

- storage of equipment and materials
- disposal of construction debris
- washing of equipment, disposal of wastewater from concrete operations, etc.
- employee parking
- temporary structures such as trailers, sanitary facilities, etc.

Unless specifically exempted by the approved forest conservation plan, any use of forest retention areas for these activities or other intrusions shall be a violation of the approved forest conservation plan.

Because reforestation and afforestation typically may involve disturbances greater than 5,000 square feet, proper sediment and erosion controls may be required. Developers should refer to the Howard County Soil Conservation District for current standards, specifications and requirements. It may be necessary to protect forest retention areas from erosion and sedimentation caused by implementation of reforestation or afforestation plantings.

Construction Period Planting Procedures

The measures to protect forest retention areas emphasize isolating them from development impacts. Reforestation or afforestation, in contrast, will often occur on land already disturbed by development activities or may be located on land which will require substantial preparation to enable forest plantings to survive and thrive. Reforestation and afforestation plantings may also require a great deal of management once they are installed. *Appendix H* provides guideline specifications for proper planting, including techniques for site preparation and management. The following issues are of particular concern.

- General site preparation for planting: For undisturbed sites, disturbance of soils should be limited to the planting field for each plant. For disturbed areas, soils should be treated by incorporating natural mulch within the top 12 inches, or with needed amendments as determined by a soils analysis. Natural amendments such as organic mulch or leaf mold compost are preferred.

- Stream buffer planting: Borders of streams and other waterways may have been damaged before reforestation and afforestation and therefore may need more extensive restoration work before reforestation or afforestation can be successful. The following are guidelines for any work within a riparian zone.

  - Correct any erosion problems
  - Minimize or eliminate any chemical use
  - Maintain an undisturbed leaf layer and understory
  - Eliminate exotics

- Steep slope planting: In areas of steep slopes or erodible soils, the preferred method of reforestation or afforestation is the use of seedlings to minimize disturbance. Planting on open or disturbed steep slopes eventually will stabilize them. Until the roots become established, however, there may still be erosion problems. Monitoring the stability of the soil will be important to the survival of the trees.

- Post-planting Considerations: For areas of large-scale disturbance, soils must be stabilized using a non-turf-building ground cover or engineering fabric. To protect against intrusion and to prevent damage of planted areas, all reforestation and afforestation sites must be posted with appropriate signs and fenced.

Certification of Completion

At the end of the construction period, the designated qualified professional shall convey to the Department of Planning And Zoning certification that all forest retention areas have been preserved, all reforestation and afforestation plantings have been installed as required by the forest conservation plan, and that all protection measures required for the post-construction period have been put in place. *Appendix J* contains a sample format for such certification. Planting must occur before June 30th to be credited toward the current growing season.

Upon review of the certification document for completeness and accuracy, the Department will notify the developer of the beginning of the post-construction management period.

POST-CONSTRUCTION MANAGEMENT PRACTICES

Many of the protection and management practices for the construction period must be continued for at least 2 growing seasons following official notification of completion of the development (or a specific phase of the overall development if phasing has been approved). The responsibility to meet the survival standards requires adequate watering, replanting, thinning or other appropriate measures. Also, inappropriate uses or intrusions must not occur, a responsibility that requires the knowledge and cooperation of the new occupants of the development.

Minimum Two Growing Season Post-Construction Management Program

A post-construction management program must be approved as part of the original forest conservation plan and remain in effect for a minimum of two growing seasons. A longer period may be required for specific strategies (e.g. natural regeneration near high use areas whose long-term viability may take longer to confirm.)

Implementation of the post-construction management program must be supervised by a qualified professional who should inspect the status of all forest retention, reforestation and afforestation areas at specified times during the life of the post construction agreement and who must certify that the required survival rates have been achieved in accordance with the agreement prior to release of bonds.

There are five primary components of the post-construction program: inspection, management of retained or new plantings, replacement of dead or damaged material when

necessary, education of new occupants of the development and final inspection and release of developer from additional responsibilities.

Inspection

Inspections should be carried out at the beginning and end of the growing season to pinpoint any problems, monitor survival rates, and specify remedial actions needed to correct existing problems. *Appendix J* has an example of an inspection report checklist.

Management of Forest Conservation Areas

Post construction management includes: maintenance of all fences, signs or other devices delineating forest conservation areas and other measures. Such other measures include: needed watering; removal of dead or damaged material and control of undesirable competing species; thinning or pruning to encourage proper growth; fertilizing, if necessary; and control of pests. Specific practices will depend on the weather prevailing during the post construction period, the types of plant material and planting methods used, and specific site conditions such as proximity to high use areas. It is the responsibility of the post-construction plan supervisor to take appropriate actions as needed. This manual, therefore, does not cite required measures. Survival success, not fulfillment of a given series of tasks, will be the measure of conformance to the needs of the post-construction program.

Newly planted trees, whether they are seedlings or 4" caliper transplants, have basic needs. Some of these needs can be met by nature alone; others may require human intervention. (The three most likely causes of death for newly planted trees are drought, competing vegetation and deer.) The basic maintenance regime should be determined by on-site environmental conditions, structure and nutrient content of soil, and rainfall. Understanding these factors and the specific needs of the species and size of plants used will result in a healthy forested area at the end of the maintenance period. *Appendix H* contains guideline specifications for maintenance of forest conservation areas and focuses on the following critical needs:

- watering
- fertilizing
- control of competing vegetation
- protection from pests, diseases and mechanical injury.

Replacement of Plant Material

An inspection shall take place at the end of year one or before the second growing season to evaluate survival rates with reference to the survival required at the end of the two year period. This is an opportunity to avoid the penalty for violating survival rate standards. This inspection should estimate survival potential based on the following:

- vigor and threat of competing vegetation (i.e. if seedlings are free to grow)
- structure
- growth rate
- crown development
- trunk health

If, after one year, the possibility exists that the original planting will not meet survival standards, the applicant may choose to establish reinforcement plantings. If plant mortality of reforestation or afforestation exceeds 10% of planted material at the end of the first growing season, such material should be replaced to bring the total number of trees to 90% of the original total. Such material shall be installed by the beginning of the second growing season. If at the end of the second growing season, survival rate drops below 75%, such material as needed to guarantee an 75% survival rate by the end of the third growing season shall be installed.

Education of New Occupants

The occupants of a new development, whether owners or tenants, must avoid activities that destroy or degrade protected forest resources. The post-construction management program must therefore include steps to educate the new occupants about the proper use of forest conservation areas, about the need for the developer to carry out the post-construction management program, and the eventual transfer of long-term responsibilities to the owners or occupants. Such educational material should include a plan locating all protected areas on the site and a description of permitted and prohibited activities within or affecting such areas. The format and method of conveying such information is left to the discretion of the developer.

Final Inspection and Release of Obligations

At the end of the post-construction management and protection period, the designated responsible professional shall convey to the Department of Planning and Zoning certification that all forest conservation areas have remained intact or have been restored to the appropriate condition, that the stipulated survival rates have been achieved, and that any permanent protection measures required by the plan are in place. *Appendix J* contains a sample format for such certification.

Upon review of the final certification document for completeness and accuracy, the County will notify the developer of release of surety and all future obligations. The developer's last official responsibility will be to transmit a copy of this notification to the owner(s) of the property(ies). Such transmittal will serve as official notice to owners of their assumption of full responsibility for all future forest conservation obligations.

LONG-TERM MANAGEMENT RESPONSIBILITIES

To maintain the integrity of forest conservation areas, the owners must refrain from any activities that would diminish the viability and environmental integrity of forest retention areas or hinder the growth and maturing of new forest plantings. When the site is occupied by tenants, the owner must insure that the tenants do not, willfully or out of ignorance, use the site in ways that violate forest conservation restrictions or damage protected forest resources. Depending on the location, as well as the size and type of plant material, some maintenance is very beneficial, particularly in the early years. In all instances, State law requires that noxious weeds be controlled.

In many developments a homeowners association, tenants association or other management organization will maintain the site. Such a group is well suited to assume explicit responsibility for protecting the integrity of forest conservation areas and performing any desired maintenance after the initial developer guarantees and obligations have expired. Responsibility for ensuring that all provisions of the conservation easement are adhered to, however, ultimately belong to the property owner(s).

CHAPTER VI

PROGRAM IMPLEMENTATION

QUALIFIED CONSULTANTS: REQUIRED BACKGROUND

All forest conservation plans, including forest stand delineations must be signed by a qualified professional. Proof of such qualification (license number and seal, or certificate from DNR, etc.) shall be part of the submission.

Under County and State law, all licensed foresters and landscape architects may prepare forest stand delineations, forest conservation plans or other required documents. State regulations issued to implement the 1991 Forest Conservation Act set criteria by which other professionals, primarily with resource or environmental planning backgrounds, are also considered qualified. (See *Appendix K* for full text of the "Approved Qualified Professionals" section of the regulations.) No other persons may prepare or implement the plans and the management programs required by the forest conservation program.

RESPONSIBILITIES AND LIABILITY OF CONSULTANTS

The consultant(s) responsible for preparation of a forest conservation plan and certification that it has been implemented must assure that:

- The required forest stand delineation is accurate.
- The retention, clearing, reforestation or afforestation areas shown on the plan are accurate and have been coordinated with other subdivision or site planning requirements to minimize loss of existing forest resources.
- The cost estimate for reforestation or afforestation is accurate and sufficient to complete the work for bonding purposes.
- Construction period protection measures and all plantings are complete and in accord with the approved forest conservation plans. (This includes plant selection, size, quantity and planting methods.)
- Post-construction survival rates have been achieved or any required mitigation for excessive plant loss has been carried out. Certification will be required prior to release of the post-construction maintenance bond.

Submission of inaccurate plans or information or failure to implement fully all construction and post-construction obligations may constitute violations of the program. Such violations may also result in suspension of qualifications to submit forest conservation plans and related documents, to implement approved plans, or to certify completion of requirements for bond release.

ORGANIZATION OF THE HOWARD COUNTY PROGRAM

Exhibits 6 - 1, 6 - 2, 6 - 3, and 6-4 summarize how forest conservation plan requirements and procedures coincide with other key subdivision, site development, or timber harvesting permit requirements.

Program Administrator

As administrator of the subdivision and site development plan review process, the Department of Planning and Zoning shall coordinate review of forest conservation plans with other requirements for approval of development proposals. These duties include:

- Deciding on applicability or exemption from forest conservation program requirements.
- Accepting of forest stand delineations and forest conservation plan submissions as part of subdivision, site development or grading permit review submissions.
- Coordinating forest conservation plan review with review of other development requirements.
- Approving forest conservation proposals, or suggesting resolution of conflicts between forest conservation proposals and other development proposal requirements (roads, storm water management, etc.)
- Approving construction period and post-construction management programs. Reviewing cost estimates for the forest conservation developers agreement and bonds.
- Reviewing certificates of completeness for developers agreements and bonds.
- Reviewing Forest Conservation Deeds of Easement.
- Approving requests for payment of fee-in-lieu of reforestation or afforestation.

In addition to its plan review responsibilities, the Department of Planning and Zoning will also manage the other aspects of the Howard County Forest Conservation Program. Chief among these are data management to document how much forest is lost, retained or created by developments subject to the program, and submission of all information needed for the required two-year review of local programs by DNR.

Interagency Review of Plans

The scope of the forest conservation program and its complex relationship to both other development requirements and to timber harvesting permit applications will involve other agencies in the review and enforcement of forest conservation requirements. Interagency cooperation will insure the compatibility of forest conservation proposals with other site development requirements, especially storm water management, sediment and erosion control, grading permits, and open space requirements. *Exhibit 6 - 5*, at the end of this

EXHIBIT 6 - 1
MAJOR SUBDIVISION PLAN PROCESS

	SUBDIVISION AND SITE DEVELOPMENT STAGES	FOREST CONSERVATION REQUIREMENTS/ACTIONS
I.	Sketch Plan	Delineation Submitted a. Delineation reviewed and verified b. County to comment on priorities it wishes incorporated into forest conservation plan
II.	Preliminary Plan (optional)	Forest Conservation Plan Submitted a. Forest conservation worksheet verified b. Preliminary forest conservation plan coordinated with lot layout, road design, open space, utility and design of SWM facilities. c. Written statements to justify clearing, priorities followed, requests for off-site reforestation/afforestation, fee-in-lieu, etc. d. Show Limit of Disturbance area and specify protection measures. e. Construction phasing schedule.
III.	Final Plan	Record Forest Conservation Restrictions a. Coordinate final forest conservation plan with construction plans, landscaping plan and plat b. Execute developer's agreement and bond. c. Record boundaries of all forest conservation areas shown on final plan. d. Record all permanent forest conservation restrictions and responsibilities including legal right of access to off-site reforestation/afforestation sites (deed of easement).
IV.	Construction Phase	a. Install all required protection measures. b. Inspection and enforcement of Limits of Disturbance and required protection measures. c. Reforestation/afforestation implemented. d. Coordinate forest conservation/reforestation/afforestation measures with other required landscaping. e. Inspection and certification of completion of forest conservation plan requirements by qualified professional.
V.	Site Development Plan/ Grading Permit (if applicable)	a. Ensure conformance to approved Forest Conservation Plan and recorded restrictions.
VI.	Post Construction	a. Minimum 2 growing season maintenance period begins. b. Replacement plantings as required. c. Inspection and certification by qualified professional that survival rates have been achieved. d. Release of bonds. e. Transfer of long term responsibility to future owners (if not original owner/developer).

EXHIBIT 6 - 2
MINOR SUBDIVISION PROCESS

	SUBDIVISION AND SITE DEVELOPMENT STAGES	FOREST CONSERVATION REQUIREMENTS/ACTIONS
I.	Minor Subdivision Application	Combined Delineation and Forest Conservation Plan Submitted a. Delineation of forest resources and description of other site environmental features, jointly with b. Forest conservation plan (designating retention, reforestation, afforestation areas) c. Show Limit of Disturbance area and specify protection measures needed.
II.	Recordation	a. Execute developer's agreement and bond (not required for forest retention). b. Record boundaries of all permanent forest conservation areas and Deed of Easement.
III.	Construction Phase	a. Install all required protection measures. b. Inspection and enforcement of Limits of Disturbance and required protection measures. c. Reforestation/afforestation implemented. d. Coordinate forest conservation/reforestation/afforestation measures with other required landscaping. e. Inspection and certification of completion of forest conservation plan requirements by qualified professional.
IV.	Site Development Plan/Grading Permit (if applicable)	a. Ensure SDP conformance to approved Forest Conservation Plan and recorded restrictions.
V.	Post Construction	a. Minimum 2 growing season maintenance period begins. b. Replacement plantings as necessary c. Inspection and certification by qualified professional that survival rates have been achieved. d. Release of bonds. e. Transfer of long term responsibility to future owners (if not original owner/developer).

EXHIBIT 6 - 3
SITE DEVELOPMENT PLAN PROCESS

	SUBDIVISION AND SITE DEVELOPMENT STAGES	FOREST CONSERVATION REQUIREMENTS/ACTIONS
I.	Site Development Plan	Combined Delineation and Forest Conservation Plan Submitted a. Delineation of forest resources and description of other site environmental features, jointly with b. Forest conservation plan designating retention, reforestation, afforestation areas, and planting specifications c. Coordinate with all construction plans, show Limit of Disturbance area and specify protection measures needed.
II.	Easement and Agreements	a. Execute deeds of easement with forest conservation area boundaries. b. Execute developer's agreement and bond.
III.	Construction Phase	a. Install all required protection measures. b. Inspection and enforcement of Limits of Disturbance and required protection measures. c. Reforestation/afforestation implemented. d. Coordinate forest conservation/reforestation/afforestation measures with other required landscaping. e. Inspection and certification of completion of forest conservation plan requirements by qualified professional.
IV.	Post Construction	a. Minimum 2 growing season maintenance period begins. b. Replacement plantings as required. c. Inspection and certification by qualified professional that survival rates have been achieved. d. Release of bonds. e. Transfer of long term responsibility to future owners (if not original owner/developer).

EXHIBIT 6 - 4
TIMBER HARVESTING PERMIT PROCESS

	SUBDIVISION AND SITE DEVELOPMENT STAGES	FOREST CONSERVATION REQUIREMENTS/ACTIONS
I.	PRE-DEVELOPMENT	a. Submit grading permit, timber harvesting plan, and declaration of intent to the Department of Planning and Zoning. b. Review and approval by Howard Soil Conservation District of the timber harvesting plan and grading plan. c. Obtain Department of Planning and Zoning approval of the grading permit. d. Submit DPZ and SCD approved grading permit and timber harvesting plan to Department of Inspections, Licenses and Permits for final permit processing and approval.
II.	SUBDIVISION OR SITE DEVELOPMENT PLAN	a. Delineation reviewed and verified. b. Forest conservation plan reviewed, coordinated with other development requirements and revised as necessary. c. Final subdivision or site development plan and forest conservation plan determined to be technically complete. d. Timber harvesting permit may be applied for and approved if in conformance with forest conservation plan (per process above) . e. Execute developers agreements and bonds. f. Execute deed of forest conservation easement and record plat, if applicable.

chapter, identifies the roles of the Department of Public Works; the Department of Inspections, Licenses and Permits; the Department of Recreation and Parks; and the Howard County Soil Conservation District in overall implementation of the Howard County Forest Conservation Program. It also enumerates the responsibilities of the Maryland General Assembly, Department of Natural Resources and Howard County Council in the process of enacting and implementing the program.

Inspection and Enforcement

Close interagency cooperation is needed for inspection and enforcement, especially during the construction period when forest retention areas and reforestation or afforestation areas are most susceptible to stress and degradation from site disturbances.

Enforcement of the approved limits of disturbance is a primary concern. Inspections of forest limits are most likely to occur in tandem with inspections for other environmental requirements such as installation and maintenance of sediment and erosion control structures and inspections to insure that floodplain, wetland, steep slope or stream buffer areas are being protected. The qualified consultant designated to oversee implementation of an approved forest conservation plan will be obliged to submit certification that all forest retention areas are properly protected and that all reforestation or afforestation planting requirements (species, size, number and planting methods) and any other horticultural or forest management measures cited in the approved plan are carried out as specified. Spot checks by County agency enforcement staff will insure this certification system is reliable and credible.

Non-Compliance and Penalties

Failure to submit a required forest conservation plan or to adhere to the requirements of an approved forest conservation plan will result in possible non-compliance and civil fines, institution of a stopwork order or injunction, requirements to restore or create forest communities lost through non-compliance, or any combination of these penalties. There are several categories of non-compliance, each with its own penalties.

1. Failure to submit a Declaration of Intent. Failure to file a Declaration of Intent may result in a civil penalty. Engaging in a development activity regulated by the forest conservation program within five-years of the effective date of period following the conclusion of activities specified in the Declaration of Intent makes the offender liable to the requirements for reforestation or afforestation based on the original forest cover.

2. Failure to submit a required forest conservation plan. Conducting any regulated activity without an approved forest conservation plan will result in civil and/or non-compliance penalties and mitigation to restore the forest resources cleared by such unauthorized actions.

3. Failure to adhere to the conditions of an approved forest conservation plan. Such violations can occur during the construction period, during the two-year minimum post-construction management period, or after transfer of the forest conservation restrictions and responsibilities to future owners of the property.

During the construction and post construction maintenance periods, the developer is liable. Civil and/or non-compliance penalties and/or mitigation of damage incurred are all possible. The post-construction management surety may be extended as appropriate for any mitigation work required to correct non-compliance.

Subsequent property owners assume full responsibility for maintaining the integrity of forest retention, reforestation and afforestation areas under the terms of the forest conservation easement. Degradation or destruction of such areas may result in monetary penalties and/or mitigation to restore these areas to a quality acceptable to the Department of Planning and Zoning.

Use of the Forest Conservation Fund

The Department of Planning and Zoning will also be responsible for utilization of the forest conservation fund established by the program as the repository of all fines and fee-in-lieu of payments collected.

The minimum fines and in-lieu fees established by SB224 will only be used to purchase, prepare, and plant new forest stands on appropriate sites. Fines and in lieu fees collected at rates exceeding the required minimum levels established by the State law may be used for other forest conservation program functions (public education, planning, training of staff) as appropriate. The fund can also accept grants, donations or other appropriations to help fund the overall operations of the forest conservation program and to increase the amount of forest created through the program. Such funds may also be used for any forest conservation program functions deemed appropriate.

Eligible sites for implementation of reforestation or afforestation funded by fee-in-lieu or penalty payments can include County-owned open space, private open space, properties with environmental easements, appropriate land in agricultural easements, preservation parcels created by rural clustering or private properties for which reforestation agreements can be negotiated. Owners of private properties to be used for such plantings must agree to have the areas and terms of forest conservation restrictions recorded as deed restrictions, to provide areas of at least 10,000 square feet for such plantings, and grant legal rights of access for any necessary site preparation, planting and post-planting management and inspection.

Accountability to the State

The Department of Planning and Zoning shall be the chief liaison between Howard County and the Maryland Department of Natural Resources (DNR). This liaison role includes preparing annual reports on accomplishments of the program, cooperating with the DNR during DNR's two-year review of local programs, notifying DNR of requests for waivers, forwarding to DNR for its review any public project involving State funding, cooperating with DNR in their inventory of Howard County forest resources, and providing a list of potential sites for new forest plantings.

EXHIBIT 6 -5
PROGRAM ADMINISTRATION RESPONSIBILITIES

MARYLAND GENERAL ASSEMBLY
- Receives annual reports from local government on progress of forest conservation program (Senate Economic and Environmental Affairs Committee and House Environmental Matters Committee)

MARYLAND DEPARTMENT OF NATURAL RESOURCES
- Issues regulations and criteria to be incorporated in local programs
- Reviews and approves local program every 2 years
- Develops forest resource maps to assist in location of potential reforestation and afforestation sites
- Reviews local government projects when state funds are involved
- Receives notice of waiver requests

DEPARTMENT OF PLANNING AND ZONING
- Administers Program
- Coordinates review of forest plan submissions with other development review submissions and timber harvesting permit applications.
- Reviews certification of compliance and approves release of financial guarantees.
- Administers use of forest conservation fund
- Acts as main liaison to DNR

DEPARTMENT OF PUBLIC WORKS
- Coordinates forest conservation construction and maintenance agreements and bonds with Developer's Agreement

DEPARTMENT OF RECREATION AND PARKS
- Evaluates reforestation/afforestation on-site for proposals of open space land to be dedicated to the County
- Maintains an inventory of public and HOA lands suitable for off-site reforestation/afforestation
- Reviews plans for off-site planting on public property

DEPARTMENT OF INSPECTIONS, LICENSES AND PERMITS
- Performs inspection for compliance with forest protection measures in conjunction with sediment and erosion control inspections

HOWARD COUNTY SOIL CONSERVATION DISTRICT
- Reviews forest conservation plans for compatibility with sediment and erosion control regulations.
- Provides technical advice on forest conservation issues related to soil issues (e.g. woodland suitability index)
- Approves timber harvesting permits that are exempt from or conform to an approved forest conservation plan.

APPENDICES

APPENDIX A
GLOSSARY OF TERMS

The glossary includes select definitions from the State Forest Conservation Manual and the County Planning, Zoning and Subdivision and Land Development Regulations.

Afforestation - the establishment of new forest on an area presently without forest cover, by planting in accord with the practices specified in the forest conservation manual.

Basal Area - a measure of forest stand density through an estimate of cross-sectional area.

Break-Even Point - the point at which the forest conservation requirements can be met solely through forest retention and no reforestation is required.

Caliper - tree diameter measured above the root collar in accordance with American Association of Nurserymen standards.

Champion Trees - the largest tree of its species within the United States, the State, or Howard County, as determined by the Maryland Department of Natural Resources.

Commercial Logging and Timber Harvesting - the cutting and removing of tree stems from a site for commercial purposes, leaving the root mass intact.

Critical Habitat for Endangered Species - a habitat occupied by an endangered species as determined or listed under Section 4-2A-04 and Section 10-2A-04, Natural Resources Article, Annotation Code of Maryland.

Critical Habitat Area - a critical habitat for endangered species and its surrounding protection area. A critical habitat area shall:

1) Be likely to contribute to the long-term survival of the species;
2) Be likely to be occupied by the species for the foreseeable future: and
3) Constitute habitat of the species which is considered critical under Natural Resources Article, §§4-2A-04 and 10-2A-06, Annotation Code of Maryland.

Declaration of Intent - a statement signed by a landowner or developer certifying that:

1) Proposed development is exempt from the requirement for an approved forest conservation plan; and
2) No development requiring a forest conservation plan will occur on the site within 5 years of the date of the completion of the exempt development.

Department - the Howard County Department of Planning and Zoning.

Development - the establishment of a principal use of a site; a change in a principal use of a site; or the improvement or alteration of a site by the construction, enlargement, or relocation of a structure; the provision of stormwater management or roads; the grading of existing topography; the clearing or grubbing of existing vegetation; or any other non-agricultural activity that results in a change in existing site conditions.

Erodible Soils - areas with soils with K values greater than 0.35.

Forest - a biological community dominated by trees and other woody plants covering an area of 10,000 square feet or greater. Forest includes:

1) Areas with a tree cover ratio 100 trees per acre with at least 50% of these trees being at least 2 inches in diameter at a height of 4.5 feet above ground; or
2) Areas meeting the criteria above that have been cut but not cleared.

Forest does not include orchards, tree nurseries, christmas tree farms or other types of forest crops.

Forest Conservation - the retention of existing forest or the creation of new forest at the levels set by this subtitle.

Forest Conservation Fund - a fund into which payments of in-lieu fees or penalties will be made when an applicant cannot comply or violates the requirements of the Forest Conservation Program. Such funds shall only be used for purposes specified in the program.

Forest Conservation Plan - a plan which shows the impacts of a proposed development on existing forest resources. A forest conservation plan includes existing forest areas to be removed or retained; the location, extent and specifications for any reforestation or afforestation required; and legal measures to protect forest resources after completion of development.

Forest Conservation Program - a local Howard County program developed under the authority of the State Forest Conservation Act and is consistent with the intent, requirements and standards of the Act, Natural Resources Article, 5-1601 et seq., Annotated Code of Maryland.

Forest Cover - the area of a site meeting the definition of forest.

Forest Product - any wood fiber product extracted from a forest which can be sold on the commercial market.

Forest Stand - a contiguous group of trees meeting the definition of forest sufficiently uniform in species composition, arrangement of age classes, and condition to be a distinguishable, homogeneous unit.

Forest Stand Delineation - the evaluation of existing forests and other vegetation on a site proposed for development.

Growing Season - the time, from spring to fall, during which consecutive frost-free days occur.

Hydric Soils - are generally defined as soils that are saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper layer of soil.

Limit of Disturbance - the boundary of permitted changes to existing site conditions due to clearing and grading, as well as other activities associated with site development such as parking of vehicles and equipment, storage of materials, and disposal of construction debris.

Maintenance Agreement - a legally binding agreement to ensure the survivability of all sites afforested, reforested or landscaped.

Manual - the Howard County Forest Conservation Manual.

Natural Regeneration - the natural establishment of trees and other vegetation with at least 700 woody, free-to-grow seedlings per acre, which are capable of reaching a height of at least 20 feet at maturity.

Net Tract Area - the total area to the nearest 1/10 acre, whether forested or not, of a proposed development, exclusive of any 100-year floodplain or preservation parcel as referenced in the Zoning Regulations. Net Tract Area is used in calculating any reforestation or afforestation obligations that may be created by the proposed development.

Other Terms - "Other Terms" which are defined in the natural resources article, Section 5-1601, "DEFINITIONS", Annotated Code of Maryland are incorporated by reference and shall apply to this subtitle for any terms which are not defined in this section or the manual.

Permanent Tree Protection Devices - structural measures, such as retaining walls or aeration devices, that are designed to protect the tree and its root systems throughout its lifetime.

Planned Unit Development - a development comprised of a combination of land uses or varying intensities of the same land-use in accordance with an integrated plan that provides flexibility in design with at least 20% of the land permanently dedicated to open space.

Reforestation - the establishment, in accordance with this Manual, of new forest cover to replace forest resources lost because of development activities.

Reforestation Threshold - the quantitative standard used to calculate when reforestation requirements increase from a ratio of 1/4 acre replacement for each acre cleared to 2 acres for each acre cleared. The reforestation threshold is also used as a baseline to calculate any forest retention credit that can be used to reduce a reforestation obligation.

Retention - the deliberate holding and protecting of existing trees, shrubs or plants on the site according to standards as set forth in this manual.

Seedlings - an unbranched woody plant, less than 24 inches in height and having a diameter of less than one half inch caliper measured at two inches above the root collar.

Selective Clearing - the careful and planned removal of trees, shrubs, and plants using specific standards and protection measured under an approved Forest Conservation Plan.

Soil Amendments - the modification of soil properties for improvement of soil structure; not to be confused with fertilizers whose purpose is to correct chemical imbalances in soils for silvicultural purposes.

Soil Protection Zone (Critical Root Zone) - the essential area of the roots that must be maintained or protected for the tree's survival.

Stand Structure - the composition of the forest stand with reference to forest association, dominant and co-dominant species, understory and herbaceous species.

Temporary Tree Protection Devices - structural measures, such as fencing or berms, installed prior to construction for the purpose of preventing access to forest retention areas, reforestation or afforestation areas during construction.

Tree - a large, branched, woody plant having one or several self-supporting stems or trunks that reach a height of at least 20 feet at maturity.

Understory Trees - trees with crowns entirely below the general level of the canopy receiving little or no sunlight from above or the sides.

Watershed - all lands lying within an area described as a subbasin in the water quality regulations adopted by the Maryland Department of the Environment.

Whip - an unbranched woody plant greater than 24 inches in height and having a diameter of less than one inch caliper measured at two inches above the root collar.

APPENDIX B
DECLARATION OF INTENT

Exhibits B-1 through B-4 are the declaration of intent forms for the four categories of conditionally exempt activities.

APPENDIX B-1
DECLARATION OF INTENT
FORESTRY ACTIVITIES

#_____ District _____ Map_____ Grid _____ Parcel _____

Name(s) _____

Location _____

_____

I, (We), _____, the Owner of the real property located at _____ and described as _____ _____ hereby declare my (our) intention to continue and/or place into commercial forestry use the above property in accordance with the provisions of Howard County Subdivision and Land Development Regulations Sections 16.1202(b) and (c) for a period of at least five (5) consecutive years following this date.

Upon completion of the commercial forestry activities, I (we) will provide the Department of Planning and Zoning a certification prepared by a qualified professional that the activities are complete. The site will remain exempt from the provisions of Section 16.1202(a) for a period of five (5) full years from the date of the certification provided that the property is not the subject of any activities requiring a forest conservation plan.

If the Owner makes application for an activity regulated under Howard County Planning, Zoning and Subdivision and Land Development Regulations Section 16.1202(a) or constructs non-forestry structures or site improvements on all or part of the parcel within five (5) full years following the date of certification that the activities have been completed, the County can require the Owner to meet the reforestation threshold established in Section 16.1205 of the Subdivision and Land Development regulations.

I (we) declare that this declaration (including any accompanying forms and statements) has been examined by me (us) and the information contained herein, to the best of my (our) knowledge, information and belief, is true, correct and complete.

Signature(s)_____ Date _____

APPENDIX B-2
DECLARATION OF INTENT
AGRICULTURAL ACTIVITIES CLEARING MORE THAN 40,000 SQ. FT. WITHIN ONE YEAR

#_____ District _____ Map_____ Grid _____ Parcel _____

Name(s) _____

Location _____

_____

I, (we), _____, the owner of the real property located at _____ and described as _____ _____ hereby declare my (our) intention to continue and/or place into agricultural uses on the above property in accordance with the provisions of Howard County Subdivision and Land Development Regulations Sections 16.1202(b)(2)(iii) and (c) for a period of at least five (5) consecutive years following this date.

The exempt practices and the acres or square feet affected are:

a. _____ _____ acres
b. _____ _____ acres
c. _____ _____ acres
d. _____ _____ acres
e. _____ _____ acres

Structures built to carry out such practices are:
(Description and square feet of ground affected)

a. _____ _____ acres
b. _____ _____ acres
c. _____ _____ acres
d. _____ _____ acres
e. _____ _____ acres

Total amount of forest areas to be cleared are _____ acres and are located on the attached property line plat.

Upon implementation of these practices, including any installation of the structures needed to conduct such activities, I (we) will provide the Department of Planning and Zoning certification that the activities are in place. The site will remain exempt from the provisions of section 16.1202(a) for a period of five (5) full years from the date of the certification provided that the property is not the subject of any activities requiring a forest conservation plan.

If the owner makes application for an activity regulated under howard county planning, zoning and subdivision and land development regulations section 16.1202(a) on all or part of the parcel within five (5) full years following the date of certification that the activities have been put into practice, the county can require the owner to meet the reforestation threshold established in section 16.1205 of the subdivision and land development regulations and may also assess a penalty fee for forested areas cut in violation of the forestry exemption.

I (we) understand that any subsequent clearing of additional forest resources beyond the amounts cited above shall require an amendment to this declaration to show the amount and location of such clearing.

I (we) declare that this declaration (including any accompanying forms and statements) has been examined by me (us) and the information contained herein, to the best of my (our) knowledge, information and belief, is true, correct and complete.

Signature(s)_____ Date _____

APPENDIX B-3
DECLARATION OF INTENT
SUBDIVISION FOR REAL ESTATE TRANSACTION

#_____ District _____ Map_____ Grid _____ Parcel _____

Name(s) _____

Location _____

_____

I, (we), _____, the owner of the real property located at _____ and described as _____ _____ hereby declare my (our) intention to subdivide the above property to transfer all/part to new owners.

Upon completion of the subdivision activities, I (we) will provide the Department of Planning and Zoning a certification prepared by a qualified professional that the activities are complete. The site will remain exempt from the provisions of the Howard County Forest Conservation Program (Section 16.1200 of the Subdivision and Land Development Regulations) section 16.1202(a) from the date of the certification only until such time that any activities requiring a forest conservation plan are proposed.

If the subsequent or present owners conduct an activity regulated under Howard County Planning, Zoning and Subdivision and Land Development Regulations Section 16.1202(a) without complying with the requirements of Section 16.1200, the County can require the owner to meet the reforestation threshold established in Section 16.1205 of the Subdivision and Land Development Regulations and may also assess a penalty fee for forested areas cut in violation of the forestry exemption.

It is also my (our) understanding that this declaration and all conditions therefor shall be included with all documents required for such real estate transfer and that this constitutes sufficient notice to the new owner(s) that they assume all future obligations to conform to the requirements of Section 16.1200 should they propose any regulated activity.

I (we) declare that this declaration (including any accompanying forms and statements) has been examined by me (us) and the information contained herein, to the best of my (our) knowledge, information and belief, is true, correct and complete.

Signature(s)_____ Date _____

APPENDIX B-4
DECLARATION OF INTENT
SINGLE LOT CLEARING LESS THAN 40,000 SQ. FT.

#_____ District _____ Map_____ Grid _____ Parcel _____

Name(s) _____
Location _____
_____

I, (we), _____, the owner of the real property located at _____ and described as _____ and such lot being a single lot of more than 40,000 square feet but not to be further subdivided, hereby declare my (our) intention to make the following site improvements but will not clear more than 40,000 square feet of existing forest resources.

Site improvements proposed:

a. _____
_____

b. _____
_____

c. _____
_____

Description of area, if any, of total proposed forest resources to be cleared (list separate stands of more than one):

a. _____ _____ acres
b. _____ _____ acres
c. _____ _____ acres
d. _____ _____ acres

[Show all improvements and forest areas on property line plat or site development plan or grading permit, if one is required.]

Upon completion of the development activities, I (we) will provide the Department of Planning and Zoning a certification prepared by a qualified professional that _____ _____. The site will remain exempt from the provisions of Section 16.1202(a) provided that the property is not the subject of any future activities resulting in a cumulative loss of forest resources of more than 40,000 square feet.

If the present or subsequent owners make application for an activity regulated under Howard County Planning, Zoning and Subdivision and Land Development Regulations Section 16.1202(a), or if total clearing of forest resources from the date of this declaration exceeds 40,000 square feet, the County can require the owner to meet the reforestation threshold established in Section 16.1205 of the Subdivision and Land Development Regulations and may also assess a penalty fee for forested areas cut in violation of the forestry exemption.

I (we) declare that this declaration (including any accompanying forms and statements) has been examined by me (us) and the information contained herein, to the best of my (our) knowledge, information and belief, is true, correct and complete.

Signature(s)_____ Date _____

APPENDIX C
FOREST STAND ANALYSIS TABLE

Applicant: _____ Project Name: _____ Submission No. _____

KEY	A. TYPE OF COMMUNITY	B. AREA*	C. SOIL INFORMATION **				D. EXISTING VEGETATION (Dominant Species and Approx.%)	E. STAND CHARACTERISTICS			F. FOREST AREA IN SENSITIVE ENVIRONMENTS * (Acres)
			1. Soil Types	2. Typical forest cover for soil type*	3. Woodland Suitability Index	4. Habitat Value for soil type		1. Size (Diam)	2. Age	3. General Conditions	

* Area measured to the nearest 1/10 acre

** Source: Howard County Soil Survey. USDA

APPENDIX D
FOREST ASSOCIATION LIST

CHESTNUT OAK

red maple
white oak
sassafras
northern red oak
black cherry
black gum
black oak
early low blueberry
pignut hickory
flowering dogwood
American chestnut
mockernut hickory
Virginia Creeper
grape
chestnut oak
tall deerberry
brambles
mapleleaf viburnum
greenbriers
scarlet oak
white ash
witch hazel

SYCAMORE-GREEN ASH-BOX ELDER-SILVER MAPLE

red maple
Virginia creeper
white oak
flowering dogwood
grape
black cherry
northern red oak
spicebush
tulip poplar
black gum
sassafras
white ash
mockernut hickory
poison ivy
southern arrowwood
black oak
pignut hickory
brambles
greenbriers
ironwood
green ash
sycamore
box elder
silver maple

RIVER BIRCH-SYCAMORE

red maple
poison ivy
Virginia creeper
greenbriers
sweet gum
southern arrowwood
tulip poplar
spicebush
black gum
grape
ironwood
American holly

TULIP POPLAR

red maple
flowering dogwood
Virginia creeper
black gum
white oak
sassafras
black cherry
grape
mockernut hickory
southern arrowwood
pignut hickory
black oak

RIVER BIRCH-SYCAMORE
(Continued)

flowering dogwood
black cherry
green ash
white oak
brambles
elderberry
slippery elm
sassafras
sycamore
river birch

SUGAR MAPLE-BASSWOOD

northern red oak
black cherry
red maple
white oak
white ash
flowering dogwood
Virginia creeper
witch hazel
black locust
greenbriers
grape
hop hornbeam
poison ivy
pignut hickory
black birch
serviceberries
sassafras
mockernut hickory
sweet pignut hickory
hawthorn
brambles
sugar maple
basswood

TULIP POPLAR
(Continued)

poison ivy
greenbriers
beech
spicebush
northern red oak
mapleleaf viburnum
early low blueberry
choke cherry
brambles
tulip poplar

HEMLOCK-BIRCH

red maple
northern red oak
witch hazel
black cherry
sugar maple
white oak
beech
ironwood
mapleleaf viburnum
shagbark hickory
white ash
striped maple
hemlock
black birch

Sources

Darr, Lonnie. 1990. A Technical Manual for Woodland Conservation with Development in Prince George's County. MNCPPC. Upper Marlboro, MD

Henderson, Carroll L. 1981. Landscaping for Wildlife. Minnesota Department of Natural Resources. St. Paul, MN.

APPENDIX E
FOREST CONSERVATION WORKSHEET

ACRES
(1/10 acre)

I. BASIC SITE DATA

Gross Site Area _____
Area Within 100 Year Floodplain _____
Area Within Agricultural Use or Preservation Parcel (If Applicable) _____
Net Tract Area _____
Land Use Category (R-RLD, R-RMD, R-S, C/I/O, I) _____

II. INFORMATION FOR CALCULATIONS

A. Net Tract Area _____
B. Reforestation Threshold (_____ % x A) _____
C. Afforestation Minimum (_____ % x A) _____
D. Existing Forest on Net Tract Area _____
E. Forest Areas to Be Cleared _____
F. Forest Areas to Be Retained _____

III. DETERMINING REQUIREMENTS: AFFORESTATION OR REFORESTATION

1. REFORESTATION

If existing forest areas equal or exceed the afforestation minimum (if D equals or is more than C), and clearing of forest areas is proposed, reforestation requirements may apply.

GO TO SECTION IV

If existing forests exceed the afforestation minimum (if D equals or is more than C) and no clearing of existing forest resources is proposed, no reforestation is required. No further calculations are needed.

2. AFFORESTATION

If existing forest area are less than the afforestation minimum (if D is less than C), afforestation requirements apply.

GO TO SECTION V

ACRES
(1/10 acre)

IV. REFORESTATION CALCULATIONS

A. Net Tract Area _____
B. Reforestation Threshold (_____ % X A) _____
C. Existing Forest on Net Tract Area _____
D. Forest Areas to Be Cleared _____
E. Forest Areas to Be Retained _____
F. Forest Areas Cleared **Above** Reforestation Threshold _____
(D - F, if F equals or is greater than B, Alternate 1)
(D - B, if F is less than B, Alternate 2)
G. Forest Areas Cleared **Below** Reforestation Threshold _____
(B - F, **if applicable**)
H. Forest Areas Retained **Above** Reforestation Threshold _____
(F - B, Retention Credit, **if applicable**)

SELECT THE ALTERNATIVE THAT APPLIES:

1. CLEARING ABOVE THE THRESHOLD ONLY

If forest areas to be retained equal or are greater than the reforestation threshold (if F equals or is greater than B), the following calculations apply:

Reforestation for clearing above threshold _____
G x 1/4
Credit for forest areas retained above threshold _____
I = Retention Credit
Total Reforestation required _____
(G x 1/4) - I

If the total reforestation requirement is equal to or less than 0, no reforestation is required.

2. CLEARING BELOW THE THRESHOLD

If forest areas to be retained are less than the reforestation threshold (if F Is less than B), The following calculations apply:

Reforestation for clearing above threshold _____
G x 1/4
Reforestation for clearing below threshold _____
H x 2

ACRES
(1/10 acre)

Total Reforestation required
(G x 1/4) + (H x 2) _____

Since clearing occurs below the threshold, no forest retention credit is possible.

V. AFFORESTATION CALCULATIONS

A. Net Tract Area _____
B. Afforestation Minimum (_____ % x A) _____
C. Existing Forest on Net Tract Area _____
D. Forest Areas to Be Cleared _____
E. Forest Areas to Be Retained _____

SELECT THE ALTERNATIVE THAT APPLIES:

1. No Clearing below the Minimum

If existing forests are less than the afforestation minimum (if D is less than C) and no clearing is proposed, the following calculations apply:

Total afforestation required
C - D _____

Afforestation must make total forest area equal the minimum required.

2. Clearing below the Minimum

If existing forests are less than the afforestation minimum (if D is less than C) and clearing is proposed, the following calculations apply:

Afforestation for unforested areas below minimum
C - D _____
Afforestation for Clearing below Minimum
E X 2 _____
Total Afforestation Required
(C - D) + (E X 2) _____

Afforestation requires the total forest area be equal to the minimum and it requires compensation for clearing.

APPENDIX F
REFORESTATION AND AFFORESTATION METHODS

SELECTIVE CLEARING AND SUPPLEMENTAL PLANTING

Selective clearing and supplemental planting qualifies as reforestation or afforestation when it will bring existing tree stands up to the standards for forest specified by the forest conservation program.

All areas improved or enhanced by selective clearing and supplemental planting will be given reforestation or afforestation credit as long as the work results in areas meeting the quantitative standards defining forest.

Description:

- Selective clearing and supplemental planting to expand and/or stabilize the edges of forest retention areas disturbed by clearing and construction activities such as grading or installation of infrastructure.
- Infill planting of open areas within existing forests that have little or no canopy cover or that have insufficient number of trees on a per acre basis.
- The removal of dead, diseased or physically damaged trees and the reforestation of disturbed areas so that distressed areas within existing forests can be restored to a healthy forest ecology.
- The transformation of stands of mature trees without understory or non-turf groundcover into true forest stands by supplemental planting in accord with definition of forest.

Evaluation Criteria:

- Existing forest and proposed supplemental plantings must meet the minimum standards for a forest.
- Selective clearing will remove existing or potential future nuisances (e.g. species sensitive to disturbance or stress).
- Selective clearing will enable young regenerative population to grow more quickly into a mature forest environment.

Design Guidance:

- Proposed supplemental plantings are suitable for specific site conditions; species selected are appropriate match to existing plant community.
- Grade sensitive species may need to be removed if subjected to significant grade changes within their critical root zone.

- If sun-sensitive species are abundant on the stand margin, supplemental planting of sun-tolerant plant materials is recommended or these sun-sensitive species should be removed.
- Species prone to wind-throw (ex. Virginia pine) within 1 tree height of structures should be removed.
- Snags 6 to 8 feet in length may be left for the benefit of wildlife if they pose no safety hazards.

Requirements for Approval:

- Applicant must show selective clearing will result in true forest communities.
- Selective clearing objectives must be clearly defined in the reforestation plan. Selective clearing is not acceptable for purely aesthetic reasons.
- Specific trees targeted for removal or alteration as part of a selective clearing program must be noted on plans.
- Selective clearing must not disturb the remaining trees and understory.
- Stumps should not be removed under any circumstance.
- Selectively cleared areas must be planted with supplemental plant materials in accord with the forest planting standards of this manual.

TRANSPLANT OF LOCAL PLANT MATERIALS

The use of transplanted materials is generally encouraged due to the hardiness and adaptability of local plant materials to local conditions. The risks associated with this practice derive from the methods used for transplanting, storing and planting transplanted materials and the soil characteristics of the planting site.

Description:

- The use of on-site or locally obtained (within a 100 mile radius) plant materials which are transplanted on-site.

Evaluation Criteria:

- The material to be transplanted is amenable to disturbance (see *Table I-1*).
- The plant material is suited for the reforestation site (sunlight, soils, moisture regime).

Design Guidance:

- Climax species, in general, are less tolerant of transplanting than pioneer or early successional species.

- Larger trees (more than 6" caliper) need specialized care and equipment. Investigative root diggings are recommended for larger trees.
- Best time for transfer is late autumn (after leaf fall) or early winter.
- Transplants are not recommended in spring after the buds start to grow.
- Soft rooted species with frozen root ball are not recommended for transplant (see *Table I-2*).
- Open grown trees grown in heavy or clay soils are preferred for transplant because their rooting patterns are typically denser than forest grown trees.

Requirements:

- Transplant of local materials must be shown to be suitable for the site.
- Soils must be prepared in a planting field fashion, with proper soil amendments.
- Root balls must meet or exceed American Association of Nurserymen specifications.
- Species stocking requirements described in this manual must be met.
- If tree banks are used, the location, treatment and schedule for banking and transplant must be described.

NURSERY STOCK

The use of nursery stock, including seedlings, is another option for reforestation. Of primary concern is the hardiness of the nursery stock for the climate and conditions of the planting site. For this reason, there is a preference for stock grown in the region.

Description:

- The use of plant material transported from local (within a 200 mile radius) nurseries for reforestation or afforestation.

Evaluation Criteria:

- Species must be suitable for planting site conditions.

Requirements:

- Species native to Maryland shall be used unless shown to be unavailable. Local native genetic stock are recommended for better survivability.
- Stock must meet American Association of Nurserymen specifications.

LANDSCAPING

Landscaping as defined below can be counted up to 20% towards the reforestation or afforestation requirement. This option may be most appropriate for high use areas adjacent to structures or for buffers between land uses.

Description:

- The planting of a mixture of trees or shrubs and non-turf groundcover to create a vegetated area with ecological as well as aesthetic qualities able to withstand the stresses of proximity to high use areas.

Evaluation Criteria:

- The landscape area must be a minimum of 2500 square feet with a minimum width of 35 feet.
- It is adjacent to an external road, property boundaries, site entrances or other highly visible locations.
- The area is adjacent to structures or high use activity areas.
- It is a transition buffer to a reforestation or afforestation area.
- The area is adjacent to picnic areas, playgrounds or other recreation areas.

Design Guidance:

- Native plant materials or cultivars of native plants are recommended.
- Ornamental plant materials may be permitted when ecologically suitable.

Requirements:

- For every 10,000 square feet of area, there must be no less than 40 major shade trees and 120 shrubs.
- Ground plane must be mulch or ground cover. Turf will not be permitted.

NATURAL REGENERATION

Under natural conditions, the lands of this region have remarkable long term abilities to regenerate forests, but numerous variables affect the success of this process.

Description:

- Cleared areas that are prepared and managed to encourage the regeneration of forests through natural recruitment by seed bank, standing seed crop or asexual sprouting. Natural regeneration is appropriate for

areas such as abandoned fields where natural regeneration has already successfully begun and pioneer tree species have been established.

- Areas that are disturbed as part of the proposed development are suitable for reforestation or afforestation, but not natural regeneration.

Evaluation Criteria:

- Pioneer trees exist in suficient numbers to meet the 100 tree per acre standards for forest and the 3 to 4 foot height standard for whips by the end of the two growing season post-construction period.
- The physical conditions (soils, sunlight, moisture, and cover) are suitable for natural regeneration or suitable plant growth.

Design Guidance:

- Best used in low visibility, low use areas or on areas (such as extremely steep slopes) that are hard to manage.
- Treatment is extremely species and site specific. Therefore, it is recommended that the plan must be prepared by professional forester.
- Management and monitoring of these areas should be intensive.

Requirements:

- Plan must describe in detail how the above factors will be addressed and provide detailed information on the method of regeneration and the target forest association being designed.
- Construction equipment must be prohibited from this area, through signage, fencing and plan delineation.
- If using soil seed bank for regeneration, the original seed bed, or other local suitable seed source must not be disturbed.
- Soils must be stabilized with an appropriate cover material (non-turf building).
- The post construction management program must remove and control noxious weeds, invasive species and non-native tree species.
- Post-construction management must extend until minimum height and survival standards can be achieved. Supplemental planting may be used to bring the area up to standards.

TABLE F-1
GENERAL TRANSPLANT TOLERANCE

High Transplant Tolerance	Low Transplant Tolerance
Malus spp. (apple)	Carya spp. (hickory)
Fraxinus spp. (ash)	Juglans spp. (walnut)
Ulmus spp. (elm)	Juglans cinerea (butternut)
Celtis occidentalis (hackberry)	Sassafrasalbidum(sassafras)
Tilia spp. (linden)	Nyssa sylvatica (tupelo)
Plantanus occidentalis (sycamore)	Quercus alba (white oak)
Populus spp. (poplar)	
Salix spp. (willow)	
Gleditsia triacanthos (honey locust)	
Quercus palustris (pin oak)	

TABLE F-2
TRANSPLANTING TOLERANCE -- FROZEN ROOT BALL

High Transplant Tolerance	Low Transplant Tolerance
Malus spp. (apple)	Betula spp. (birch)
Ulmus spp. (elm)	Cornus spp. (dogwood)
Gleditsia triacanthos (honey locust)	Tsuga spp. (hemlock)
Tilia spp. (linden)	Magnolia spp. (magnolia)
Acer spp. (maple)	Quercus spp. (oak)
Pinus resinosa (red pine)	Liquidambar (sweet gum)
Pinus strobus (white pine)	Liriodendron tuplipifera
Pinus sylvestris (Scotch pine)	(tulip tree)

APPENDIX G
SOIL AND FOREST PROTECTION TECHNIQUES FOR FOREST RETENTION AREAS

SOIL PROTECTION ZONE

The soil protection zone is that area which must be protected from construction activity and other stresses (e.g. flooding) to protect a forest retention stand from construction damage. Protecting trees from construction damage means protecting sufficient roots to provide the trees with adequate water and nutrient uptake for the existing leaf area and to maintain the physical stability of the tree. Trees in forest stands become interdependent on each other for physical support during high winds. Removal of adjacent trees and destruction of roots can cause windthrow long after the completion of construction.

The extent of a tree's root system can be quite large. The ratio of root expansion to crown spread can be 2:1 for large open grown specimen trees and can be significantly larger (up to 5:1) for trees growing in the interior of forest stands. The increase of root expansion in forest stands stems from adjacent trees restricting the crown spread of a tree while its roots can constantly grow through the soil medium.

The minimum requirement for root protection varies from species to species and from soil type to soil type. The soil protection zone changes with the proximity of other trees, the amount of past human influence (agriculture or construction) in the vicinity of the tree and changes in soil type or ground water. For open grown trees, protecting the soil within the dripline of the tree is adequate to save the tree in most cases. For trees that have been part of forest communities, however, the soil protection zone must reflect a more complex relationship between crown spread and root growth.

Calculating the Soil Protection Zone

A workable set of criteria for determining the limit of the soil protection zone is needed. In general, the soil protection zone is easier to define as a relationship to tree height. The following guidelines will protect most of the trees, most of the time, from construction damage.

1) Specimen trees: the limit of the soil protection zone shall be the area within the drip line of the tree.

2) Clusters of trees: i.e., groups of trees which are open grown, but growing close enough so that the individual crowns have grown together. For trees on the exterior of the group, the limit of the soil protection zone shall be the limit of the drip line. For interior trees, the soil protection zone shall be a

distance from the trunk of 40 percent of the height of tree or the limit of the drip line, whichever is greater.

3) Forest stands: trees with a continuous canopy and an undisturbed ground plane. The limit of the soil protection zone for an individual tree shall be a distance from the trunk of 40 percent of the height of the tree or the limit of the drip line, whichever is greater.

Modifications to the Soil Protection Zone

When disturbance of the soil protection zone is unavoidable, tree survival remains probable provided:

1) Disturbance does not exceed 20 percent of the original soil protection zone area, and

2) A protected area of equal size and contiguous to the remaining soil protection zone is added back so that the finals soil protection zone area is not decreased, and

3) The new limit of the soil protection zone is no closer to the center of any tree to be protected than 20 percent of the tree's height.

All reductions to the original soil protection zone shall be deducted from the calculations of the size of the forest retention area.

Reduction to the Soil Protection Zone for Individual Trees

The soil protection zone for a specific tree may be reduced if it can be demonstrated that a smaller area will have no less impact on the tree's health than the size of the soil protection zone which would have resulted using the standard calculation. Requests for such reductions should include the following information:

1) The extent of the rooting system with root diameters 1" or greater; as determined by a field root survey.

2) The exact species of the tree and the qualified professional's estimation of this species' ability to withstand construction damage.

3) The soil texture and the existing bulk density of the soil as measured in grams per cubic centimeter.

4) An estimate of soil moisture conditions before and after construction.

5) A list of construction impact mitigation practices to be performed before, during, and after construction.

Upon determination that the request does not pose any significant threat to the tree, reductions of the allowable soil protection zone may be made up to the following maximum amounts:

■ 10" db or less	50 percent
■ 10" - 15" db	40 percent
■ 15" - 25" db	30 percent
■ 25" db or larger	20 percent

Requirements for the Soil Protection Zone

Unless specifically approved by the forest conservation plan, no construction activity shall be permitted within the soil protection zone. This includes:

- Grading cut or fill.
- Removal of existing ground plane vegetation or organic leaf layers.
- Roads or parking.
- Walks, patios or decks.
- Foundations, walls, or building footprints.
- Underground utilities.
- Temporary stormwater or sediment control structures.
- Storage or stock piling of construction supplies and equipment, including machinery, construction trailers, fill, topsoil, trash, etc.
- Disposal of construction waste, including concrete truck wash off, paints, solvents, contaminated runoff, oils, fuels, or any other substances which are harmful to plants or animals.

The following activities are permitted within the soil protection zone:

- Removal of tree limbs which are outside of the soil protection zone and interfere with construction.
- Removal of dead or dying trees within the soil protection zone.
- Forest thinning or tree removal which is consistent with recognized forestry practices.
- Removal of trees on the edges of tree groups or forest stands whose trunks are within the soil protection zone of other trees, but which do not have sufficient soil protection zones of their own to allow them to survive. Note that trees which have a remaining soil protection zone of less than 50 percent of the limit required by these specifications must be removed.
- Removal of vines or other herbaceous plants which threaten the ecological balance of the remaining plants in the soil protection zone.

- Below ground utilities that can be placed by the use of a tunneling machine.
- Fences which do not require continuous footings or which have posts no closer than 6'-0" o.c. and which can be manually installed.
- Walks and paths that meet the following requirements:
  - They are constructed of materials that can be installed using equipment with a maximum weight of 1/2 ton.
  - They are no wider than 6'-0".
  - They are placed no closer than 6' from the base of the trunk of any tree over 12" D.B.H.
  - Are constructed without filling greater than 6".
- Removal of any existing walks, walls, roads, or other structures as required. These items should be removed without the use of heavy equipment.

Construction Adjacent to Soil Protection Zone

Prior to the start of any construction (including clearing) adjacent to the soil protection zone, a fence must be erected along the boundary round all soil protection zones. This fence shall have 8-1/2" x 11" orange signs which shall read "Tree Preservation Area" in 1" high lettering posted every 50'. The fence shall be one of the following:

- 3 strands of barbed wire spaced 18" apart - 4' high.
- 4' high wood and wire "snow fencing".
- 4' high chain link fence.
- 4' high welded wire fence.

All fencing shall be attached to "U" Channel metal posts set 10' o.c. max. No fencing or wire shall be attached to any tree.

Prior to the start of any grading, all sediment control devices shall be in place to prevent any silt or sediment from entering the soil protection zone. A synthetic filter fabric silt fence of a type acceptable to the U.S.D.A. Soil Conservation Service shall be installed on the uphill side of all soil protection zones. This fence shall be cleaned and maintained on a regular basis through the construction period. All drainage devices, inlets, or swales required to maintain existing surface and subsurface groundwater conditions within the soil protection zone must also be installed and operational prior to grading.

Management of the Soil Protection Zone

Forest retention stands, smaller tree stands, and individual trees that the Forest Conservation Plan specifies must be protected and require careful management during and after construction.

Specimen trees and groups of trees are nearly always growing on soils previously influenced by human activity. If the soils under these trees are already compacted, they

should be core aerated prior to construction and again after construction. Light spring and fall low nitrogen fertilizations will also help these trees adjust to the new environment. Very old trees (30" or larger D.B.H.) should be manually irrigated several times during the first two summers following grading in their vicinity. Each group of trees must also be monitored for disease and insect problems during and after construction. Trees in construction zones are more susceptible to attack by pests than trees in undisturbed conditions.

Landscape practices under trees are as critical to tree survival as how much construction occurs around them. The following management practices must occur in the soil protection zone:

- Bare soil: prior to construction, core aerate. Hand scarify with a steel rake to a depth of 1" max. Top dress with 1" - 2" shredded bark mulch.
- Mown lawn: prior to construction, core aerate. Keep grass mowed during construction.
- Unmown grass: leave undisturbed during construction. After construction, mow grass and core aerate.
- Landscape shrubs and/or groundcovers: leave undisturbed during construction. Hand scarify and mulch any area with bare soil. Leave any paved areas, walks, drives, etc. in place within the dripline until other construction is nearly completed. Fill voids from removed objects with light top soil.
- Natural occurring ground plane growth: leave undisturbed except for invasive vines or small trees which could affect growth habits of specimen trees.

EXHIBIT G - 1
SOIL PROTECTION AREA
(The Critical Root Zone)

The soil protection area (Critical Root Zone) of a tree is the zone in which the majority of a tree's roots lay. Ninety-five percent of the roots of most trees will be found in the upper 12-18 feet of the soil. The majority of the roots that supply the nutrients and water to the tree are found just below the soil surface. The total amount of a tree's roots are generally proportional to the volume of the tree's canopy. Therefore, if the roots only penetrate a thin layer of soil, then the roots must spread far from the tree, beyond the extension of the canopy.

When delineating forest retention lines in the field, one must consider not only the visible portion of the tree (the trunk and canopy) but the below ground portion as well. On all forest conservation plan sheets, isolated specimen trees should be noted with their critical root zones and all forest stands to be saved should be noted by the edges of their critical root zones and not just by the extent of their canopies.

The true size of the critical root zone is determined by the species and size of the tree as well as the conditions of the soil (including texture and moisture level). It is difficult to generalize for all trees but also difficult to field examine the root systems of all of the trees in question.

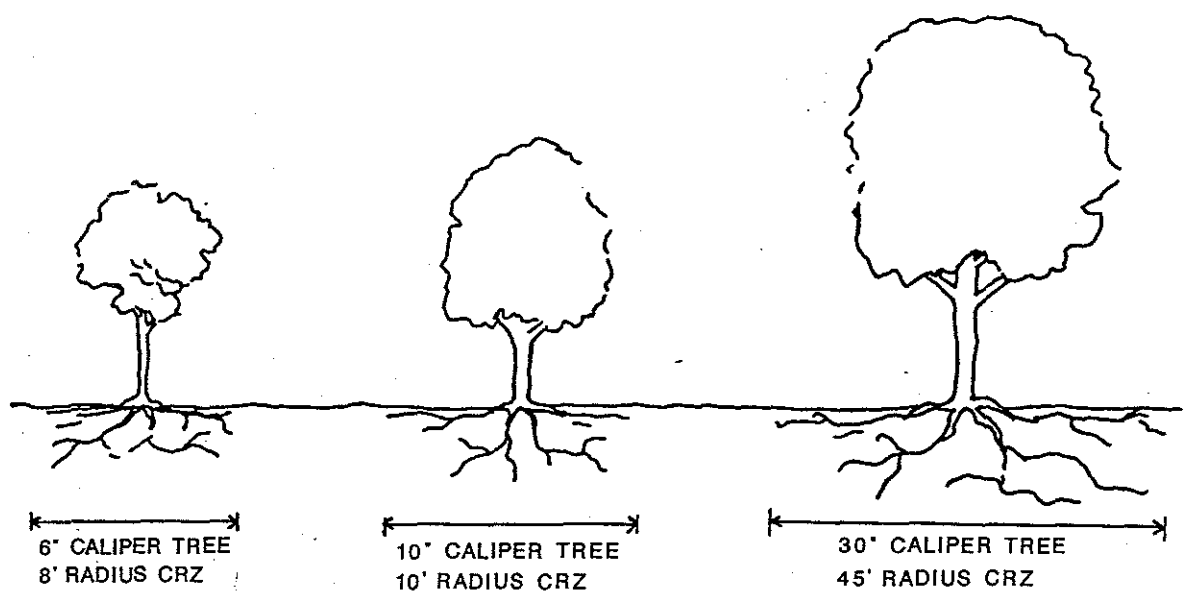
There are several ways to estimate the size of the critical root zone without examining the roots in the field. The following calculation is suggested but other methods may be accepted if shown to protect the complete root zone.

<u>For the edges of large areas, use the greater of the two choices below:</u>

1' caliper of the tree = 1' radius of the critical root zone, or
8 ft radius circle around the trunk of the tree

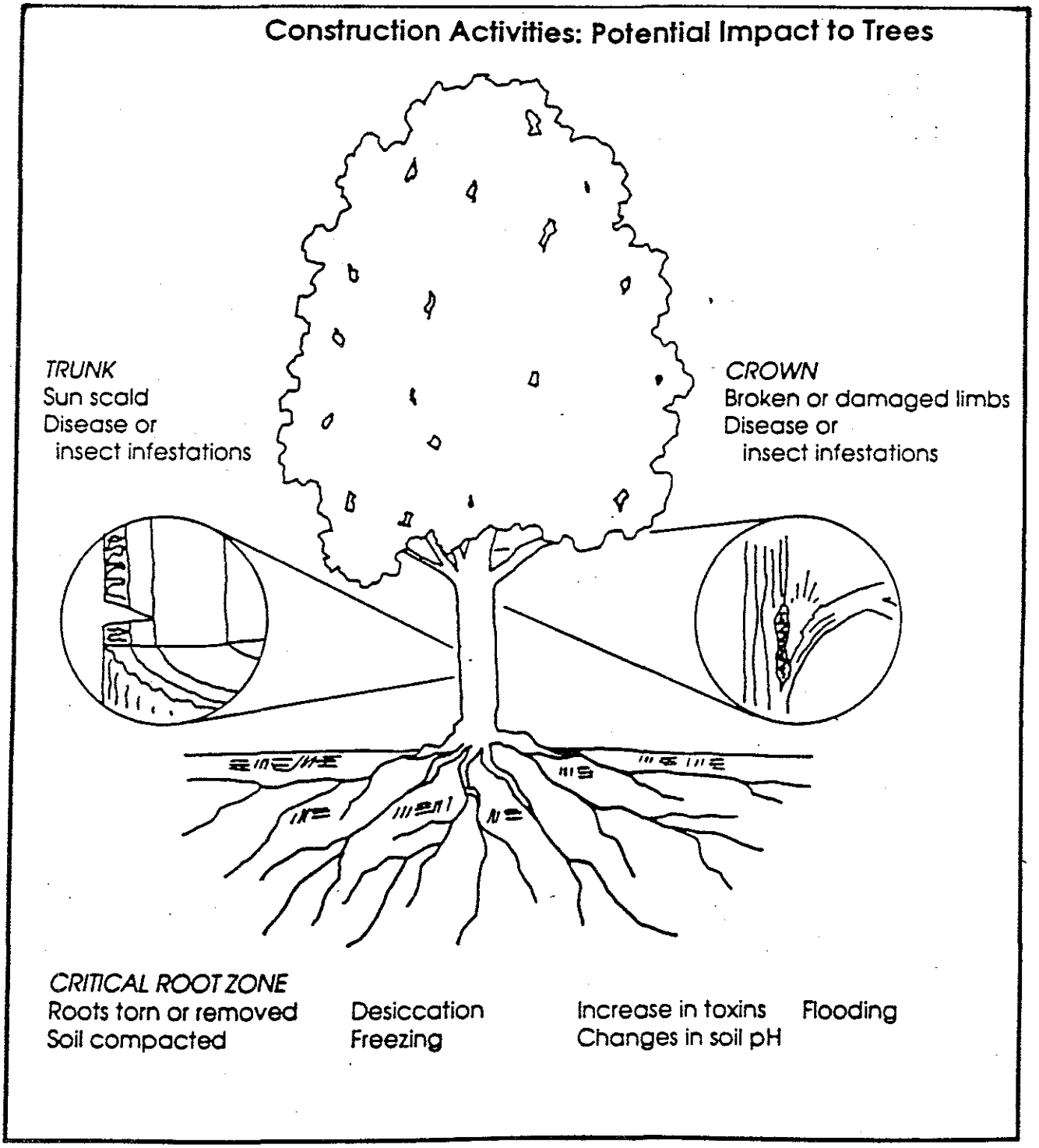
<u>For isolated specimen trees:</u>

1' caliper = 1.5' radius of the critical root zone



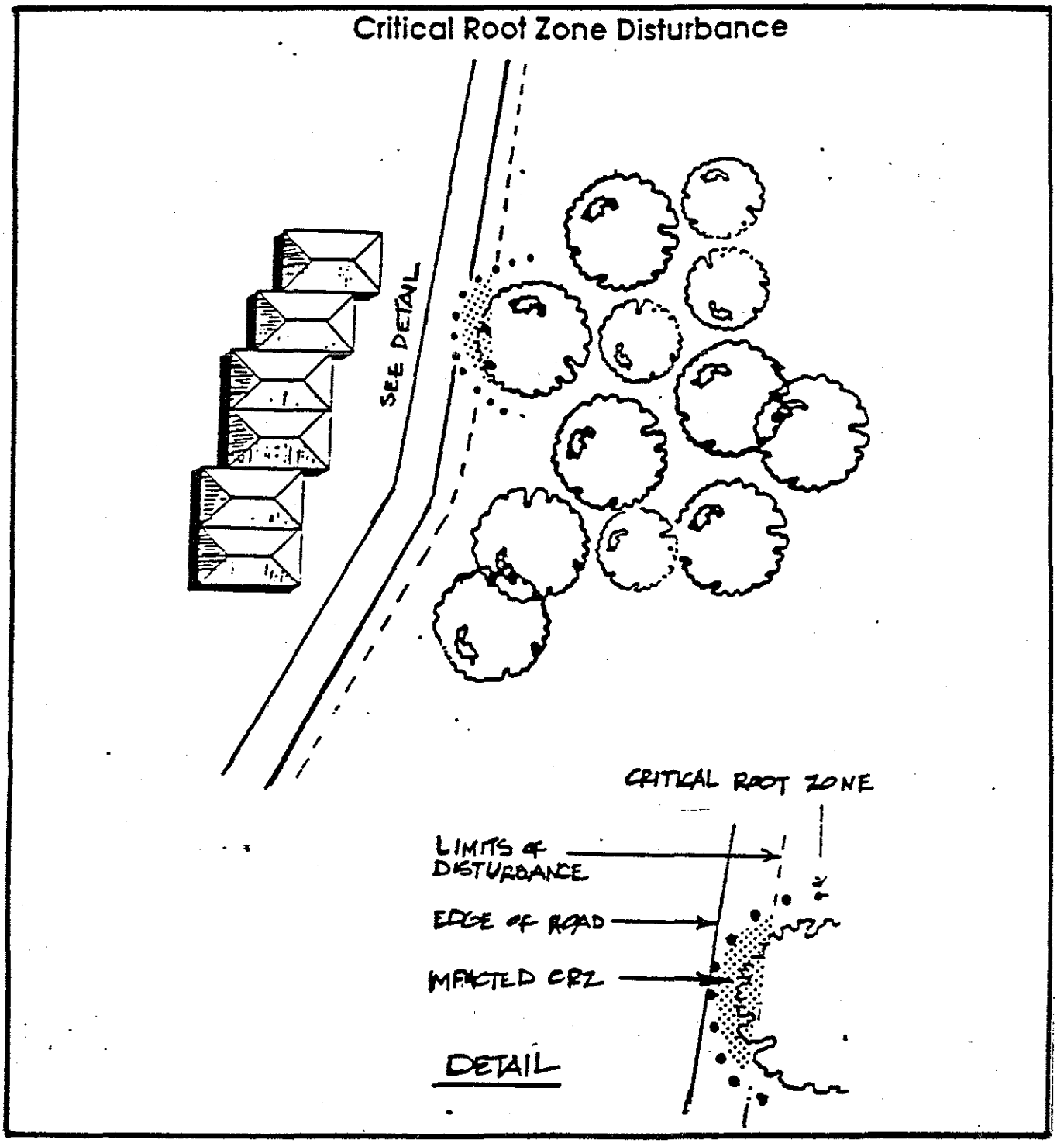
The Critical Root Zone is the area in which most of a tree's root lay. Retaining this area, along with the tree itself, will help to insure a healthy retention area.

EXHIBIT G - 2



Maintaining healthy forests during the construction process necessitates avoiding contact with all above and below ground tree parts. Figure 3.5.1 summarizes some common construction impacts.

EXHIBIT G - 3

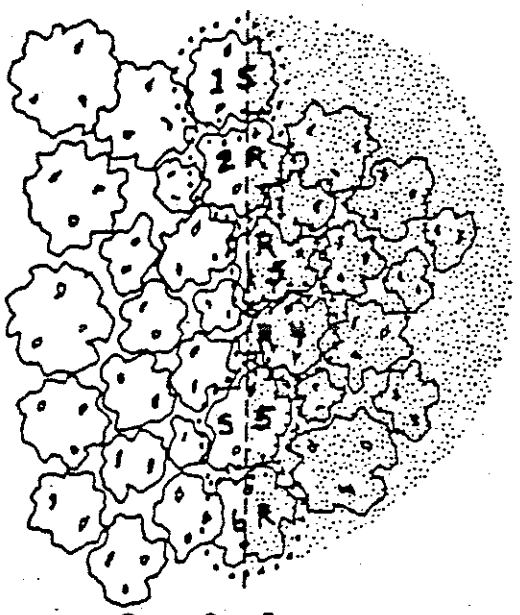


If a Critical Root Zone of a retained tree is within the limit of disturbance, the impact can be graph cally represented on the Forest Conservation Plan. This will help to highlight the location for future use of long term protection devices, such as oeration systems

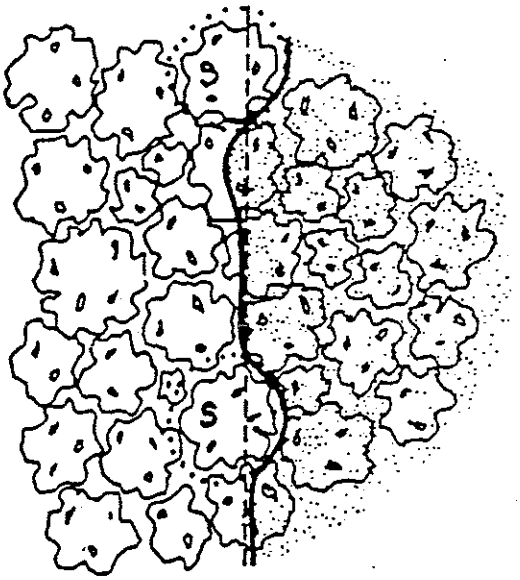
EXHIBIT G - 4

Field Edge Determination

Preliminary Edge



Final Edge



Critical Root Zone
Preliminary Retention Edge
R Remove
S Save
Cleared Area

Critical Root Zone
Preliminary Retention Edge
Final Retention Edge
Cleared Area

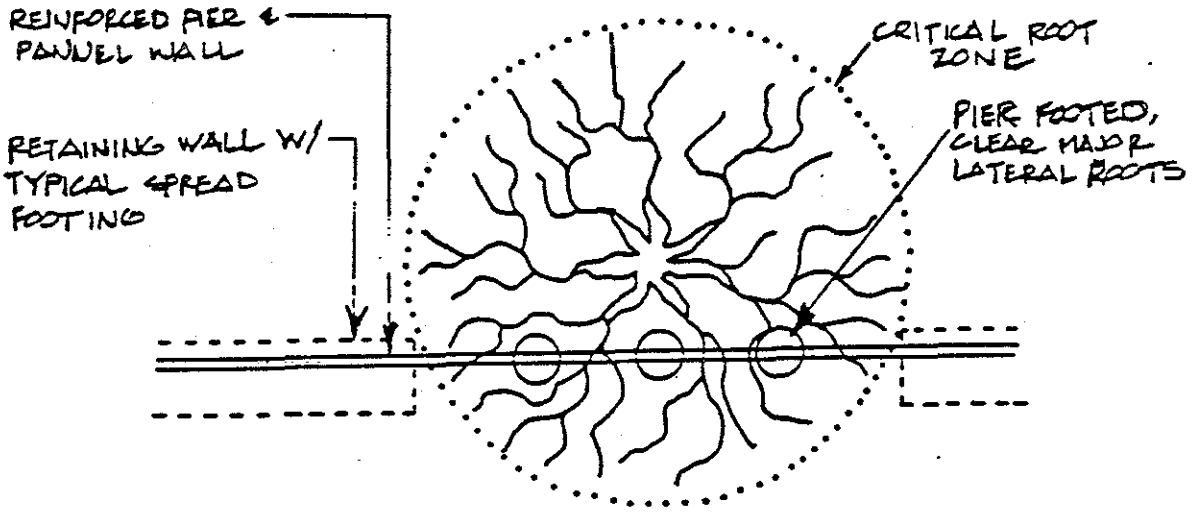
Tree #	Status	Notes
1	Save	Preliminary retention edge (PRE) impacting approximately 40% of Critical Root Zone (CRZ). Worth moving line slightly to accommodate.
2	Remove	PRE impact nearing 50% of CRZ: species: tulip poplar (cannot withstand disturbance well); trunk shows sign of decay; adjust line to remove.
3	Remove	PRE over trunk
4	Remove	Tree is completely within disturbance zone.
5	Save	Approximately 40% impact of CRZ: healthy tree. move edge to accommodate.
6	Remove	Retention edge runs through trunk.

As a result of this process:
NO ACRES LOST FROM BUILDABLE AREA ...TWO TREES SAVED

Staking Retention Edges in the field requires tree-by-tree decisions. The above example demonstrates the use of the Critical Root Zone, tree health, and tree species in laying out a final, healthy, retention line.

EXHIBIT G - 5

Reinforced Pier and Panel Wall

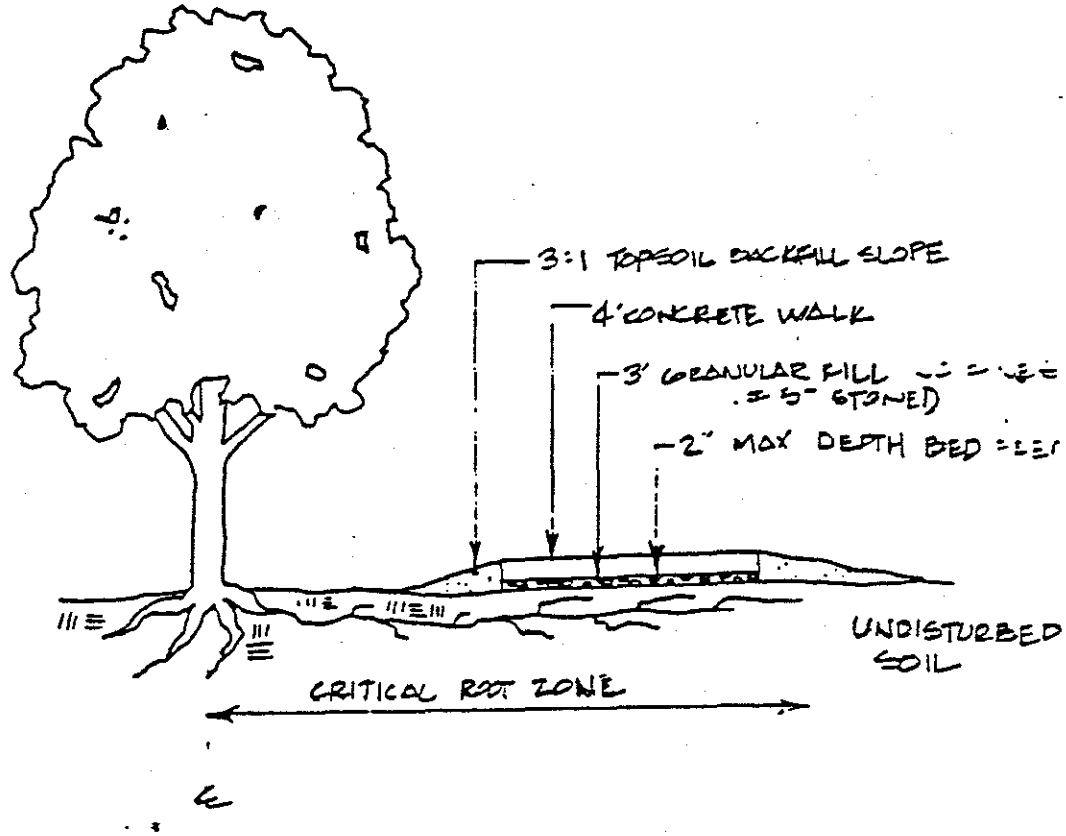


Notes:
1. Area of disturbance should be minimized
2. Care should be taken to avoid major lateral roots
3. Roots should be cleanly cut using a vibratory knife or other similar equipment

Source: Steve Clark & Associates

EXHIBIT G - 6

Raised Sidewalk

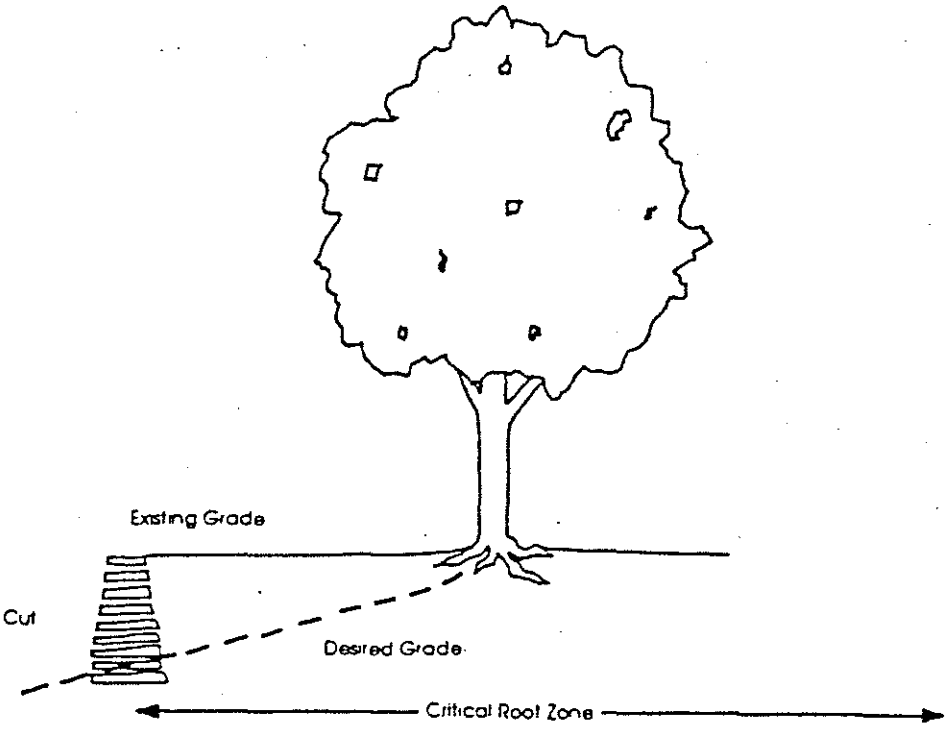


Notes:
1. Bed preparation should not exceed 2 inches
2. Granular fill should contain no fines
3. Minimize width of sidewalk; should be no wider than 4 feet

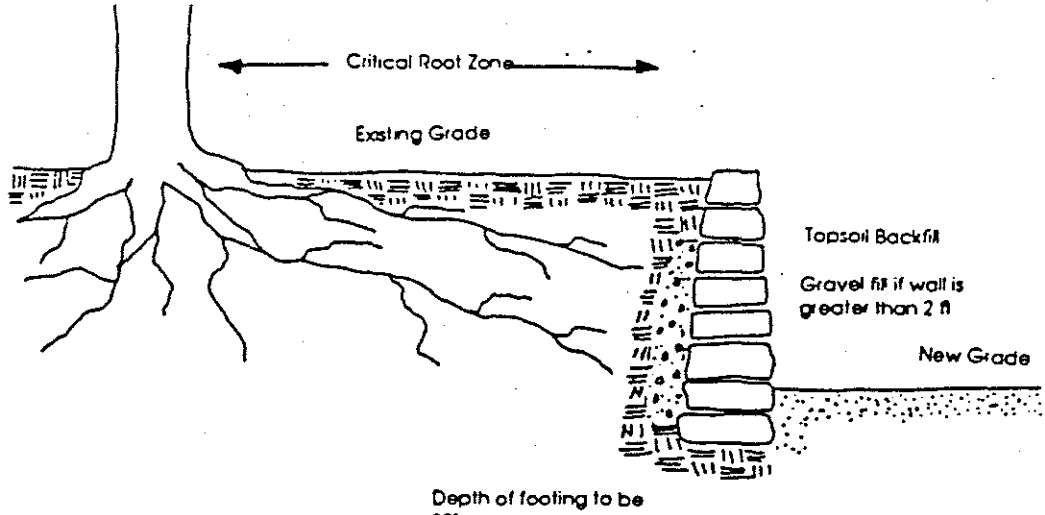
Source: City of Gaithersburg, Maryland
City Tree Manual

EXHIBIT G - 7

Retaining Walls



Source Fulton County, Georgia
Tree Preservation Ordinance

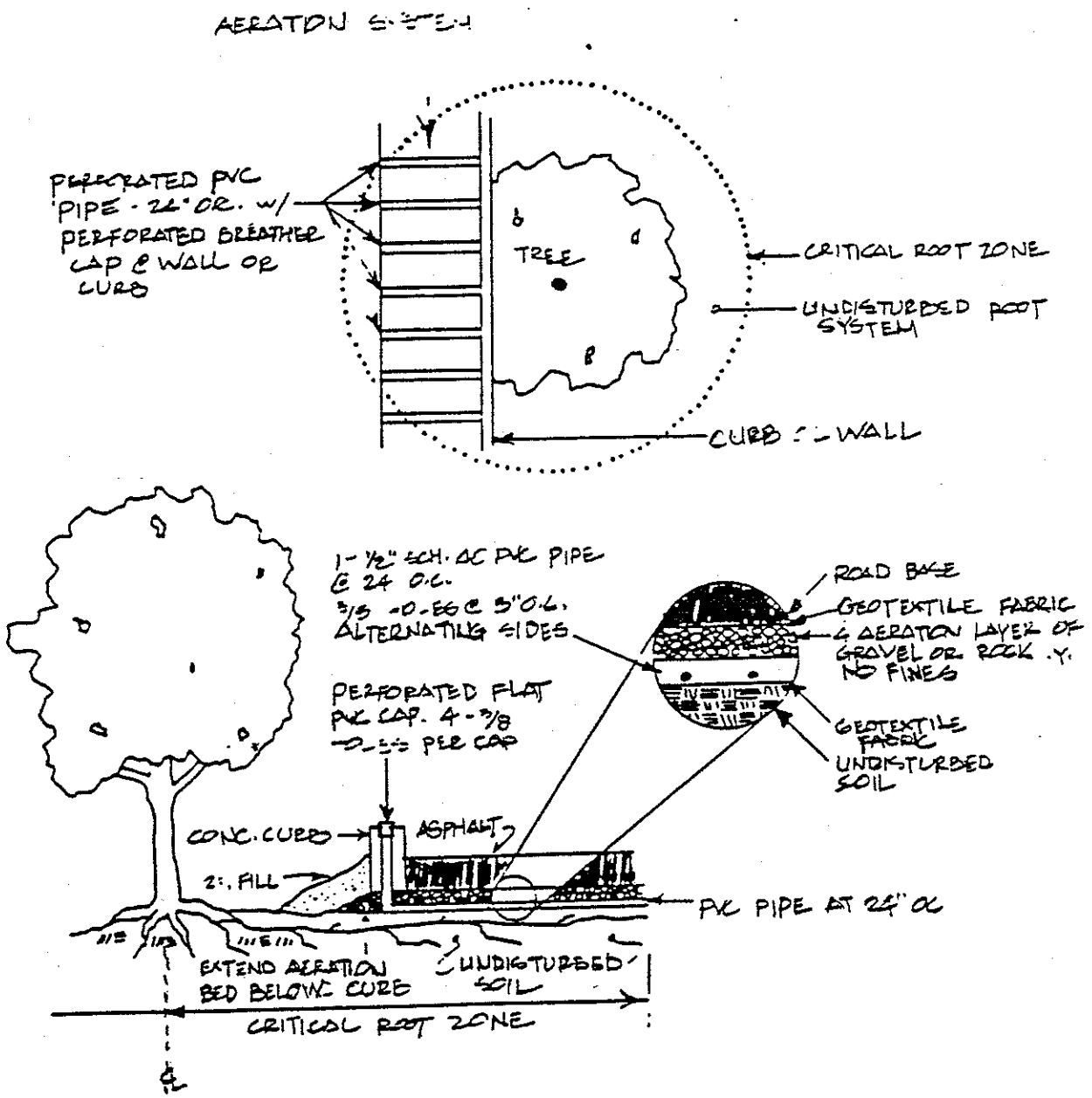


Depth of footing to be
30" minimum—any roots shall be bridged

Source Fairfax County, Virginia
Vegetation Preservation & Planting

Note:
1. Wall should be constructed outside the critical root zone.

EXHIBIT G - 8



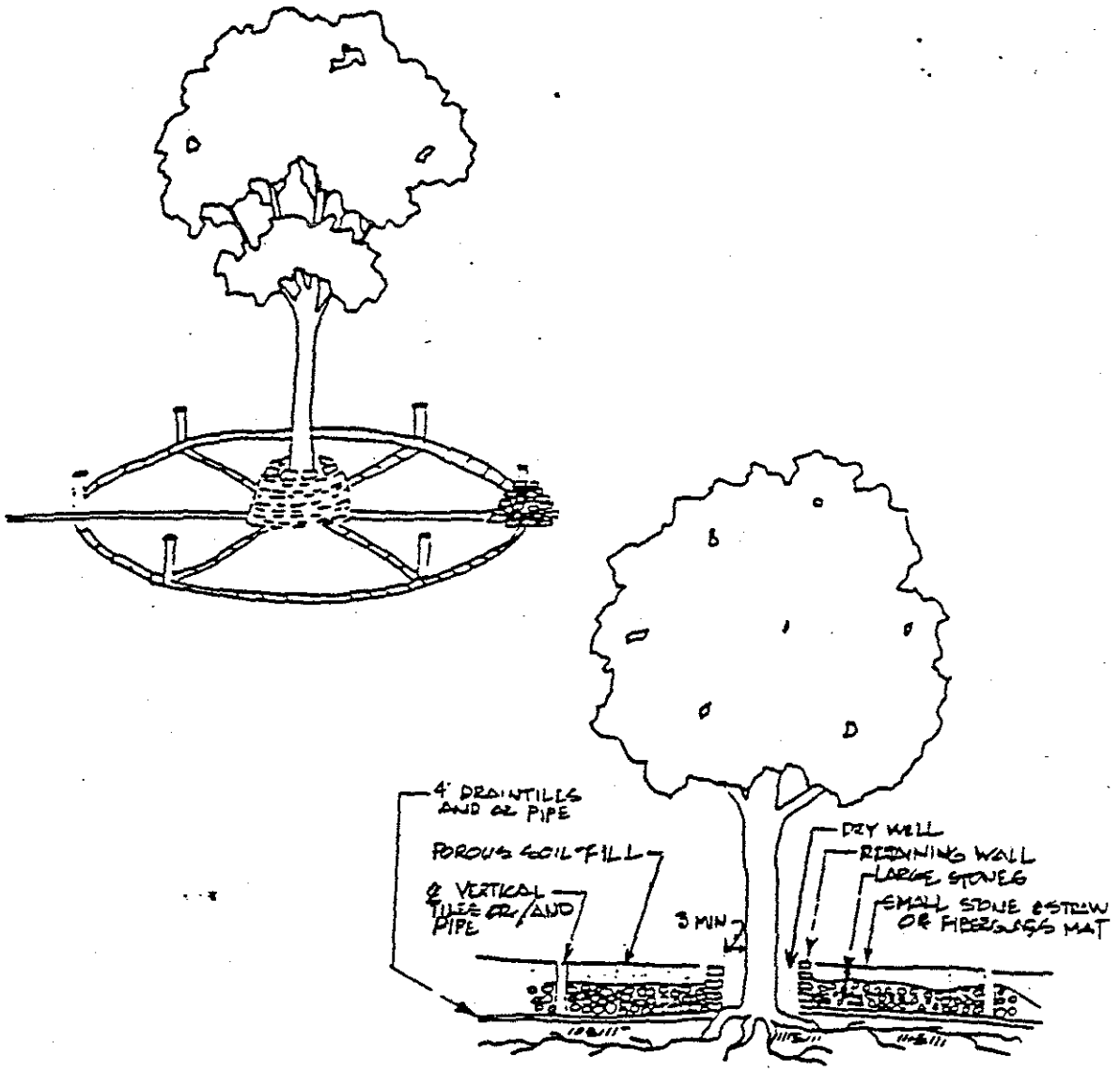
Notes:

1. Bed preparation should not exceed two inches.
2. Vertical pipe should be capped with a perforated cap with 4-3/8 inch holes per cap.
3. Gravel or rock should contain no fines.
4. Can also be used when critical root zone is covered by fill instead of asphalt.

Source: Steve Clark & Associates

EXHIBIT G - 9

Tree Well

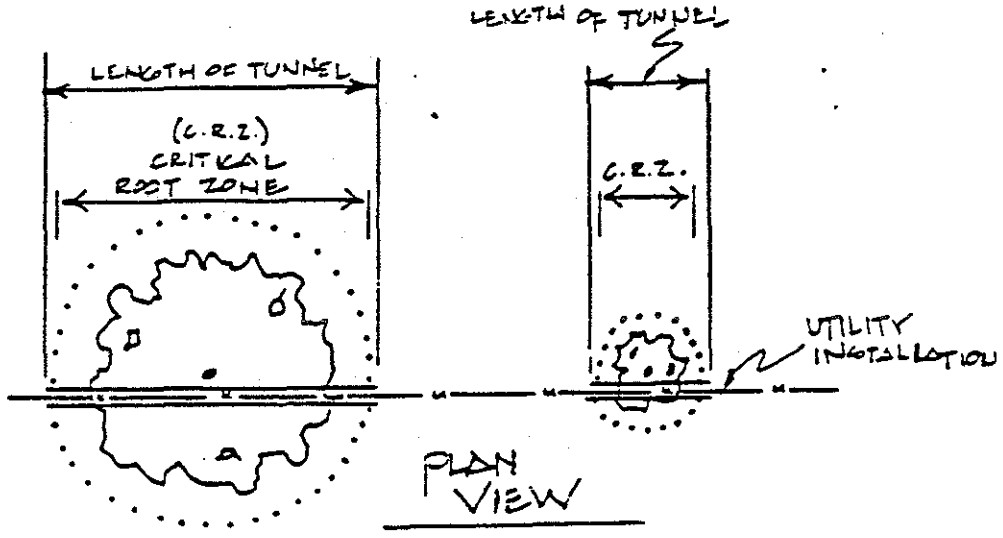


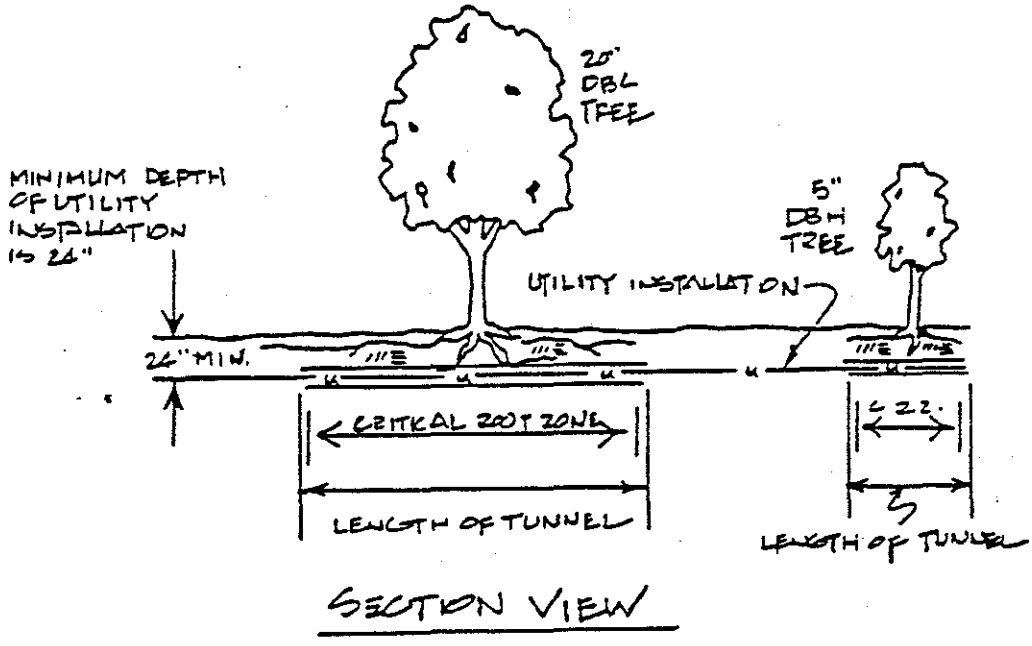
Notes:
1. Well wall should be no closer than 3 feet from tree trunk or more for smaller trees.
2. Drainage pipe layout should extend beyond the critical root zone
3. Vertical pipes shall be capped with a perforated flat cap with 4-3/8 inch holes per cap
4. Radiating spokes should be on 3 foot centers at the well wall

Source: Fairfax County, Virginia
Vegetation Preservation & Planting

EXHIBIT G - 10

Tunnelling





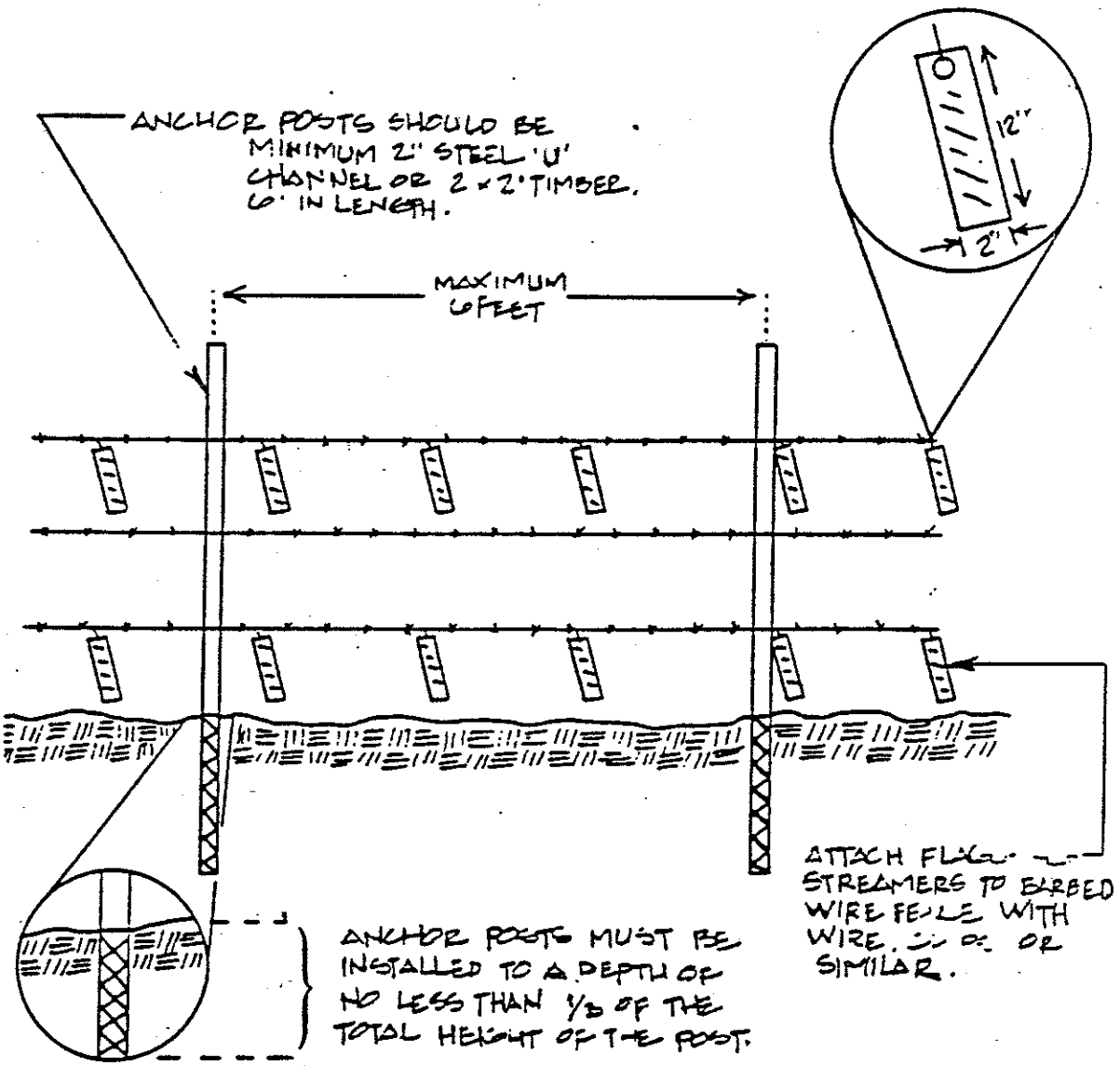
Notes:

1. Tunnel under critical root zone
2. Tunnel should be 24 inches deep at a minimum
3. When tunneling, aim for the trunk of the tree
4. When trenching, tunnel through the critical root zone

Adapted from:
Source: Fairfax County, Virginia
Vegetation Preservation & Planting

EXHIBIT G - 11

Three Sarbed Wire



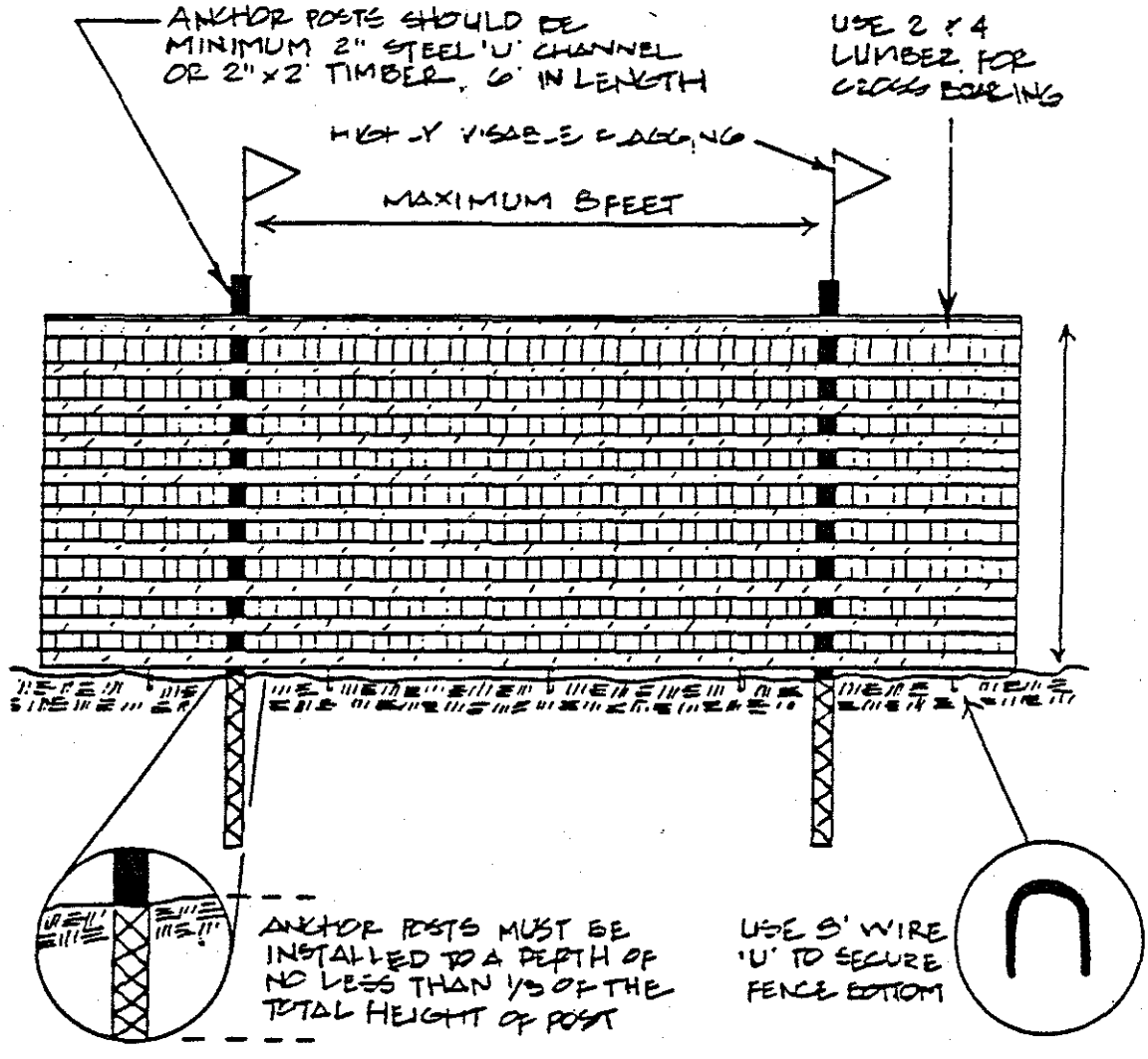
Notes

1. Forest protection device only
2. Retention Area will be set as part of the review process.
3. Boundaries of Retention Area should be staked and flagged prior to installing device.
4. Avoid root damage when placing anchor posts.
5. Barbed wire should be securely attached to posts.
6. Device should be properly maintained during construction.
7. Protective signage is also recommended.

Source: Prince George's County, Maryland Woodland Conservation Manual

EXHIBIT G - 12

Blaze Orange Plastic Mesh



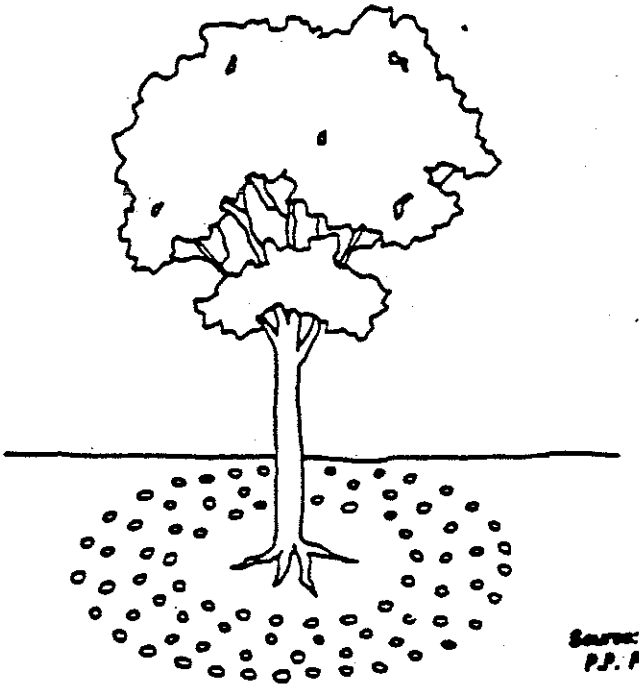
Notes

1. Forest protection device only.
2. Retention Area will be set as part of the review process.
3. Boundaries of Retention Area should be staked and flagged prior to installing device
4. Root damage should be avoided.
5. Protective signage may also be used.
6. Device should be maintained throughout construction.

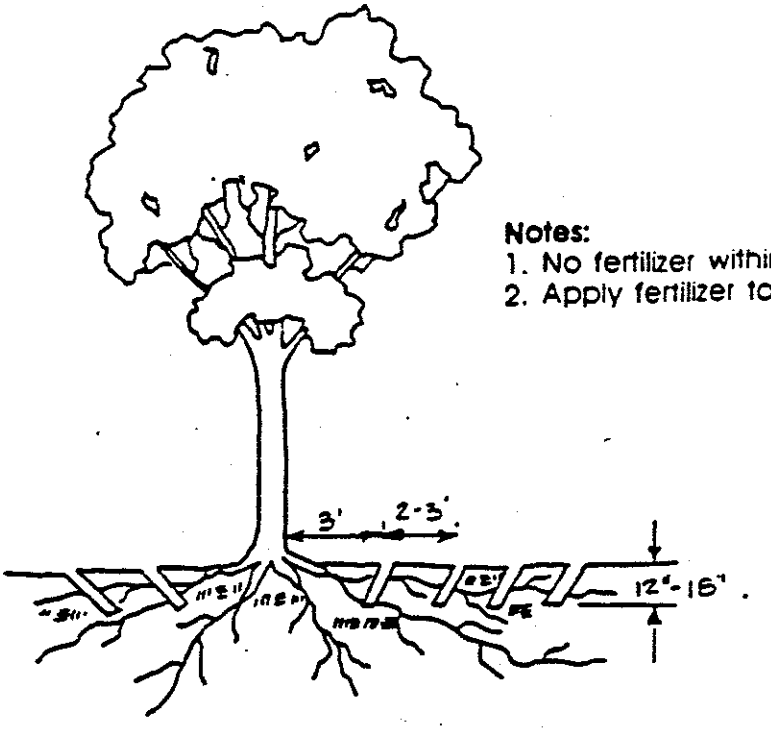
Source: Prince George County, Maryland Woodland Conservation Manual

EXHIBIT G - 13

Application of Fertilizers by Injection



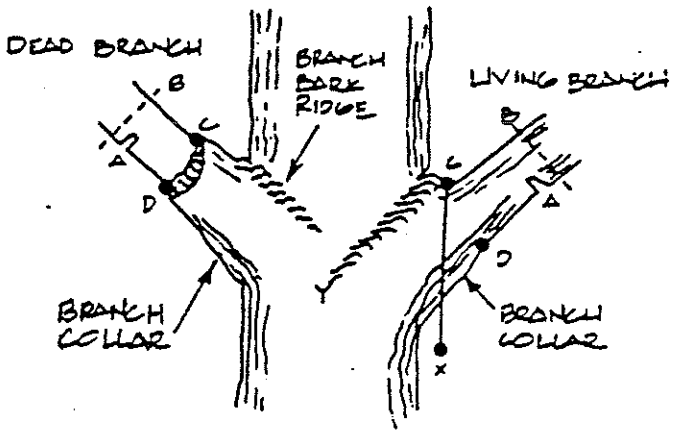
Source: Tree Maintenance, 5th Edition
P.P. Pirone



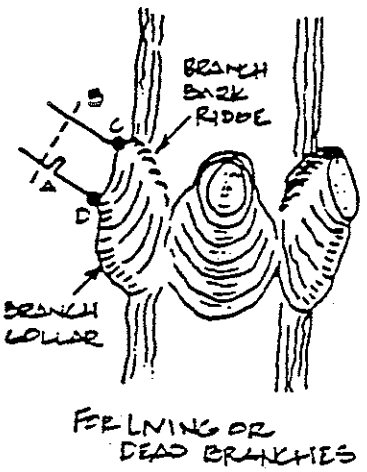
Notes:
1. No fertilizer within 3 feet of trunk
2. Apply fertilizer to entire critical root zone

EXHIBIT G - 14

Croweduction



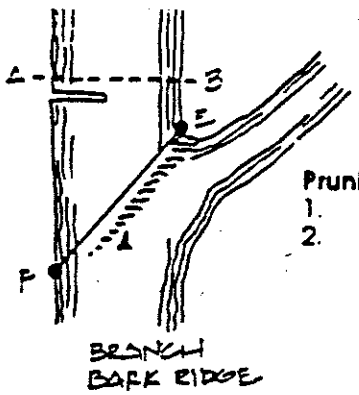
HARDWOODS



CONIFERS

Pruning a Branch

1. Remove branch weight by undercutting at A and remove limb by cutting through at B
2. Remove stub at CD (line between branch bark ridge and outer edge of branch collar).
3. If D is difficult to find on hardwoods, drop vertical from C (line CX). Angle XCY=XCD.



Pruning a Leader or To Reduce Size

1. Remove top weight by cutting at A&E.
2. Remove stub at EF parallel to the Branch Bark Ridge.

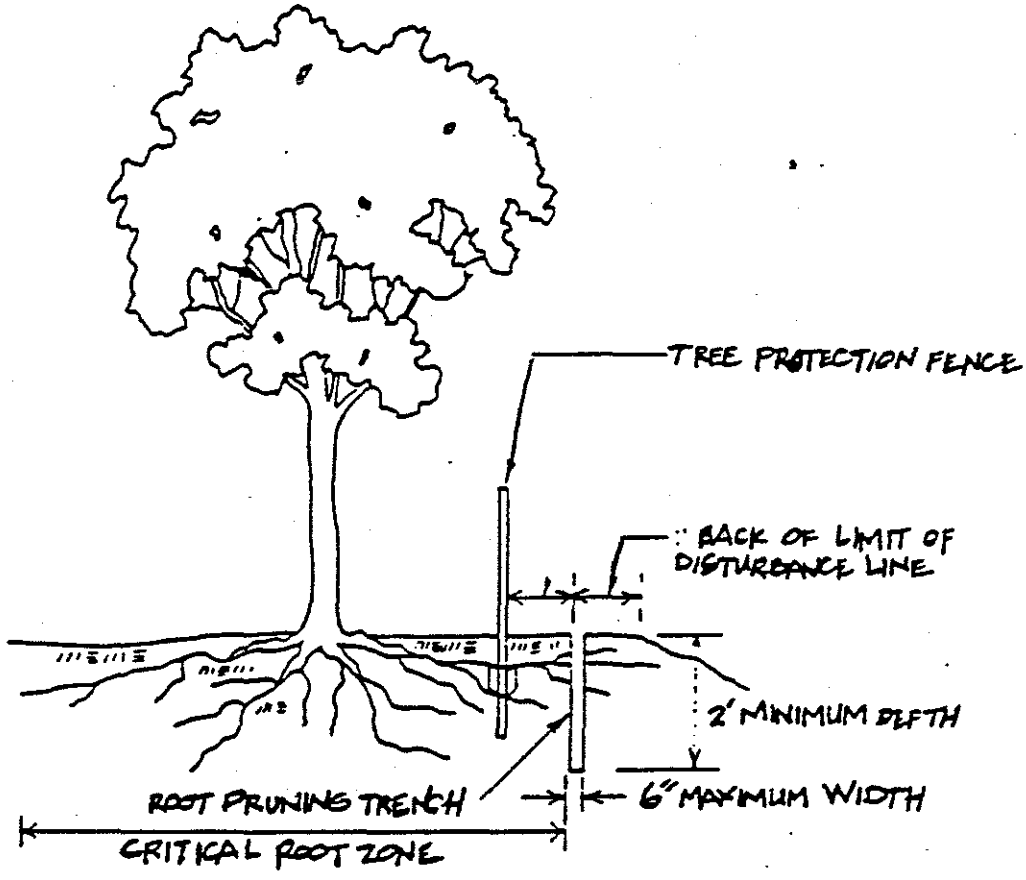
Source: Fairfax County, Virginia Vegetation Preservation & Planting

Notes:

1. Only prune at specified times
2. No more than 30% of crown to be removed at one time.

EXHIBIT G - 15

Root Pruning



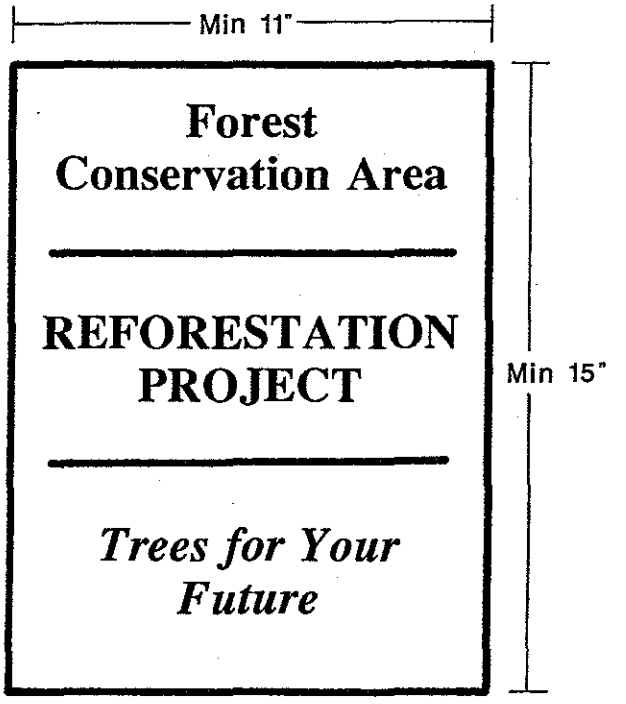
Notes:

1. Retention Areas will be set as part of the review process
2. Boundaries of Retention Areas should be staked flagged prior to trenching
3. Exact location of trench should be identified
4. Trench should be immediately backfilled with soil removed or other high organic soil
5. Roots should be cleanly cut using vibratory knife or other acceptable equipment

Source: City of Gaithersburg, Maryland

EXHIBIT G - 16

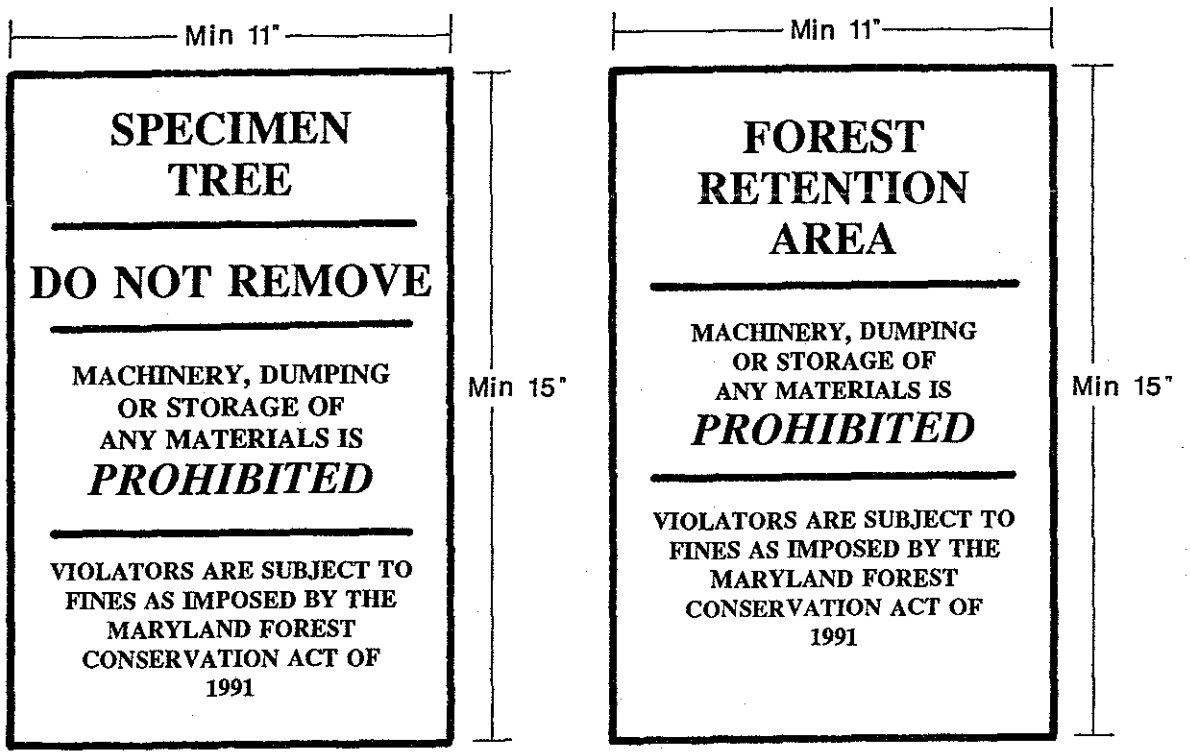
Reforestation and Afforestation Area Protection Signage



Signs similar to protection signage for Retention Areas can be used on Afforestation and Reforestation Areas. The signs notify construction workers and future residents of the newly planted material, improving the trees' survival rates.

EXHIBIT G - 17

Signage



APPENDIX H
PLANTING AND MAINTENANCE GUIDELINES

SITE PREPARATION FOR PLANTING

Undisturbed Sites

Soils disturbance should be limited to the planting field for each plant. **Planting field** is a new term that reflects a change in recommended planting specifications. Research has shown that root systems of trees planted in the traditional holes with amended soils are likely to remain confined to the amended soil area. Such trees have lower survival rates. A planting field of radius = 5 x diameter of the root ball is recommended.

On steep slopes or erodible soils, soil disturbance should be limited to the planting field whose radius is equal to 2.5 diameter of the root ball.

Disturbed Areas

Soils should be treated by incorporating natural mulch within the top 12 inches or by amendments as determined by a soils analysis. Soil amendments, by definition, include modifications of soils to improve such structural characteristics as bulk density or porosity. On development sites, the common use of fill materials may increase the need for such amendments. Natural amendments such as organic mulch or leaf mold compost are preferred.

When fill material is used at the planting site, it should be clean fill topped with 12 inches of native soil. Stockpiling of native top soils must be done in such a way that the height of the pile does not damage the seed bank.

Planting Period

Planting windows are the time during the year when, depending on the size stock being used, planting windows differ. Recommended planting windows are shown in Exhibit H-1.

Plant Material Storage

Planting should occur within 24 hours of delivery to the site. Plant materials left unplanted for more than 24 hours should be protected from direct sun and weather and kept moist. Bare root stock unplanted for more than 24 hours should be heeled in as shown in Exhibit H-2. Nursery stock should be planted within 2 weeks. On-site or local transplanted materials should be stored in tree banks if unplanted for more than 24 hours, following the example in Exhibit H-3.

On Site Inspection

Planting stock should be inspected prior to planting. Plants not conforming to standard nurseryman specifications for size, form, vigor, roots, trunk wounds, insects and disease should be replaced.

PLANT MATERIAL SIZE AND DENSITY

Plant Size

Nursery grown plant materials greater than 1" caliper should meet or exceed the requirements of American Association of Nurserymen specifications, i.e. should be typical of the species and variety, have a normal habit of growth, be first quality, sound, vigorous, well-branched, have healthy, well furnished root systems, and be free of disease, insect pests and mechanical injuries.

Planting stock less than 1" caliper should meet the following standards:

- Seedlings/whips:
  hardwoods: 1/4" to 1/2" caliper with roots no less than 8" long
  conifers: 1/8" to 1/4" caliper with roots not less than 8" long and top height of 6" or more
- Shrubs:
  1/8" or larger caliper with 8" root system

Plant Density

The following densities are required for reforestation and afforestation plant materials:

- 100 2" caliper trees/acre (20' x 20' spacing)
- 200 1" caliper trees/acre (15' x 15' spacing)
- 350 hardwood seedlings or whips/acre with tree shelters (11' x 11' spacing)
- 700 seedlings/acre (8' x 8' spacing)

The spacings identified above are not meant to imply that trees must be planted in a grid pattern. A more natural appearance is desired.

PLANT INSTALLATION

Seedlings/Whips

Small stock, such as seedlings and whips, and ball and burlap stock up to 2" caliper, can be planted by manual methods of planting using shovels, planting or dibble bars, and mattocks (See Exhibit H-4). For large areas, planting machines are occasionally used but have the drawback of creating linear, plantation-type forests.

Extreme care should be taken to insure retained moisture of the roots. When planting seedlings and whips, a moist carrying container should be used to prevent desiccation (See Exhibit H-5). For greater protection, seedlings may be planted with tree shelters.

Areas planted with seedlings or whips should be mulched after planting as shown in Exhibit H-6.

Container Grown Stock

Successful planting of container grown stock requires careful site preparation and inspection of the plant material root system. Caution when using plants grown in a soil medium differing from the soil on the planting site. The plant should be removed from the container and the roots gently loosened from the soil. If the roots encircle the root ball, substitution is strongly recommended. J-shaped or kinked root systems should also be noted, and the plants replaced if necessary. Roots may not be trimmed on-site, due to the increased chances of soil borne diseases. (See Exhibit H-7.)

Balled and Burlapped Trees

Balled and burlapped trees greater than 2" caliper) and usually planted using tree spades. This technique is particularly when suited for transplanting on-site or with local plant materials. For trees larger than 6" caliper, specialized equipment is recommended.

Balled and burlapped trees must be handled with care while planting. Trees should not be picked up by the truck or dropped; both these practices may separate the trunk from the root ball. Prior to planting, root balls should be kept moist. (See Exhibit H-7.)

Planting fields

The planting field should be prepared and native stockpiled soils should be used to backfill the planting field. Rake soils evenly over the planting field and cover with 2 to 4 inches of mulch. Use watering to settle soil backfilled around trees. Amendments are not recommended in the planting field; studies have shown that roots will be encouraged to stay within the amended soils.

Staking

Staking of larger trees is not recommended except in areas of high winds. Staking may be used for trees larger than 8 feet in height. Movement is necessary to strengthen the trunk of the planted tree. When stakes are used, the post-construction period management plan should specify their removal after the first growing season (See Exhibit H-8).

GENERAL GUIDANCE FOR MAINTENANCE OF PLANTED AREAS

Watering

A watering plan should only be implemented to compensate for deficient rainfall patterns. Trees can die from too much water as well as too little. Newly planted trees may need water as much as once a week for the entire first growing season. The next two years, in contrast, may require watering only a few times a year (one a month during July and August). After that, trees should only need water in severe droughts. Bare root transplants, if sufficiently watered during planting, may not need water for almost 2-4 weeks after growth begins. Balled and burlap material may require more frequent watering.

Soil and Watering: Soil texture influences the downward flow of water. Soils with more clay tend to retain more water and can be watered less often; soils with more sand drain more quickly and need to be watered more often. For examples of on-site evaluation recommendations. If the soil was well prepared before planting, there should be few drainage problems. Restricted downward penetration indicates the soil may have been compacted during construction and not aerated before planting, or there may be a clay hardpan.

How to Water: The best way to water is deeply and slowly using a regular hose, a soaker hose, or drip irrigation. For larger trees, start by watering the root ball thoroughly. The watered area shall be enlarged to include the whole root zone as the tree becomes more established. Mulching around the base of newly transplanted trees prevents roots from drying too quickly while still providing air movement to the roots.

Fertilizing

Fertilizing is the chemical modification of soils to correct for a specific nutrient deficiency. These deficiencies are most effectively identified in a laboratory soils analysis. Nothing should be added to the soil without first testing to determine any nutrient needs.

What Nutrients to Apply: Trees depend on three major nutrients, nitrogen, phosphorus, and potassium and a host of other minor ones (or micronutrients) such as calcium,

magnesium and iron. In most soils, most of the micronutrients are available in abundance. Of the major nutrients, nitrogen is usually the limiting one.

When to Fertilize: Even when soils are deficient in nitrogen, fertilizing within the first growing season after planting is not recommended. Too much nitrogen may cause a spurt of canopy growth which the roots cannot support. It is, therefore, best to wait until after the end of the first growing season, either in the late fall or early spring.

What Type of Fertilizer: Organic fertilizers are preferred to synthetic fertilizers. Bone meal or seaweed based products are available commercially. Organic fertilizers have a slow-release effect that can supply nutrients to the plant as needed while minimizing the risk of excess nutrients entering the forest system and the water supply. Some synthetic fertilizers can mimic this slow-release action and may be appropriate for use.

Control of Competing Vegetation

Unfortunately, good sites for reforestation and afforestation are generally good sites for unwanted vegetation as well. Unwanted vegetation growing near newly planted trees can take over the site. The need to control this problem depends on the ability of the planted material to withstand the intrusion. Smaller trees may need more care, although some seedlings survive with the overgrowth and will shade it out as the trees grow. As a preventative measure, consider the potential for growth of invasive species while choosing a reforestation or afforestation area.

Mulch is one of the best weed deterrents. Spread a 2" to 4" layer of mulch over the root area of the newly planted trees avoiding direct contact with the trunk, a prime spot for fungal growth. (Mulch also helps maintain the soil moisture level and may provide a buffer for any equipment such as mowers that may be used to maintain the area.) Mulching and manual control of competing vegetation is more compatible with the long term forest health than the use of herbicides.

Protection: Pests, Diseases and Mechanical Injury.

Integrated Pest Management (IPM) is one of the most effective and safest approaches for maintaining a healthy forest. IPM basics include proper species selection for the site, good pruning, mulching and fertilizing practices, regular monitoring, and proper timing of necessary sprays. Good cultural practices will minimize the amount of spraying. Professional IPM programs have reduced pesticide use by 90%. Some aspects of a full IPM program include:

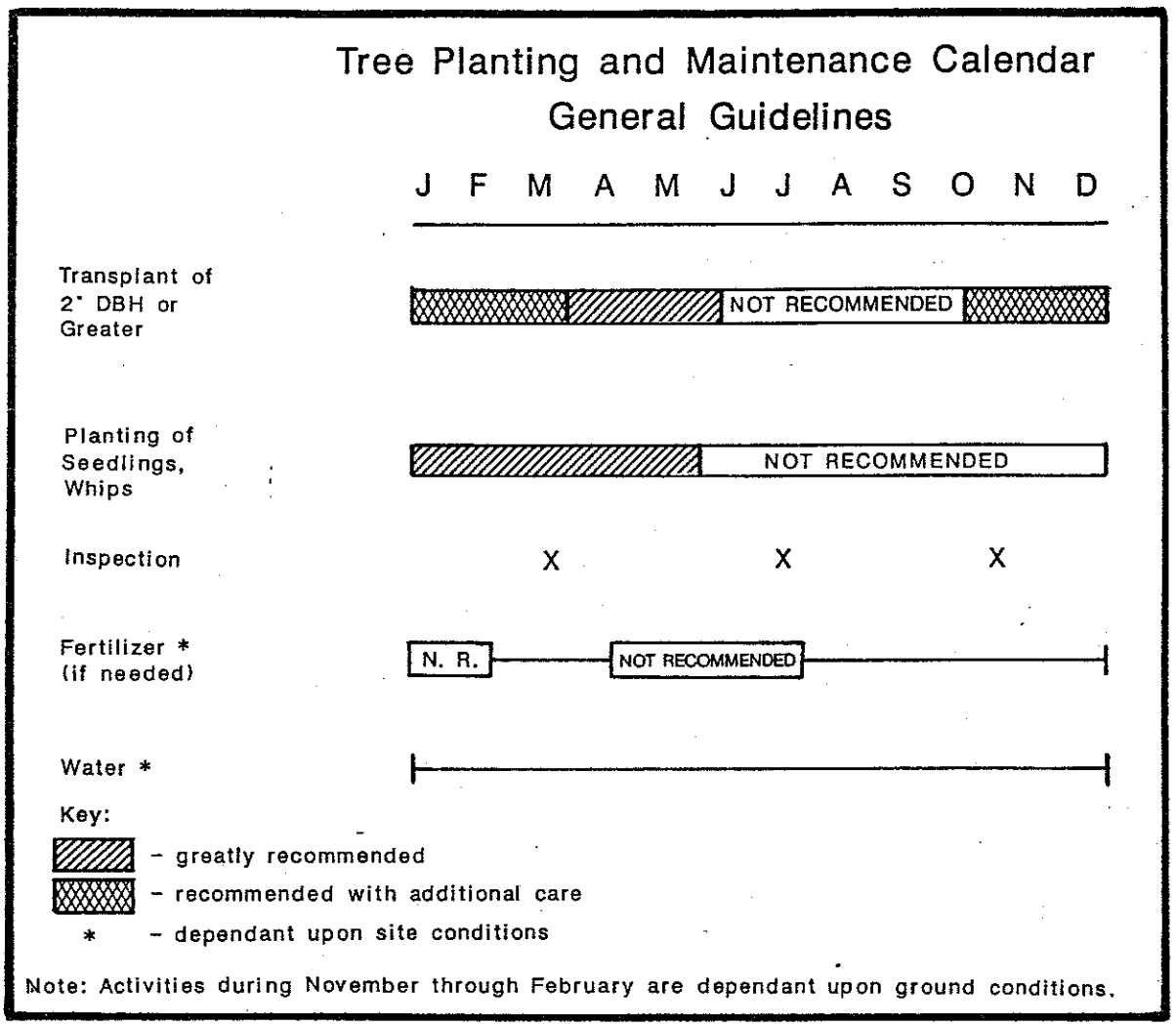
1) Elimination of some low vegetation before planting to help control the rodent population which thrives in brushy environments.
2) Use of tree shelters to protect the trunks of seedlings or whips from animal damage. The shelters act as mini-greenhouses to speed growth. (These

trees need more water than those planted without tree shelters, however.)

3) Mulching around the trees to minimize trunk damage from mowers. Wounds provide an entry way for pests.
4) Pruning dead and diseased branches with a clean cut to prevent establishment or spreading of disease.

Sunscald is a problem for thin barked young trees. Tree wrap was commonly used to protect trees from sunscald but is no longer recommended due to the increased opportunities for insect infestation and disease. An alternative to wrapping is to allow small non-competitive branches, commonly pruned during or before planting, to grow on the sunny side of the trunk to help shade the trunk.

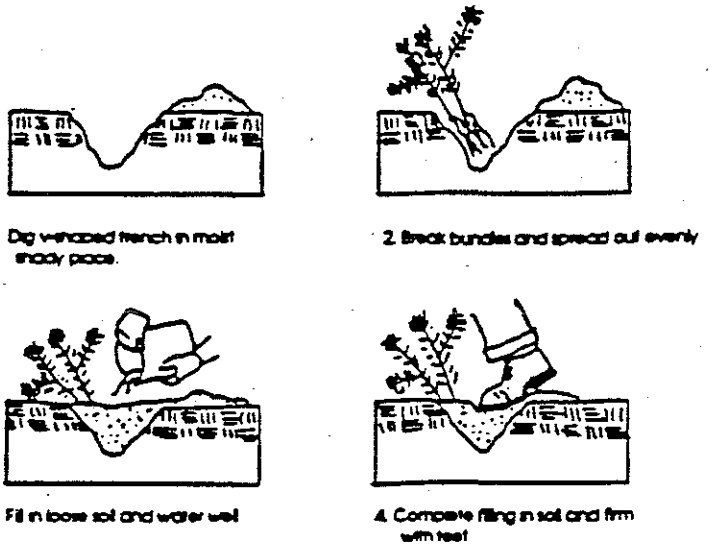
EXHIBIT H - 1



The planting and care of trees is most successful when coordinated with the local climatic conditions. This calendar summarizes some of the recommended time frames for basic reforestation and stress reduction activities.

EXHIBIT H - 2

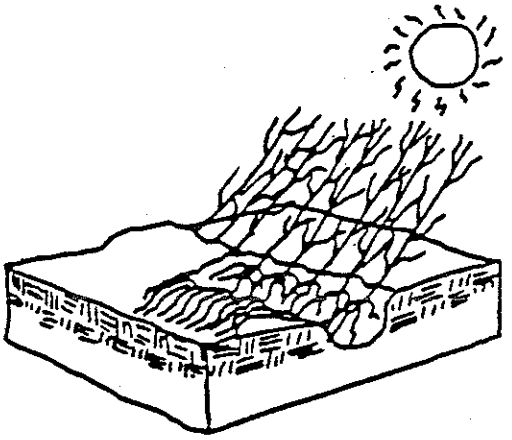
Heeling In Bare Root Stock



Bare root seedling and whip stock shoot be heeled in as shown above, if left unplanted for more than 24 hours.

EXHIBIT H - 3

Tree Banking

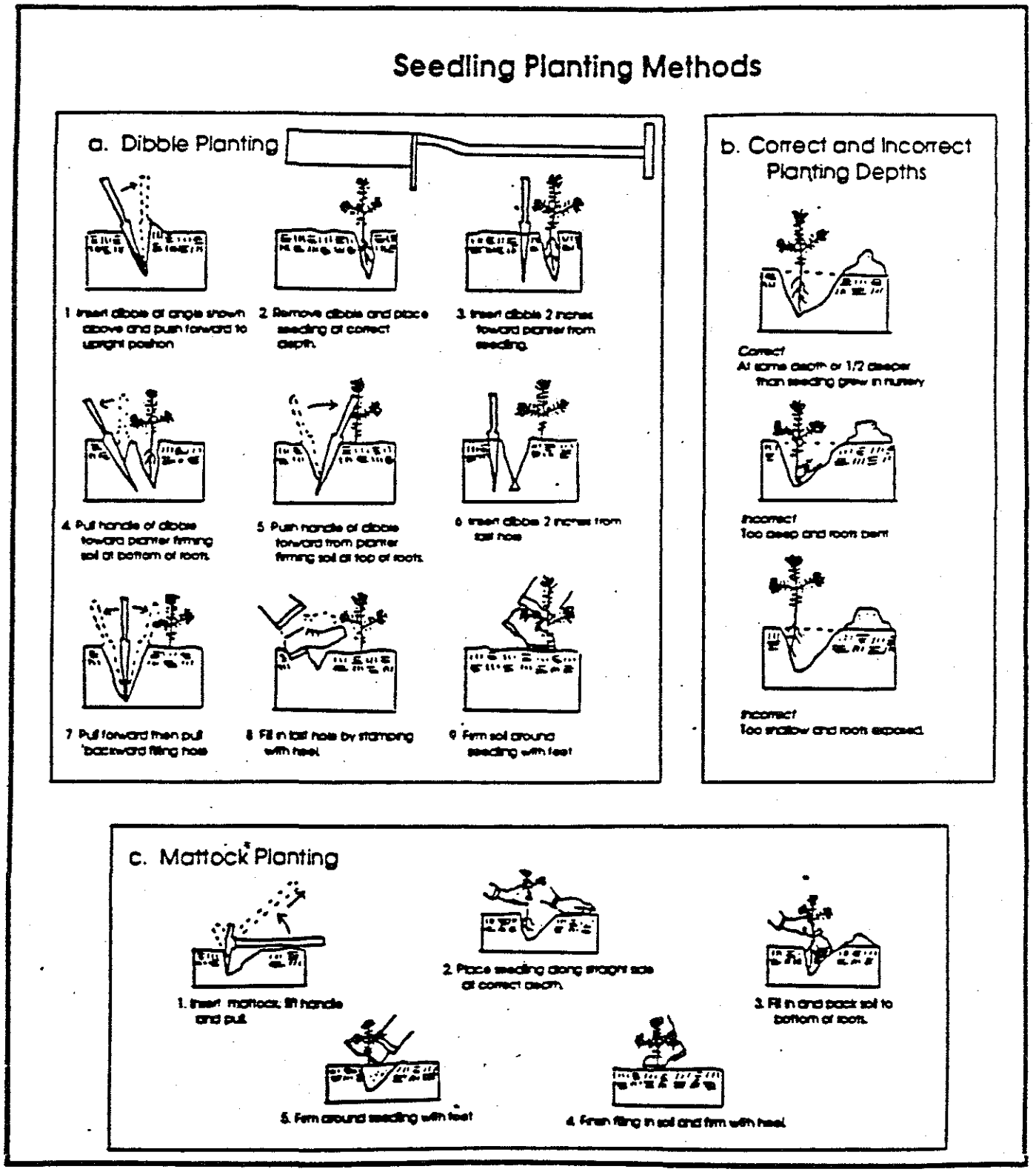


Place trees in an east-west trench with the tops of the trees pointing toward the afternoon sun. Moist soil should be worked around the roots to cover them and minimize air pockets. Pointing the tree tops toward the afternoon sun exposes the least surface to the sun so the buds will be less likely to begin growth.

Source: Harris, 1983, p.208. Reprinted by permission of Prentice-Hall, Inc Englewood Cliffs, NJ.

When bare root trees must be held in the open for longer than a few days, the method of tree banking described above is recommended.

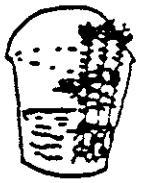
EXHIBIT H - 4



Seedlings and whips need special care when planted. Figure 3.6.5 details the recommended manual planting procedures which include correct planting depths (b) as well as methods for two different planting tools: the dibble (a) and the mattock (c).

EXHIBIT H - 5

Handling Seedlings in the Field



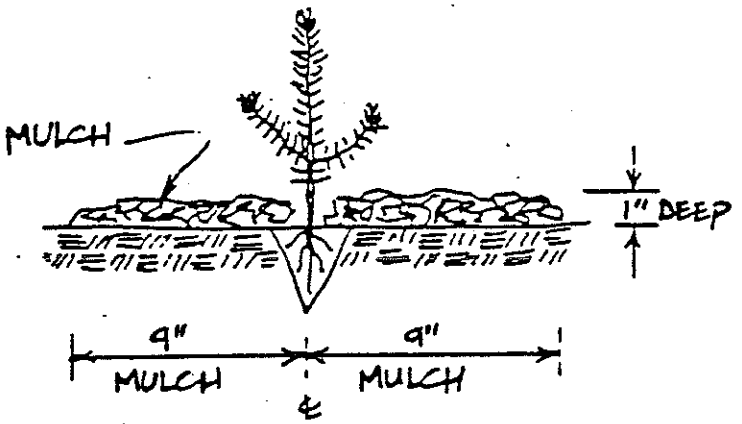
Correct
In bucket with sufficient water to cover roots

Incorrect
In hand: roots dry out.

Figure 3.3.6 notes the correct method for handling seedlings in the planting field. Seedlings dry out very quickly and, once dry, often are not usable even after moistening.

EXHIBIT H - 6

Seedling and Whip Planting Specification



Mulching newly planted seedlings is suggested as it helps the soil retain moisture and it protects the seedling from compaction and stem injury.

EXHIBIT H - 7

Planting Specifications:
Container Grown and Balled and Burlapped Stock

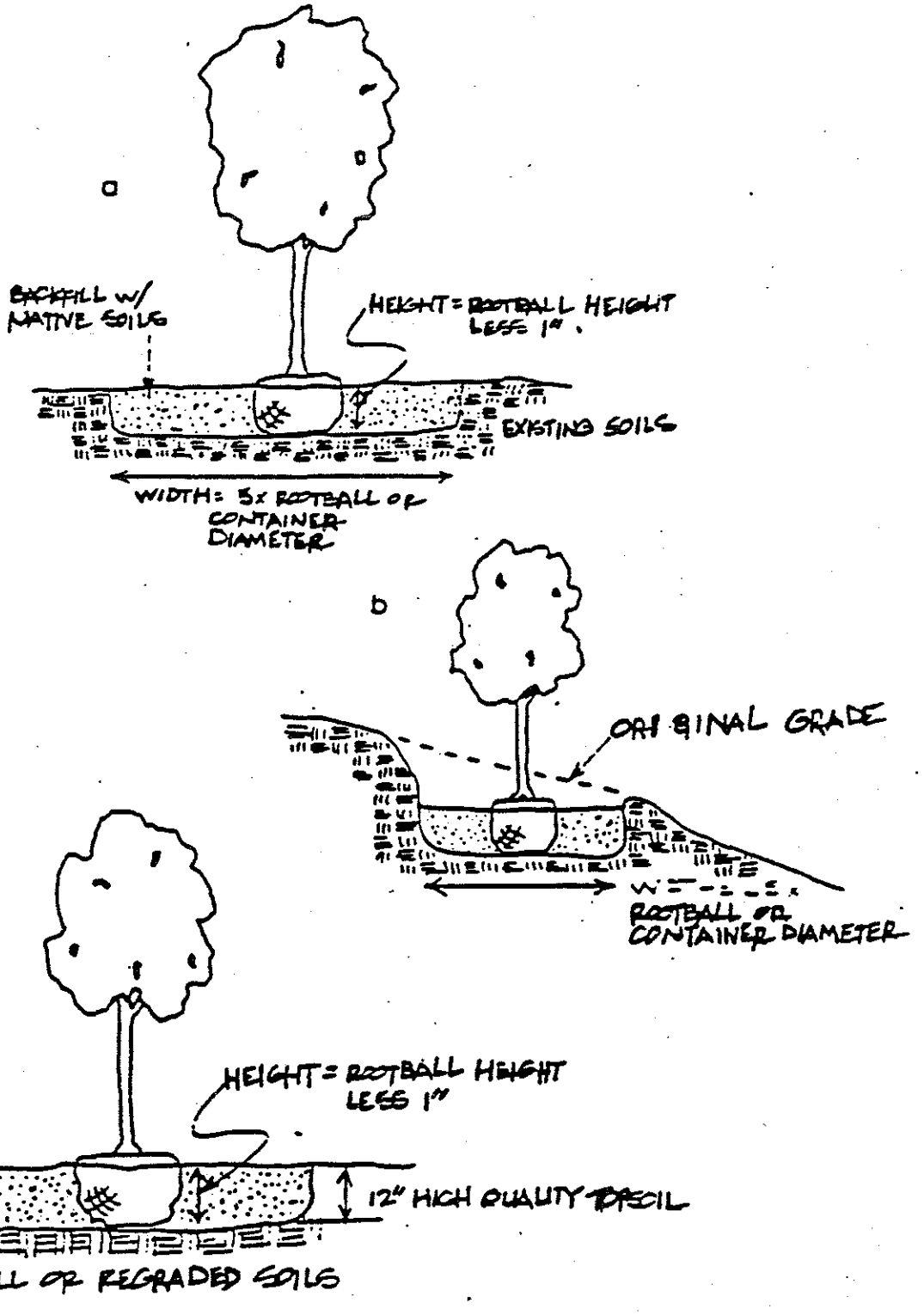
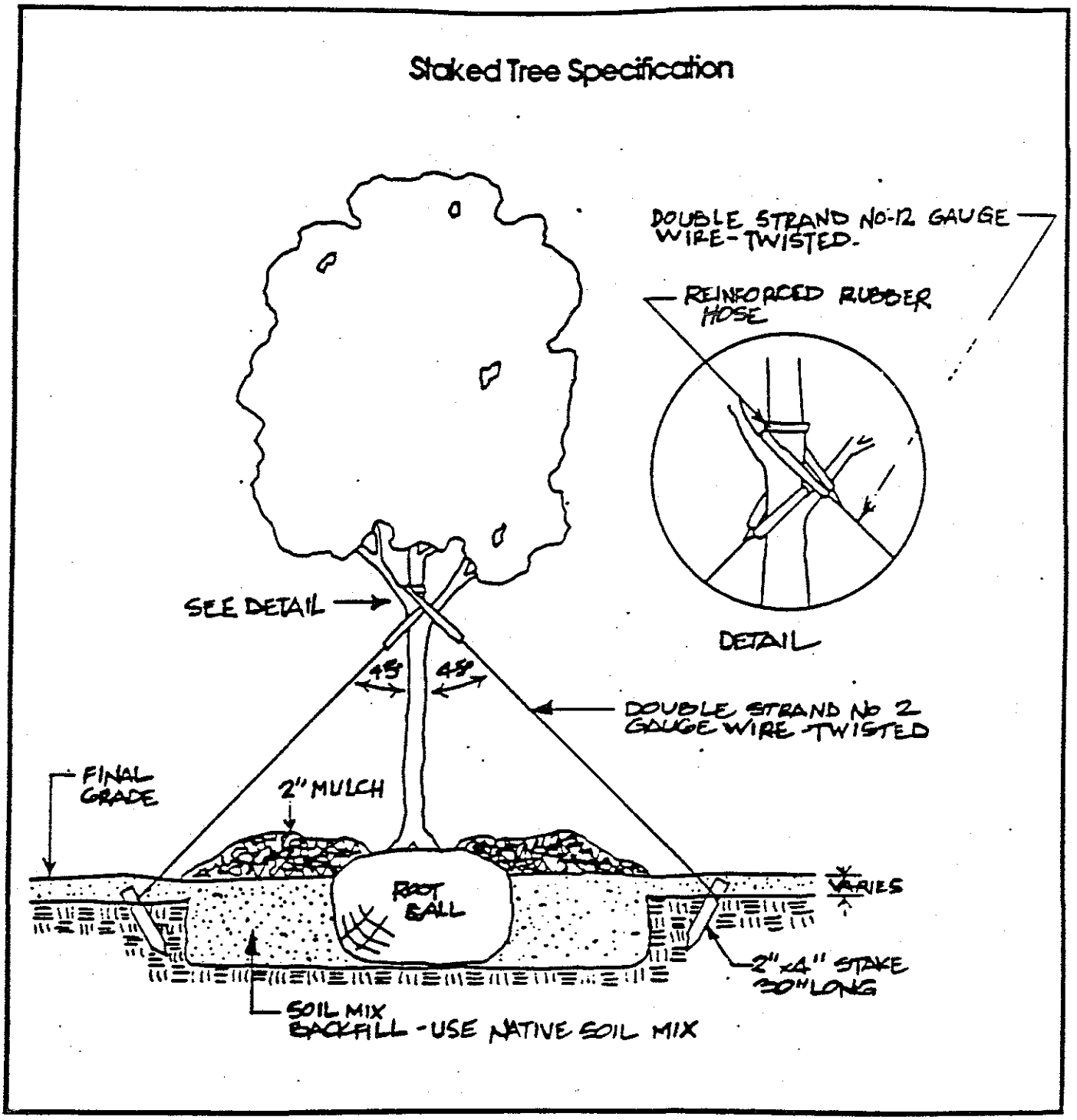
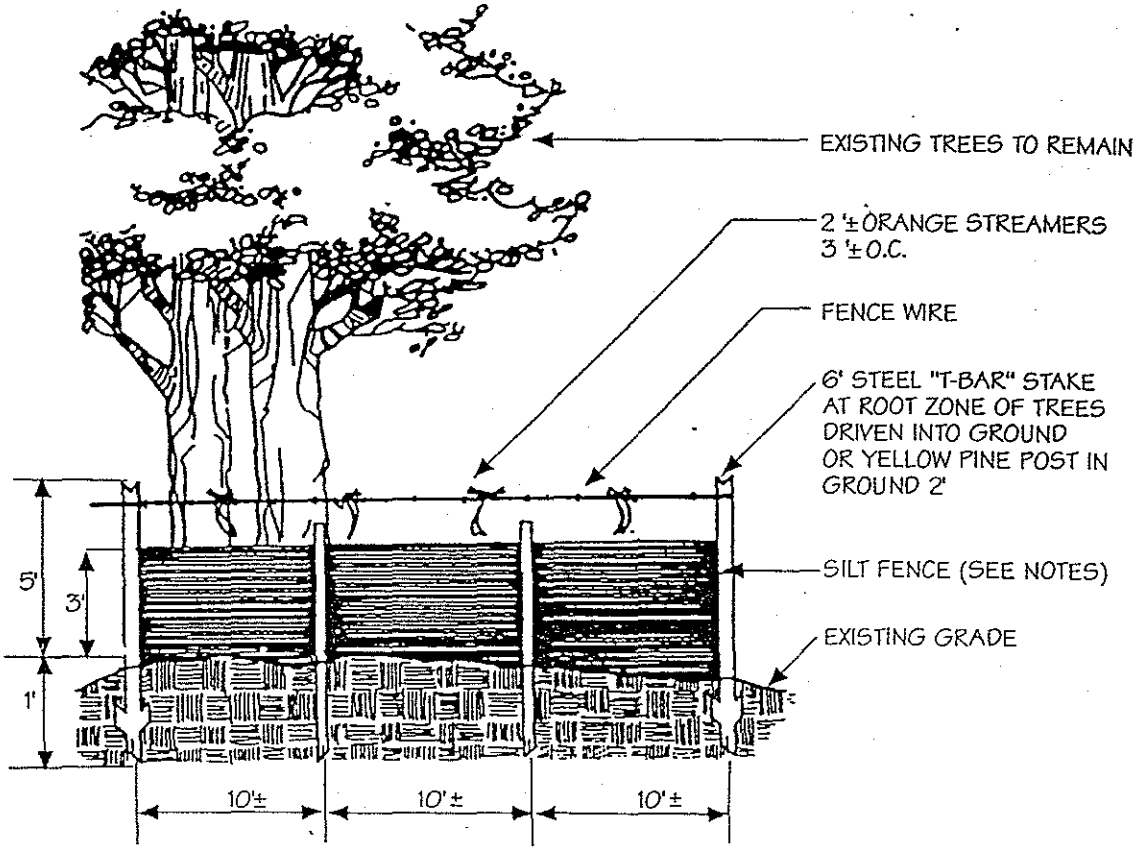


EXHIBIT H - 8



Staking of trees may be used only when transplanting in areas of high winds for trees larger than eight feet in height. Stakes and wires should be removed after the first growing season.

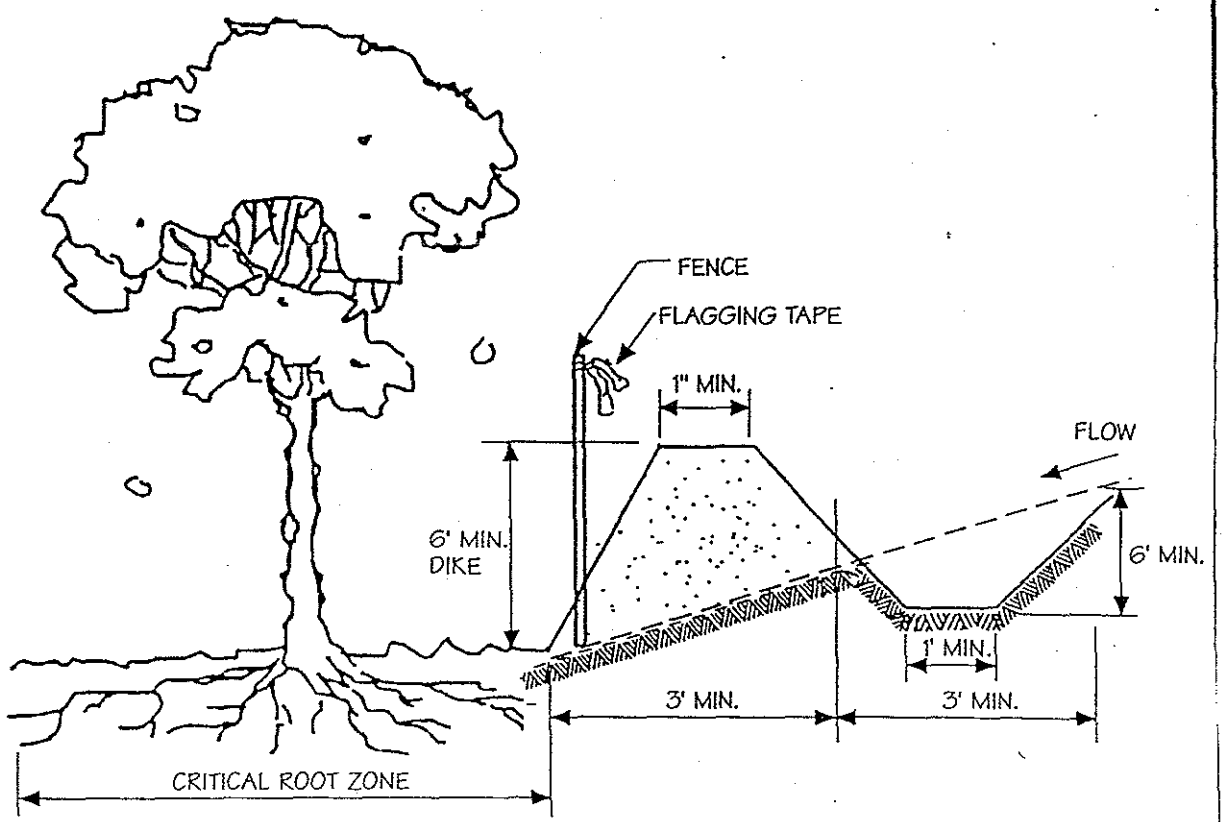
EXHIBIT H-9



Notes:
1. Silt fence to be heeled into the soil.
2. Wire, snow fence, etc. for tree protection only.
3. Boundaries of Retention Area will be established as part of the forest conservation plan review process.
4. Boundaries of Retention Area should be staked and flagged prior to installing device.
5. Avoid root damage when placing anchor posts.
6. Device should be properly maintained throughout construction.
7. Protection signs are also required, see Figure C-4.
8. Locate fence outside the Critical Root Zone.

Source: Adapted from Steve Clark & Associates/ACRT, Inc.

EXHIBIT H-10



Notes:

1. Combine sediment control and forest protection device.
2. Boundaries of Retention Area will be established as part of the forest conservation plan review process.
3. Boundaries of Retention Area should be staked prior to installing protection device.
4. Root damage should be avoided.
5. Toe of slope should be outside the Critical Root Zone.
6. Equipment is prohibited within Critical Root Zone of Retention Area; place dike accordingly.
7. All standard maintenance for earth dikes and swales apply to these details.
8. All standard reclamation practices for earth dikes and swales shall apply to these details.

Source: Adapted from Prince George's County, Maryland: Woodland Conservation Manual

APPENDIX I
FOREST MANAGEMENT PROCEDURES CHECKLIST

Step 1: Pre-Construction

Designate on plans:

____ Forest retention areas
____ Isolated specimen trees to be saved
____ Employee parking areas
____ Equipment staging areas

Temporary forest protection devices:

____ Forest protection fences or
____ Combined sediment control and tree protection fences
____ Forest retention area signs

Permanent forest protection devices:

____ Tree wells
____ Root aeration system
____ Retaining walls

Address stress reduction of forest edges and isolated specimen trees:

____ Root Pruning
____ Crown reduction or pruning
____ Watering
____ Fertilizing
____ Mulching

Step 2: Construction Phase

Monitor unauthorized use of forest retention areas:

____ Soil compaction
____ Root injury
____ Trunk wounds
____ Limb injury
____ Flooded conditions
____ Drought conditions

Step 3: 2-Year Minimum Post-Construction Period

Monitor unauthorized use of forest conservation areas.

Stress Reduction, when needed:

____ Root Pruning
____ Crown reduction or pruning
____ Watering
____ Fertilizing
____ Mulching

Repair of tree damages:

____ Root repair
____ Removal of dead limbs
____ Soil aeration
____ Removal of dead or dying trees posing an immediate safety hazard
____ Removal of temporary tree protection structures
____ On-site inspection by local or state project inspector
____ Education of owners or occupants on need to respect retention, reforestation or afforestation areas.

Future Protection Measures _____

_____

_____

_____

APPENDIX J
REFORESTATION/AFFORESTATION
INSPECTION CERTIFICATIONS

PROJECT NAME: _____
FILE NUMBER: _____
SITE LOCATION: _____

_____

INDIVIDUAL AND COMPANY THAT PREPARED PLAN: _____

_____

INDIVIDUAL AND COMPANY PROVIDING INSPECTION: _____

_____

If the original forest conservation plan preparer does not provide certification, attach a statement of qualifications for the certifying profesional.

1. INITIAL PLANTING INSPECTION
   Acreage of Planting: _____

Forest planting has been completed in accordance with the approved forest conservation plan (explain any deviations): _____

_____

_____

_____
Signature, Qualified Professional
Licensed by the State of Maryland

2. FINAL PLANTING INSPECTION
   % Survival _____
   Cause of Mortality: _____

_____

_____

COMMENTS: _____

_____

_____

_____

_____

_____
Signature, Qualified Professional
Licensed by the State of Maryland

APPENDIX J
INSPECTION CHECKLIST

___ Pest or disease infestations

___ Inhibited or stunted growth

___ Binding or restriction due to stakes and ties

___ Broken, dead, or diseased branches

___ Wilted, curled, or distorted leaves or driedout buds

___ Leaf color abnormalities (spots, yellowing, or brown margins); early leaf drop

___ Cracks in bark from sunburn

___ Sucker growth at the base or on the sides of the tree's trunk

___ Holes or substances oozing from the trunk

___ Dead or dying trees nearby, which may infect surrounding vegetation

___ Severe erosion, sunken holes in the root-ball area, or an inadequate watering basin that threatens the young tree's water supply

___ Flooding or poor drainage

___ Surface roots beginning to grow

___ Algae or mosses around tree base, indicating excess watering

___ A layer or soot or particulate matter from air pollution

___ Invasive plant growth threatening viability of reforestation or afforestation plantings

___ Improper use or intrusions into forest conservation areas

___ Missing or damaged protective measures (fences, signs, etc.)

___ Unauthorized clearing or other removal of forest vegetation

APPENDIX K
CONSULTANT QUALIFICATIONS

08.19.06 Additional Requirements for State or Local Programs

01 Approved Qualified Professional.

A. An individual may prepare a forest stand delineation or a fores conservation plan, if the individual:
   (1) Is a licensed forester;
   (2) Is a licensed landscape architect; or
   (3) Meets the requirements of §B of this regulation.

B. An individual may be approved by the Department as a qualified professional if the individual:
   (1) Possesses a 4-year degree in the natural resources sciences, natural resource management, landscape or environmental planning;
   (2) Has the following:
      (a) 2 years of professional experience in natural resources sciences, natural resource management, landscape planning or environmental planning, or its equivalent, as determined by the State, or
      (b) A graduate degree in natural resources and 1 year of professional experience;
   (3) Has the ability to meet the obligations required by the Forest Conservation Manual to prepare a forest stand delineation and a forest conservation plan; and
   (4) Satisfactorily completes a forest conservation course offered by the Department.

C. The Department shall offer forest conservation courses on a regular basis, which shall demonstrate how to:

   (1) Develop and interpret a forest stand delineation and forest conservation plan according to criteria stated in the Forest Conservation Manual;
   (2) Prepare and interpret soils, topography, floodplain, wetlands, and site maps;
   (3) Prepare afforestation and reforestation plans according to criteria stated in the Forest Conservation Manual;
   (4) Prepare a sketch map of a site, showing areas of forest retention, proposed reforestation, or afforestation;
   (5) Identify and evaluate protection measures that may be appropriate for forested areas that are sensitive to disturbance;
   (6) Identify flora and fauna, including trees, woody shrubs, plants, and wildlife;
   (7) Diagnose and treat forest pest and disease problems; and
   (8) Understand ecosystem interactions including:
      (a) Water regime impacts,
      (b) Soil variations as they affect existing trees and species selection for afforestation and reforestation,
      (c) Wildlife habitats,
      (d) Multi-storied plant canopies, and
      (e) Forest successional stages.

From: Maryland Register, Vol. 18,. Issue 23; Friday, Nov. 15, 1991

APPENDIX L
GUIDELINES FOR RURAL CLUSTER SUBDIVISIONS

Subdivisions in the RC OR RR zoning districts that use the cluster provisions of the Zoning Regulations will create a preservation parcel. Because of the relatively large acreage involved, forest conservation requirements can become overwhelming. Accordingly, rural cluster applicants have the option to include only the cluster area itself in the forest conservation calculations and exclude the preservation parcels or to include all or a portion of the preservation parcel. The choice depends largely on whether the preservation parcel has sufficient forest resources to minimize any forest conservation obligations that development of the cluster may create. The intent is to identify the most efficient way to preserve forests without undue burden on the applicant, future purchasers of the cluster lots, or the agricultural use of a preservation parcel. In all instances, preservation parcels that are three acres or less in size must be considered part of the subdivsion and included in forest conservation calculations.

The three options are:

a) The preservation parcel may be excluded from all calculations (net tract area, existing forest on-site, etc.) Because it is not part of the land use change caused by the cluster. The worksheet calculations would only include the area of the cluster subdivision. This option makes the most sense when there are no or few existing resources on the site and when including the preservation parcel would create a large afforestation obligation.

b) All of the preservation parcel can be included as part of the forest conservation plan. This option works when the preservation parcel is not in active agricultural use and has sufficient forest cover to meet forest conservation obligations created by the cluster subdivision or to avert a larger afforestation obligation.

c) When all forest resources on the preservation parcel will be put into a forest conservation easement, the forest stands in the net tract area of the preservation parcel can be added to the amount of "forest retained" on the worksheets. This grants credit for existing forests on the preservation parcel, but discounts the areas of the preservation parcel not in forest. This hybrid option is justified because it maximizes the conservation of forest resources without jeopardizing agricultural preservation objectives for the unforested areas of the preservation parcel. By making all forest resources on the preservation parcel part of the FCP, the applicants may not merely include what is convenient to include to make the numbers work.

The reforestation or afforestation obligation created by a rural cluster subdivision should be met in priority areas within the preservation parcel, as long as it does not interfere with active agricultural uses.

Forest conservation obigations should be satisfied on the preservation parcel, rather than on cluster lots to minimize the likelihood of future enforcement problems.

APPENDIX M
GUIDELINES FOR MINOR SUBDIVISIONS

Minor subdivisions of four or fewer buildable lots typically encompass small parcels. On-site forest resources, if any, generally lack the complexity found on larger parcels which may have numerous stands of different composition, age, health, etc. The small size of the minor subdivision, the limited extent and variety of any forest resources, and the processing of a final plan only (rather than the normal multiple stage review process) justify streamlined forest conservation procedures.

The following guidelines are set forth to ensure that minor subdivisions meet the intent of the forest conservation program, but avoid overly detailed or incomplete submissions. The situations cited below are the most typical, but variations may be approved to address particular circumstances.

PRE-SUBMISSION CLARIFICATION

When the applicability of forest conservation program requirements to a proposed minor subdivision is not clear, the department strongly recommends a pre-submission review or meeting prior to formal submission. If a pre-submittal waiver petition for items other than forest conservation program requirements is submitted for a minor subdivision, this pre-submittal information should be part of the waiver submission.

Presubmission review requires: 1) a plan of the site showing existing forests, environmental features, probable limits of disturbance, and 2) a completed worksheet (Appendix G in the manual) showing the likely impacts of the proposed subdivision. Because this is only an informal screening, a qualified professional need not prepare these materials.

Upon Department of Planning and Zoning review, the submitter will be advised about the applicability of the program, the likely obligation stemming from the program requirements, the options available if different solutions are possible, and the department's preference. **This review is only advisory.** It does **not** constitute approval of the material or options presented.

To determine what should be submitted as part of this pre-submission review or to arrange a meeting, call the Department of Planning and Zoning at 410-313-2354.

FORMAL SUBMISSION

The forest conservation program permits minor subdivisions to file a Joint Forest Stand Delineation (FSD) and Forest Conservation Plan (FCP) submission. If the applicant is confident that a proposal is likely to be approved as submitted, simultaneous

submission is advisable since it will reduce overall review time for forest conservation issues.

The Department of Planning and Zoning also allows a two stage submission in which the original submission includes the FSD and a completed worksheet, with the forest conservation plan to be submitted after the Department of Planning And Zoning has made its initial round of comments. Staged submission is advisable when the location and amount of clearing or reforestation cannot be accurately estimated until such features as lot lines, utilities, roads or driveway access, etc. are firmly located. In these situations, the Department will need: conceptual grading or a limit of disturbance line; preliminary boundaries of forests to be cleared, retained or replanted; and a draft of the worksheet calculations.

1) Standard Forest Stand Delineation

Except for cases where on site forest resources either do not exist or will not be disturbed, all forest stand delineations must include:

a) A plan showing the on-site forest stands and other vegetation (Exhibit 301);
b) A narrative describing and evaluating the various forest stands, and;
c) The completed forest stand analysis table (Appendix E).

The narrative need not be extensive and simple statements can be included on the plan sheet, if appropriate. The FSD plan can be incorporated onto the required supplemental sheet showing existing conditions and environmental features. The preparer must sign the FSD base plan.

2) Standard Forest Conservation Plan for Afforestation or Reforestation

Whenever new forest plantings are required, a forest conservation plan in accordance with the manual must be submitted, including: written justification for proposed clearing and planting locations; a planting program depicting species and method of planting chosen; construction surety and developer agreement; two year post construction maintenance agreement; and a long-term binding forest conservation agreement.

When forest conservation requirements are met entirely through retention, minor subdivisions must record a forest conservation easement, but a developer's agreement and surety are not required.

Forest retention and forest planting on private residential lots may only be approved in accordance with Section 16.120(b)(4)(iii) of the Subdivision Regulations.

PROCEDURAL ALTERNATIVES

1) No Forest Resources Exist

When no forest resources exist on site, a simplified FSD is allowed:

a) The Final Plan Supplemental Sheet showing existing conditions,
b) A certification (on the forest stand analysis table) by a qualified professional that no on-site forest resources exist; and
c) A worksheet (Appendix G) documenting the amount of afforestation owed.

The forest conservation plan will consist of either:

a) A plan showing the proposed on-site or off-site afforestation location, species and planting methods to be used, and other items in accordance with the manual and checklist; or
b) A request for a fee-in-lieu payment at $0.30/square foot owned with a written justification stating why on-site or off-site planting cannot reasonably be done.

2) Forest Retention Plan When No Clearing or Afforestation Is Proposed

When forest resources exist on site, but no clearing is proposed, no afforestation is required **and** the existing forests will be placed under a forest conservation easement, a simplified FSD is required, but no FCP.

The simplified FSD can consist of:

a) the Final Plan Supplemental Sheet showing existing conditions (No individual trees need to be located or described);
b) A certification on the forest stand analysis table by a qualified professional that no resources will be disturbed; and
c) A complete worksheet.

3) Forest Retention When Clearing Will Not Exceed the Break-even Point

When some forest clearing is proposed, a standard FSD is required to assess retention priorities.

When the full extent of clearing is not known at the Final Plan stage, forest conservation obligations will be considered fully met if the final plat establishes a forest conservation easement area that meets or exceeds the break-even point based on the reforestation worksheet calculations. The developer, builder, or future lot owners will be permitted to subsequently clear areas outside such easement without any penalty or

reforestation obligations, provided the established forest conservation areas remain undisturbed. All other regulations on clearing and grading will apply outside the forest conservation areas.

To determine the Break-even Point (B.E.P.), use the following formula:

B.E.P. = (EXISTING FOREST EQUAL TO REFORESTATION THRESHOLD) + 20% (OF EXISTING FOREST ABOVE THRESHOLD)

For example, on a 2-acre net tract fully wooded R-20 site:

B.E.P. = (0.2 X 2.0 ACRES) + (0.2 X 1.6 ACRES)

B.E.P. = (.40) + (.32)

B.E.P. = .72 ACRES

4) Request for Fee-in-lieu

In some instances on-site and off-site planting is not feasible or appropriate; fee-in-lieu may be an acceptable resolution of forest conservation requirements. When the total forest planting obligation is less than 10,000 square feet, the department generally prefers the forest conservation debt be fulfilled by fee-in-lieu payment. When the total obligation is above 10,000 square feet the department will review the appropriateness of payment of fee-in-lieu versus planting on a case-by-case basis.

If the developer wishes to make a fee-in-lieu request prior to submitting a forest conservation plan, the Department will require:

a) a forest stand delineation;
b) a completed worksheet;
c) a letter stating in detail why on-site or off-site planting is not a reasonable option; and
d) a completed fee-in-lieu request form.

APPENDIX N
GUIDELINES FOR PHASED DEVELOPMENT

Addressing forest conservation requirements for phased development of large properties and bulk parcel subdivisions is difficult because the specific development program and forest impacts may not be clear initially. Bulk parcel subdivisions are particularly difficult as they typically result in multiple owners and diffused forest conservation obligations. To avoid this problem, forest conservation requirements must be met by the developer at the subdivision stage unless otherwise approved by the Department of Planning and Zoning.

While the developer needs flexibility, the County needs to ensure forest retention, afforestation, and/or reforestation are in priority locations. To reconcile these objectives the forest stand delineation must cover the entire property, however developers have several options for meeting forest conservation requirements.

FOREST STAND DELINEATION

The Forest Stand Delineation (FSD) in accordance with the manual must include:

1) a forest stand plan, narrative and forest stand analysis table; and

2) a worksheet realistically estimating the amount of forest conservation obligation anticipated. The applicant may use the break-even calculation or may indicate more or less forest clearing depending on how the property will be developed/marketed.

FOREST CONSERVATION PLAN

1) At a minimum, the forest conservation plan should provide retention, afforestation, or reforestation in the environmentally sensitive areas (floodplain, wetlands, wetland and stream buffer, and steep slopes) in an amount not to exceed the estimated forest conservation obligation. A developer's agreement, surety, and a forest conservation easement will be required as part of the initial development phase.

2) The remainder of the estimated forest conservation obligation, if any, may with the Department of Planning and Zoning's concurrence, be met in the following ways:

a) elsewhere on-site as part of the initial subdivision or phase;
b) off-site as part of the initial subdivision or phase;
c) in-lieu-fee as part of the initial subdivision or phase;
d) on-site during subsequent development phases (subdivision or SDP) for one or more specific parcels or sections.

The Department of Planning and Zoning prefers to address as much of the forest conservation obligation as possible during the initial development phase to minimize future tracking of obligations for the property. It is generally better to plan for optimal development of the property than to minimize initial forest conservation obligations, which may defer an excessive burden to subsequent phases if clearing drops below the 2:1 reforestation threshold.

APPENDIX O
HOWARD COUNTY CAPITAL IMPROVEMENT PROJECTS

Almost all County capital improvement projects are subject to forest conservation requirements.

EXCEPTIONS

The following activities, however, are exempt from the requirements of forest conservation, even if part of a State-funded project:

1) Any activity conducted on a single lot of any size provided that:

   a) The activity does not result in the cutting, clearing or grading of more than 40,000 square feet of forest; and
   b) The activity on the lot will not result in the cutting, clearing or grading of any forest that is subject to the requirements of a previous forest conservation plan prepared under Subtitle 19.

2) The cutting or clearing of public utility right-of-way or land for electric generating stations licensed under Article 78, Section 54A and 54B, or Section 54-i, Annotated Code of Maryland.

3) Any routine maintenance of public utility rights-of-way.

A "public utility" is defined as a transmission line or electric generating station, or water, sewer, electric, gas, telephone or television cable service line. The question of whether a project consists of routine maintenance or new construction may be determined by the County as the reviewing authority.

STATE FUNDED HIGHWAY PROJECTS

State-funded 'highway projects', will be reviewed by the Department of Natural Resources under the reforestation law, Natural Resources Article Section 5-103. As currently interpreted by the State, a "highway project" is <u>any</u> roadway construction which has <u>any</u> State funding.

In the case of "highway projects", the constructing agency should submit a "Reforestation Site Review" form (DNR/RCS 399). Although the $0.10 per square foot fee is a possibility under Section 5-103, the State's first preference is for mitigation planting on-site.

ALL OTHER COUNTY CAPITAL PROJECTS

The State of Maryland has essentially delegated responsibility for enforcing forest conservation obligations to the County subject to the County notifying the State of the project, and obtaining authorization on a case-by-case basis (DNR Subtitle 19, CH.4(D) and (E) following). Essentially what the State requires is notification, and a courtesy copy of the relevant plans and materials. Therefore, it is the County's responsibility to determine forest conservation requirements for its own school, road, utility, and other capital projects. This policy applies even if a project has all or partial State-funding.

For all capital projects, the Department of Planning and Zoning should be contacted as soon as possible if there are any questions about the applicability of forest conservation requirements or which agency will be responsible for review. The Department has copies of DNR Form 399 and information on how forest conservation requirements for highways with state funding differ from County forest conservation requirements governing all other projects.

Pending capital projects should be submitted to the appropriate review agencies in accordance with the above processing procedures, with consideration given to the response time-frames mandated by law. If a project is subject to State review, (i.e. if it is a "highway project" with any State funding) use Exhibit S-1, the DNR Form 399. If the project is subject to County review, submit the project to the Department of Planning and Zoning. In most instances, the project will be transmitted to the Subdivision Review Committee. In all instances, the Department of Planning and Zoning will review and provide written comments concerning forest conservation requirements.

Howard County Department of Planning and Zoning
3430 Court House Drive
Ellicott City, MD 21043
(410) 313-2354