Carroll County, Maryland Forest Conservation Technical Manual

May 2011 Edition

Carroll County Commissioners
Westminster, Maryland

Effective date:

This document has been adapted from the Third edition of the Maryland “State Forest Conservation Manual”, dated 1997.

Carroll County Forest Conservation Technical Manual
Fourth Edition, May 2011

Acknowledgments

Early in 1993, the DNR-Forest Service convened a task force to review the 1991 edition of the Forest Conservation Manual: Guidance for the Conservation of Maryland's Forests During Land Use Changes and recommend revisions which would clarify and streamline existing procedures and requirements. Our goal was to assist applicants, especially to the State Program, to meet the submission requirements for Forest Stand Delineations and Forest Conservation Plans.

The Technical Manual Task Force met through 1993 and presented its recommendations to the Forest Conservation Advisory Group which had been appointed to review statutory and regulatory requirements of the Forest Conservation Act. Through a cooperative effort, an initial draft of the third edition of the State manual was prepared and reviewed by the two groups. The second edition was released in 1995. Subsequent to that a further refined third edition was published in 1997.

The first edition of Carroll County's Manual was adopted from the 1991 edition of the State Technical Manual. This edition is an adoption of the third edition of the State Manual. The document is also the result of the review and deliberation of a technical sub committee of the Carroll County Environmental Affairs Advisory Board. The Committee included Christopher Batten, Harry Staley, Glen Edwards, Wayne Watkins, and Len Wrabel from the private sector, Mr. Kevin Dayhoff, Chair of the EAAB, and Ms. Vicki Luther and James Slater, Timothy Burke, and Tom Robertson representing Carroll County.

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Chapter 1

Introduction

Contents:

1.0 Protecting Forests and Sensitive Areas Through Site Planning
- **1.1 What Are the Basic Planning Requirements?**
- **1.2 Using the Manual**
- **1.3 Site Planning Considerations**

1.0 Protecting Forests and Sensitive Areas Through Site Planning

From the western mountains of Garrett County to the Chesapeake Bay and the shores of the Atlantic Ocean, forests contribute greatly to the quality of life in Maryland. Air quality is enhanced by forests, which reduce atmospheric carbon dioxide through photosynthesis, filter particulates, and absorb nitrates. They provide habitat for numerous plants and animals and recreational opportunities and resources for people. Forests along waterways play a particularly crucial role in maintaining water quality and a healthy balance of terrestrial and aquatic flora and fauna by moderating water temperature fluctuations and buffering streams from runoff filled with sediments and other pollutants. In addition, the forest products industry represents a major industry in the State and Maryland's economic health depends heavily on its contributions.

At the beginning of this century, much of Maryland's forest cover had been cleared for agriculture or cut for fuel, timber, or charcoal. Since then, many rural and urban areas have been reforested with the guidance and assistance of long-standing State and federal programs.

Today, loss of forest cover in Maryland occurs primarily as a result of construction activities associated with increased urban development. Unlike forest clearing for agriculture, once development occurs, the regeneration potential of forests is often lost.

The Maryland Forest Conservation Act was passed by the General Assembly in 1991 and subsequently amended to conserve the State's forest resources during development activities. The Act requires identification of existing forest stands, protection of the most desirable forest stands, and establishment of areas where new forests can be planted. Forest conservation planning occurs during the initial design or site planning of a proposed development.

The Forest Conservation Act establishes standards for local authorities to enforce during the development process It is intended to protect not only forests and trees in developing areas, but also any sensitive areas identified during the local planning or comprehensive land use plan adoption process. Standards established in the Act for identification, retention, and replanting include those areas designated as sensitive areas under the Growth Management, Resource Protection and Planning Act of 1992. These include nontidal floodplains, streams and their buffers, steep slopes, and critical habitats.

Identification and mapping of these areas is required for approval of a Forest Stand Delineation. Protection of these areas can be accomplished through the establishment of long-term protection methods as part of locally approved Forest Conservation Plans. In addition, sensitive areas located offsite may provide opportunities for replanting, preservation, and protection under a local comprehensive plan or when approved as a technique for afforestation or reforestation.

Successful forest conservation planning requires collaboration between professional foresters, planners, landscape architects, engineers, surveyors, and developers, as well as effective communication between applicants and plan approval authorities. Throughout the development process, the professionals and landowners should act in accordance with the priorities and standards established by State and local law for forest conservation. This planning requires integration of specific forest protection measures with local land use objectives and the aims of individual landowners. Protected forest areas may be used for recreation, wildlife habitat areas, aesthetics, energy savings, or for timber production. The use and enjoyment of these areas by future residents, as well as preservation of identified priority sensitive areas, will maintain and enhance Maryland's overall quality of life.

It is not the intent of the Ordinance to place unreasonable restrictions on development. Rather it aims to maximize the benefits of forests in a cooperative effort with development, thereby slowing the loss of forested land in the state and improving the environment of both developed and undeveloped areas. The work requires collaboration between professional foresters, planners and the development industry to generate a functional and economical plan that will provide many long-term benefits to people and their environment.

1.1 What Are the Basic Planning Requirements?

The Carroll County Forest Conservation Ordinance derived from the Maryland Forest Conservation Act of 1991. It requires that prior to the approval of any development which results in the cumulative disturbance of 40,000 square feet or greater, applicants shall submit a **Forest Stand Delineation (FSD)** and a **Forest Conservation Plan (FCP)**. These plans must be approved by Carroll County before development can proceed.

The provisions of the Forest Conservation Act of 1991 may be found in the Annotated Code of Maryland (Natural Resources Article, Title 5, Subtitle 16) and the Code of Maryland Regulations (COMAR Title 08, Subtitle 19, Forest Conservation). Any references in this Manual to the Natural Resources Article are from the Annotated Code of Maryland. The provisions of the Carroll County Forest Conservation Ordinance may be found in the Carroll County Maryland Code of Public Local Laws and Ordinances, Chapter 115.

A **Forest Stand Delineation** is an inventory of existing site conditions and forests and shall be used during the preliminary review process to determine the most suitable and practical areas for forest conservation during development. (Natural Resource Article 5-1604).

A **Forest Conservation Plan** details the amount of the forest which will be retained, reforested, or afforested; the locations where this will occur; proposed protection measures taken during development, such as location of devices and limits of disturbance; construction scheduling; maintenance and monitoring procedures; long term protection measures; and other measures which may be required (Natural Resource Article 5-1605).

The Forest Conservation Technical Manual outlines submittal requirements for Forest Stand Delineations and includes required information for the approval of Forest Conservation Plans such as specific forest conservation criteria and protection techniques. (Natural Resource Article 5-1603).

1.2 Using the Manual

The Department of Natural Resources adopted regulations setting the requirements and standards of performance for submitting Forest Stand Delineations and Forest Conservation Plans. In addition, DNR exercises review authority of all Forest Stand Delineations and Forest Conservation Plans for State-funded projects under the State Forest Conservation Program.

This document is the technical manual for the Carroll County Forest Conservation Program. This Manual is based upon the Carroll County Maryland Code of Public Local Laws and Ordinances, Chapter 115, and the State Forest Conservation Manual. The legal provisions upon which the Manual is based may be found in the Annotated Code of Maryland (Natural Resources Article, Title 5, Subtitle 16) and the Code of Maryland Regulations (COMAR Title 08, Subtitle 19, Forest Conservation). Minimum standards for local programs are found in COMAR, Title 8, Subtitle 19, Chapter 2, "State Review and Approval of a Local Program."

This Manual is cited as the Carroll County Forest Conservation Manual, Fourth Edition, 2011. It replaces previous versions as the standard for Carroll County's Program. This Manual has been adopted by the County in accordance with Section 115-20 of the Carroll County Maryland Code of Public Local Laws and Ordinances, Chapter 115. This manual establishes standards and instructs and assists those professionals responsible for conducting the field work and preparing plans required by Chapter 115.

Chapter 1, Introduction, covers the basic requirements of the Act and site planning considerations.

Chapter 2, Forest Stand Delineations (FSD), covers the first submittal requirement. FSD's describe the existing forest and environmental features as defined in the Act and Regulations. There are three levels of FSD's beginning with a simplified version. At a minimum, a map is submitted which shows the extent, description, and location of forest areas, streams and their buffers, nontidal floodplain, steep slopes, and critical habitats on and closely adjacent to a development site. If forest will be cleared, additional information will be required.

Chapter 3, Forest Conservation Plans (FCP), discusses the second submittal requirement, FCP's, and step-by-step procedures for their preparation. These plans show the proposed forest retention areas, how much forest is retained or replanted, the plans for replanting, and the forest protection measures during and after construction. The main chapter elements include Determination of Priority Forests and Priority Areas, Forest and Tree Protection, Forest and Tree Planting, Maintenance and Monitoring, and Enforcement.

Chapter 4, Linear Projects, discusses conditions and requirements for special projects such as linear utilities.

Appendix A contains sample site plan illustrations.

Appendix B is a Glossary of Terms. Users are also referred to the statutory and regulatory definitions as contained in Natural Resource Article 5-1601 and COMAR 08.19.01.

Appendix C contains examples of data collection and analysis worksheets that demonstrate the step-by-step process shown in Chapters 2 and 3. These may be used directly or adapted. While they have been tested by field reviewers and include all elements required for analysis, applicants may desire to revise them for convenience.

Appendix D contains examples of forest protection and planting specifications and details which may be used directly or adapted. Wherever possible, these are consistent with other construction specifications; however, as additional research is performed or as new methods are introduced, these may be changed. Applicants may wish to verify them with standards contained in the American Standard for Nursery Stock (ANSI) and other horticultural sources. Some of these are listed in Appendix E.

Appendix E is a list of references used in the Manual.

Appendix F is a list of invasive exotic plant species common in Maryland.

Comments or questions concerning the Maryland Forest Conservation Act may be addressed to:

Forest Conservation Program
Department of Natural Resources - Forest Service
Tawes State Office Building, E-1
Annapolis, MD 21401
410-260-8531
Attn: Forest Conservation Manual, Regulations Coordinator

Questions about Carroll County's program should be directed to: Carroll County, Forest Conservation Program - 225 North Center Street, Westminster, Maryland 21157

1.3 Site Planning Considerations

To illustrate the requirements and procedures of preparing Forest Stand Delineations and Forest Conservation Plans, a sample development site plan has been prepared. The sample site is 193 acres in size and contains approximately 34 acres of forest. The site, a medium density residential area, is shown in **Figure 1:1**.

Site planning is a complex, interdisciplinary process that must consider a variety of issues and regulations -- local comprehensive plans, ordinances, and subdivision regulations; infrastructure, such as roads and utilities; state and local regulations that protect wetlands, streams and their buffers, steep slopes, critical habitats; and, of course, the wishes of the developer. Now, subdivision and development also requires coordination of the Forest Conservation Act with all the other needs. This section suggests ways to accommodate site and development constraints while meeting forest conservation requirements.

Forest conservation is a key element in the site planning process. The forest conservation consultant works with the developer, contractor, site planner, engineer, wetland consultant, and other specialists on the team to ensure that forest conservation requirements are integrated into plans as they evolve from concept to final plan. An initial concept plan should incorporate sensitive area and Forest Stand Delineation information. A Forest Conservation Plan is an integral part of the final subdivision or site plan. Retention and planting can effectively contribute to other planning objectives, such as screening unattractive views, buffering incompatible land uses, and enhancing wildlife habitats.

This section outlines site design issues that may affect forest conservation and suggests ways of minimizing potential conflicts between forest conservation planning and other regulations or requirements.

Residential Design

Common methods for retaining forests and priority retention areas in residential communities involve minimizing the total area of disturbance by using smaller lots, clustering lots, and changing lot configurations. By reducing impacts to priority forest retention areas and related sensitive natural resources, lengthy and expensive regulatory processes may be avoided. Some of these methods are:

- Minimize clearing and grading around proposed development features avoid mass clearing and grading. Estimate carefully the amount of clearing needed for walkout elevations on slopes.
- Minimize impervious surfaces and related disturbance through design techniques such as shared driveways or reduced road widths, so long as required setbacks, construction specifications, and fire safety regulations are satisfied. Where these conflict with high priority forest retention areas, a variance to local regulations may be possible where safety is not affected.

- Cluster where possible residential development can be concentrated in areas most suitable for construction with the remainder reserved as open space. Cluster subdivisions often allow smaller or alternative lot and housing sizes or layouts with a proportional increase in open space. Land preserved in open space retains sensitive natural resources and provides areas for community recreation use. Many preserved open spaces are suitable for long-term retention of forest and locations of proposed open space can be designed using a Forest Stand Delineation. High priority areas should be retained, connecting corridors should be preserved, and unnecessary forest fragmentation avoided.

Site Grading and Drainage

To avoid excessive grading:

- Preserve natural grades, retain existing drainage patterns and minimize grading of steep areas.
- Seek variances to site grading requirements if needed to protect high priority forest retention areas.
- Consider retaining walls to limit the extent of site grading (see Section 3.2 on forest protection).

Roadway Design

Road rights-of-way and impervious paving can have significant effects on forests. Wide roadways and extensive cuts and fills for construction may fragment forest habitat and impose significant alterations to forest hydrology. To limit adverse impacts on existing forests:

- Locate roads with reference to natural grades and environmental features.
- Avoid road alignments that disturb high priority forests wherever possible. When roads must be adjacent to high priority forest retention areas, consider using retaining walls to limit the extent of road grading.
- Use minimum road width standards and minimum setbacks from rights-of-way to preserve existing forests. Variances to local standards may be appropriate means to meet forest conservation objectives.

Utilities

A maze of essential utilities crosses most urban and suburban developments and their design criteria vary widely. The layout of these sewer, telephone, cable, electric, gas and other lines, and the timing of their construction can affect forest areas. Utility companies often require that exclusive easement areas be reserved for the construction and maintenance of the utilities. Many utilities prohibit forest retention or planting within easement or right-of-way areas.[1]

- Investigate modifying utility line specifications to permit reforestation of easements or planting lower growing trees and shrubs under power lines. If forests must be prohibited within these areas, the right-of-way or easement areas may not be credited as a retention, afforestation, or reforestation area.
- Reduce right-of-way width or use common trenching when possible. Disturbance within the right-of-way should be the minimum necessary to install and maintain the utility.

Sewage reserve areas (SRA's) and septic systems are required in areas without public sewers. Design and installation of these systems is approved by State and local health departments. As with utility easements, these systems require cleared areas at installation or for future replacement systems within the easement areas. Furthermore, State regulations allow no other easements on SRA's, therefore, these areas are not candidates for long-term forest protection. To ensure forest protection when designing utilities:

[1] Reference 3.32 Standards for trees

- Locate septic areas outside of priority forest retention areas whenever possible.
- Minimize disturbance when the location of gravity-driven utility lines and septic areas are dictated by topographic conditions and clearing is necessary.

Stormwater Management

Stormwater management facilities pose special problems for forest conservation even though they play crucial roles in the protection of stream quality and aquatic habitat. These facilities are often located at low points of a site and correlate with high priority forest retention areas, stream buffers, floodplains, non-tidal wetlands, and drainage swales.

- Avoid locating stormwater management areas in high priority forest retention areas whenever possible.
- Plan stormwater management facilities to minimize forest disturbance.
- Design stormwater management areas and outfalls to avoid major changes to the hydrology of a retained forest area.
- If possible, plant forest in stormwater management facilities.

Some forest areas may be suitable for water quantity treatment. Where forests are in hydric and hydric inclusion soils, an embankment may be used to impound water in the forest and slowly release it. The impoundment should be for very brief periods as forested wetlands are tolerant of standing water for limited periods of time.

- Consider bioretention for water quality and quantity treatment. These are specially engineered planted areas which combine particular drainage and nutrient uptake characteristics.
- Investigate waivers to stormwater management quantity control when needed to achieve forest retention objectives, particularly when forest retention areas provide stormwater infiltration benefits.

Erosion and Sediment Control

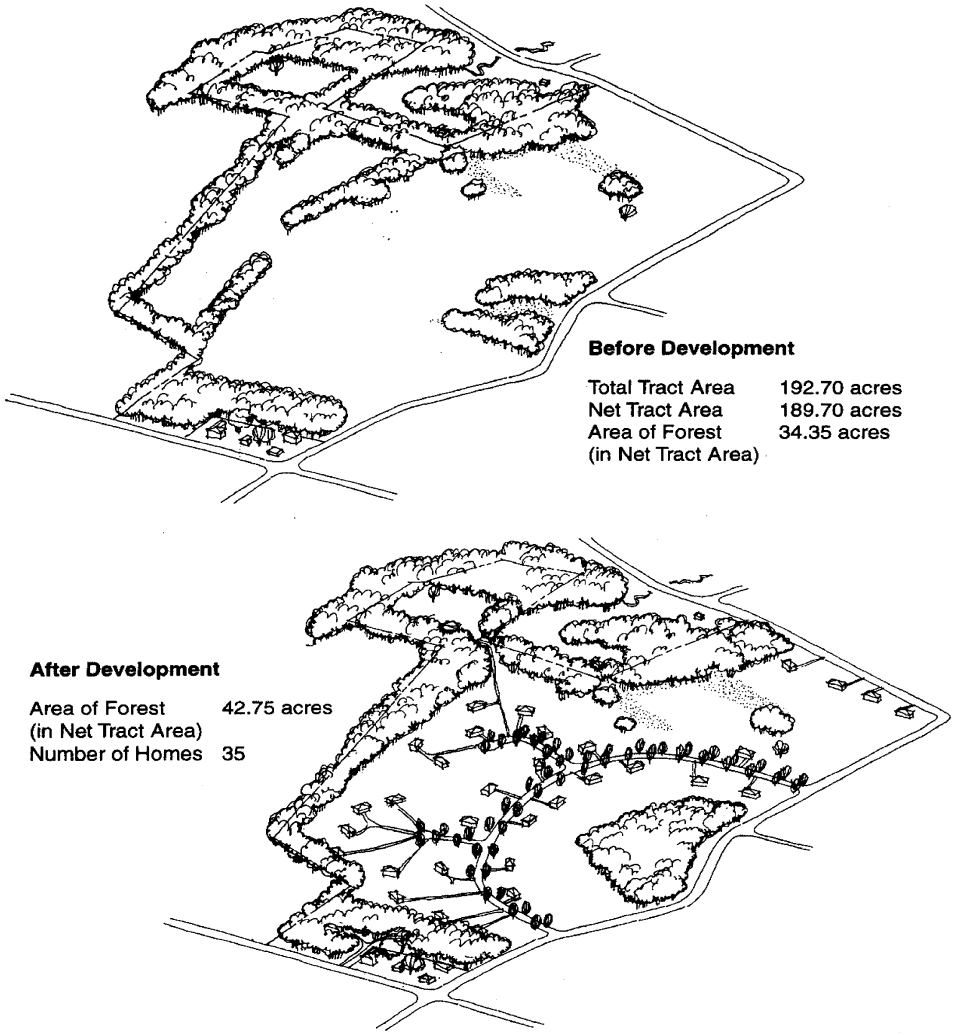
Designing and constructing erosion and sediment control structures should be closely coordinated with forest conservation planning. Protecting retained forests and planted areas requires enforcing defined limits of disturbance and controlling sediment losses from construction sites.

- Do not clear forests to accommodate construction of temporary sediment and erosion control devices or temporary stormwater management devices. Locate them in areas that will be disturbed for later development.
- Design and install forest protection devices prior to or with sediment control devices. Adapt silt fencing and other measures used for erosion and sediment control for forest protection when outside of retention or planting areas. Locate perimeter berms outside of critical root zones. Forest conservation areas may need added protection, such as flagging or signs as specified in Section 3.2.
- Do not direct untreated runoff into forest retention, afforestation, or reforestation areas. Retained forests should be protected from short-term hydrologic changes and excessive sedimentation that often result during construction. However, if existing hydrology permits, retained forests may be appropriate for handling partially treated runoff. The use of existing forests and future afforested areas to serve as additional treatment areas should be considered as part of best management practices for sediment and erosion control.

Wetlands

Wetlands protection, as specified by State and federal regulations, should have few conflicts with the Forest Conservation Act. Identifying and delineating wetlands when preparing a Forest Stand Delineation will assist site design and avoid costly or lengthy construction delays.

- Identify forested nontidal wetlands which are priority for retention.
- Report soils, vegetation, and hydrology information collected when a wetland delineation is required in a Forest Stand Delineation.
- Reforest disturbed wetlands or their buffers. Verify that local, State, and federal regulatory requirements for replanting will be satisfied first. Deduct land area permitted to be disturbed under state and federal regulations from calculations for Forest Conservation Act reforestation.



Case Study: Before and After Development	Figure 1:1

Chapter 2

Forest Stand Delineations

Contents:

2.0 Purpose and Use of the Forest Stand Delineation
2.0.1 Who May Prepare a Forest Stand Delineation?
2.1 What Type Of Forest Stand Delineation Is Required?
2.2 Required Elements for the Different Types of FSD's
2.2.1 Simplified Forest Stand Delineation Requirements
2.2.2 Full FSD Requirements

2.0 Introduction

The purpose of a Forest Stand Delineation (FSD) is to provide a tool that can be used to determine the most suitable and practical areas for forest conservation during the preliminary design and review stages of development. It uses a combination of resource mapping and field assessment to inventory and describe existing forest and locate priority areas for retention, reforestation, or afforestation on the site. The FSD is used to guide development and to identify and prioritize resources for protection, conservation and management. It is the tool used to determine retention and removal priorities.

Priority Retention Areas

Priority retention areas include forests or other areas which are defined in Natural Resources Article 5-1607(c) or a local forest conservation program. They include trees, shrubs, or plants in sensitive areas such as 100-year nontidal floodplains, intermittent or perennial streams and their buffers, steep slopes, and Critical Habitat Areas. Also included are contiguous forest that connects the largest undeveloped or most vegetated tracts of land within and adjacent to the site, trees, shrubs, or plants identified on the list of rare, threatened, or endangered species of the U.S. Fish and Wildlife Service or the Department of Natural Resources, trees that are part of an historic site or associated with an historic structure or designated as a National, State, or local Champion Tree, and trees which have a diameter at 4.5 feet above the ground (DBH) of 30 inches, or 75% of the DBH of the current State Champion of that species.

Approved Forest Stand Delineations are required elements of approved Forest Conservation Plans. An approved FSD is valid for five years. To remain valid thereafter, it shall be updated and re-approved every five years unless it becomes part of a single approved Forest Conservation Plan encompassing the entire property.

While reforestation or afforestation may occur on a development site after the approval of a Forest Stand Delineation and before Forest Conservation Plan approval, the approved FSD shall determine the amount of existing forest on the site. Any areas reforested or afforested after the FSD approval date and retained in forest, protected, and placed under maintenance and long-term protective agreements may be included and credited to any required reforestation or afforestation.

This chapter is divided into sections which cover the type of Forest Stand Delineation required (Section 2.1) and the requirements and suggested procedures for preparing Forest Stand Delineations (Section 2.2). Program requirements are listed for two types of forest stand delineations. The level to be used depends on the site conditions and proposed development. The suggested procedures are oriented toward the complete requirements of a full FSD.

2.0.1 Who May Prepare a Forest Stand Delineation?

A Forest Stand Delineation may only be prepared by a Maryland Licensed Forester, Maryland Licensed Landscape Architect, or other Qualified Professional. A stamp or other certification by the preparer shall appear on the submission.

Qualified Professionals are approved by the Department of Natural Resources - Forest Service, or, for local applications, approved by an adopted and approved local forest conservation program, according to criteria adopted in COMAR 08.19.06. Lists of DNR Qualified Professionals, applications, and criteria are available upon request of the State Forest Conservation Coordinator.

2.1 What Type Of Forest Stand Delineation Is Required?

Two different levels of forest stand delineations may be used. The conditions and requirements for these follow and are summarized in **Figure 2:1**.

Simplified Forest Stand Delineations

Simplified FSD's may be used when:

- No forest currently exists on the site; or
- None of the existing forest on the site will be cut, cleared, or graded for the proposed use
- All of the forest on the site will be retained and protected under a long term protection agreement (Section 3.2).

Approval of the Simplified FSD shall require meeting either of these two conditions. If the applicant is unable to meet either condition for any reason, including, for example, the uncertainty of future development plans, then a Full FSD must be submitted.

Full Forest Stand Delineations

Full FSD's shall be required for all submissions where the conditions of a Simplified FSD will not be met.

EXISTING FOREST CONDITIONS or PROPOSED LAND USE DEVELOPMENT CHARACTERISTICS	FOREST STAND DELINEATION REQUIREMENTS
Development that will result in less than 40,000 square feet of cumulative disturbance	**EXEMPT – No delineation required.**
Activities that clear less than 20,000 square feet of forest on a single recorded lot	**EXEMPT – No delineation required.**
Development that will result in greater than 40,000 square feet of cumulative disturbance where NO FOREST EXISTS	**SIMPLIFIED FOREST STAND DELINEATION** **Preliminary Forest Conservation Plan may be submitted at the same time as the FSD.** • **No sampling required** • **No narrative required**
Site has EXISTING FOREST< but • **Forest will NOT BE IMPACTED by clearing or grading and** • **Forests will be fully protected by a long-term protective agreement**	**SIMPLIFIED FOREST STAND DELINEATION** **Preliminary Forest Conservation Plan may be submitted at the same time as the FSD.** • **No sampling but field verification required** • **No narrative required**
All other development sites where • **Priority forests will be cleared**	**FULL FOREST STAND DELINEATION** **Separate submittal of Forest Stand Delineation and Forest Conservation Plan required.** • **Sampling required** • **Analysis and narrative** • **Forest Stand Summary required**

Forest Stand Delineation Decision Matrix — **Figure 2:1**

2.2 Required Elements for the Different Types of FSD's

Forest Stand Delineations shall be submitted for the net tract area in most instances, this will be the land parcel of record for which the application for subdivision, grading, or sediment and erosion control will be submitted. The elements required in an FSD are based on existing forest conditions and proposed development, both of which may be determined based on preliminary site reconnaissance and factors such as existing zoning.

Forest is defined in the Forest Conservation Act (Nat. Res. Art. 5-1601) and the Code of Public Local Laws and Ordinances of Carroll County, Chapter 115, Forest Conservation as a biological community dominated by trees and other woody plants covering a land area of 10,000 square feet or more, having a minimum density of 100 trees per acre and a minimum of 50 percent of those having diameters of at least 2 inches at breast height (DBH). This definition of forest also includes areas which have been cut but not cleared (where stumps remain).

2.2.1 Simplified Forest Stand Delineation Requirements

Simplified FSD's shall contain the following minimum elements:

- An **Application** signed by the applicant. The applicant shall be an authorized signatory. Application forms are available on request.

- A **Site Vicinity Map**. This map (**Appendix A, Figure A:5**) shows the location of the site, including forested and sensitive areas adjacent to the site. A minimum scale of 1" = 2,000' (1:24,000) is recommended. This map may be an inset on the Environmental Features or FSD Map.

- An **Environmental Features Map** or **Forest Stand Delineation Map**. This shall be prepared at approximately the same scale as the proposed development plan and shall sufficiently indicate all of the required features where applicable. (Examples of these maps are in Section 2.2 and **Figures A:6 and A:7**) Environmental features may be identified and located by using maps or aerial photography for a simplified FSD, although they should be verified for use in later site planning. A walk-through survey to verify locations is required for a Full FSD. Environmental features include:

  -- Sensitive Areas
  - 100-year nontidal FEMA mapped floodplains.
  - Intermittent and perennial streams and their buffers.
  - Steep slopes of 25% or more.
  - Critical Habitat Areas designated by the State or local authorities.
  - Nontidal wetlands and their buffers.
  - Letter to Maryland Department of National Resources requesting status of rare, threatened and endangered flora and fauna.

  -- Topography
  - Topographic contours at a maximum scale of 1" = 100'-0" with 2''-0" contour intervals.

  -- Soils
  - Hydric soils, erodible soils on slopes of 15% or more and soils with structural limitations may be classified using USDA Soil Surveys or other local information.

In addition to the environmental features listed above, the Simplified FSD shall show:

- Field verified forest boundaries (tree lines) using the maximum aerial extent of the canopy. Where these tree lines extend offsite, they shall be shown for at least 100 feet. Total area in acres of adjacent contiguous forested areas shall be indicated on the map. Forested areas onsite shall be indicated by a dominant species type.
- A proposed limit of disturbance line.
- Proposed areas of long-term protection. If existing forest will not be removed and retention is required, sample plots are not required. This wavier of sample plots will be allowed if a description of the retention area is provided by a Qualified Professional. The description must certify the retention area as qualifying as a forest according to the Manual.

Requirements for Simplified FSD's are summarized in the checklist in **Figure 2:2**. Sample delineation and sample plan maps using this option are shown in **Figures 2:3** and **2:4**.

SUBMITTAL REQUIREMENTS

1. Site Vicinity Map

- ☐ location of the project site and surrounding area within one square mile
- ☐ major roads
- ☐ north arrow
- ☐ forested areas
- ☐ minimum scale of 1"=2000' (1:24,000)

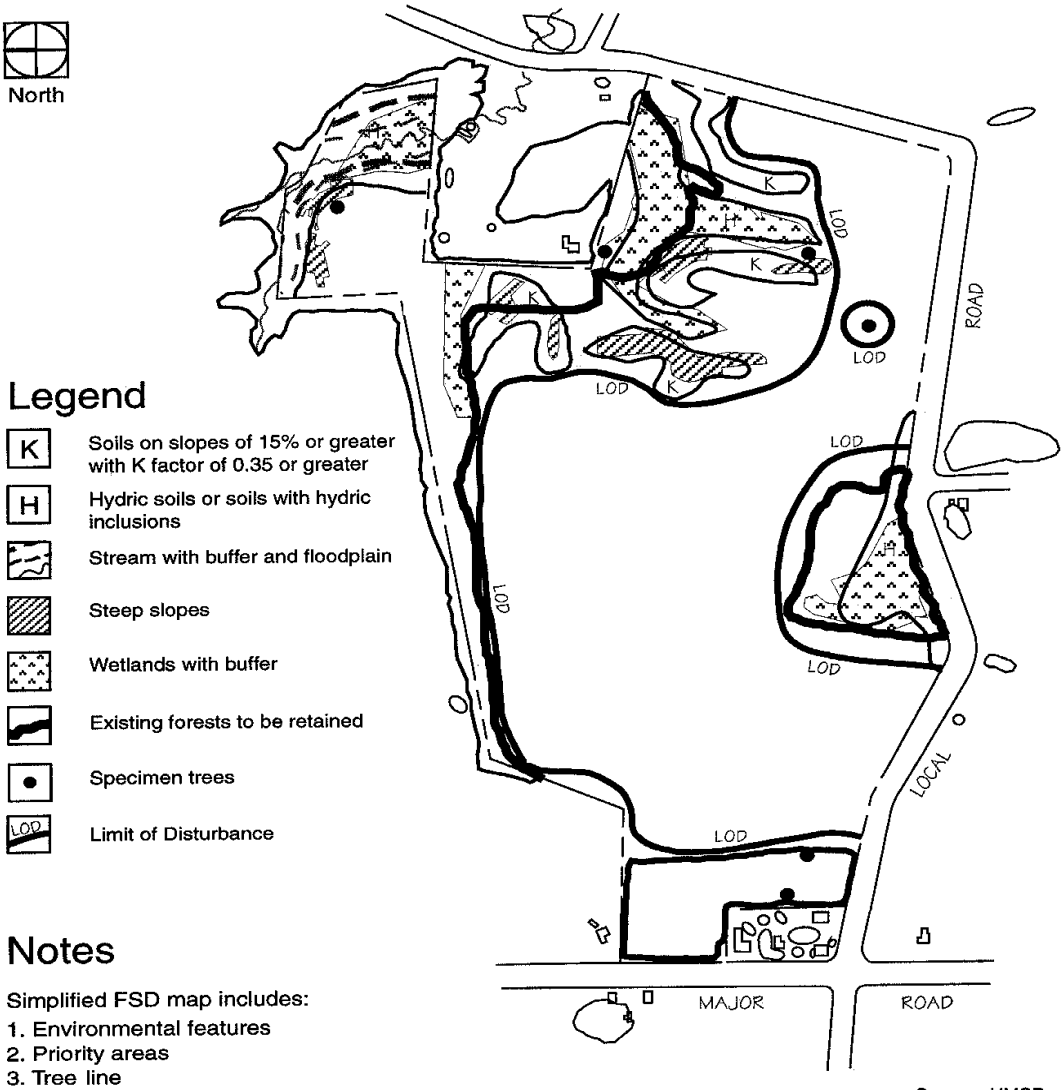
2. Environmental Features Map

- ☐ property boundaries (tax maps, plats, or surveyed boundaries)
- ☐ north arrow
- ☐ title, date, revisions, scale, and legend
- ☐ certification by Qualified Professional or stamp of a Maryland Licensed L.A. or Forester
- ☐ topographic contours at a scale no greater than 1"= 100-'0" with a minimum 2'0" contour interval, or an approved alternative.
- ☐ steep slopes greater than 25% (on areas greater than or equal to 10,000 square feet)
- ☐ 100-year nontidal floodplain
- ☐ intermittent and perennial streams
- ☐ stream buffers
- ☐ soil classifications (SCS Soil Surveys) indicating soils with
  - structural limitations
  - hydric properties
  - K value greater than 0.35 on slopes greater than or equal to 15%
- ☐ nontidal wetlands and buffers
- ☐ proposed limits of disturbance
- ☐ areas proposed for long-term protection (if forest exists)
- ☐ past and present management of
  - forested areas
  - unforested areas
- ☐ adjacent land uses
- ☐ forested areas and unforested areas including tree lines extending offsite
- ☐ size and location of adjacent forested areas
- ☐ forest type (dominant species)
- ☐ cultural features, including dumps, etc.
- ☐ Letter of request for information from the Department of Natural Resources' Maryland Heritage Program
- ☐ Real Property Search form (Tax Assessments)

3. Application

- ☐ complete information including signature

Simplified FSD Checklist	**Figure 2:2**



Legend

- K — Soils on slopes of 15% or greater with K factor of 0.35 or greater
- H — Hydric soils or soils with hydric inclusions
- Stream with buffer and floodplain
- Steep slopes
- Wetlands with buffer
- Existing forests to be retained
- Specimen trees
- LOD — Limit of Disturbance

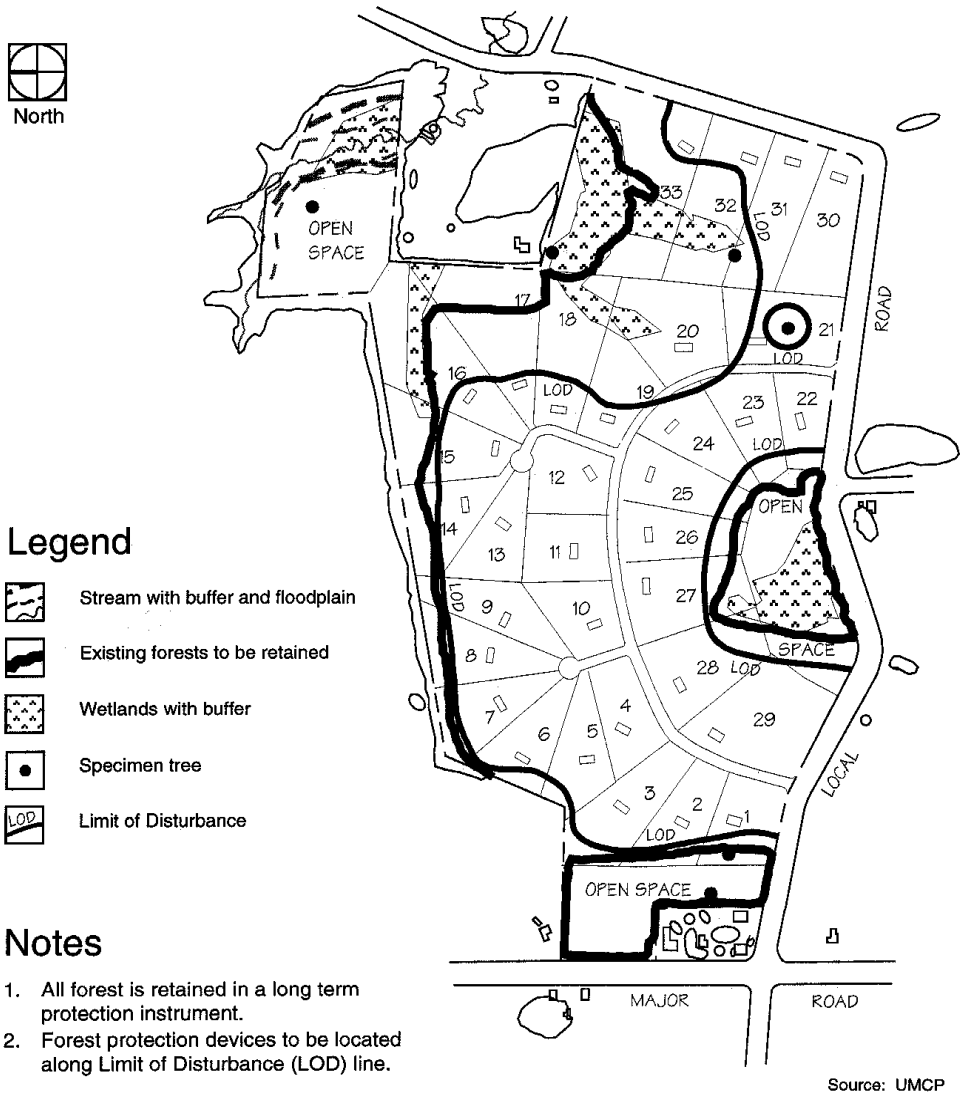
Notes

Simplified FSD map includes:

1. Environmental features
2. Priority areas
3. Tree line

Source: UMCP

Simplified FSD Area	Figure 2:3



Legend

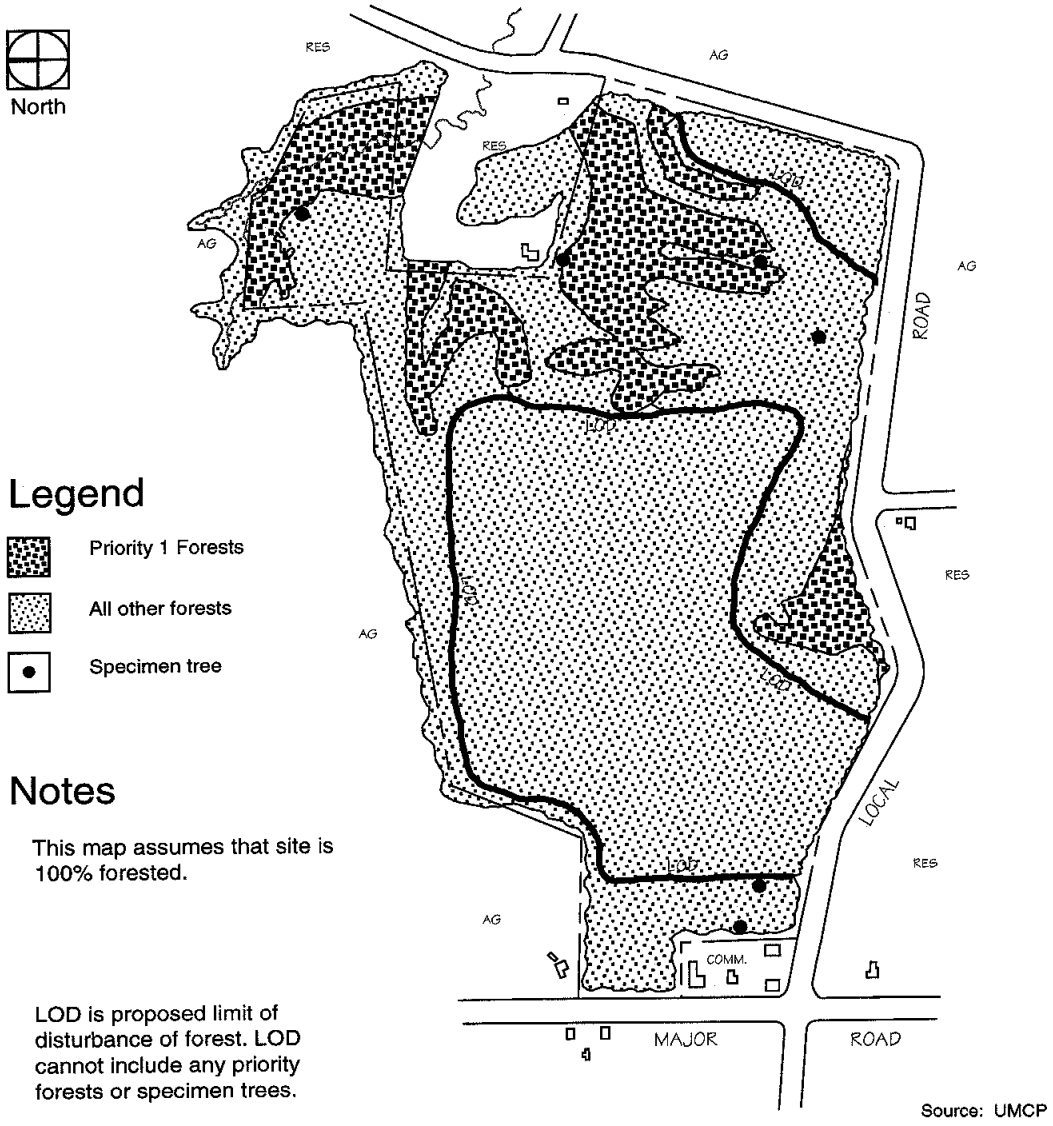
- Stream with buffer and floodplain
- Existing forests to be retained
- Wetlands with buffer
- Specimen tree
- Limit of Disturbance

Notes

1. All forest is retained in a long term protection instrument.
2. Forest protection devices to be located along Limit of Disturbance (LOD) line.

Source: UMCP

Simplified FCP Plan	Figure 2:4



Priority Retention Map (example) | **Figure 2:5**

SUBMITTAL REQUIREMENTS

1. Site Vicinity Map

- ☐ location of the project site and surrounding area within one square mile
- ☐ major roads
- ☐ political boundaries
- ☐ north arrow
- ☐ adjacent land uses
- ☐ forested areas
- ☐ minimum scale of 1"+2000' (1:24,000)
- ☐ adjacent land uses

2. Environmental Features Map

- ☐ property boundaries (tax maps, plats, or surveyed boundaries)
- ☐ north arrow
- ☐ title, date, revisions, scale, and legend
- ☐ certification by Qualified Professional or stamp of a Maryland licensed L.A. or Forester
- ☐ topographic contours at a scale no greater than 1"= 100' with a minimum 2' contour interval
- ☐ steep slopes greater than 25% (on areas greater than or equal to 10,000 square feet)
- ☐ 100-year nontidal floodplain
- ☐ intermittent and perennial streams (USGS 7 ½ minute quads of SCS Soil Surveys)
- ☐ stream buffers
- ☐ soil classifications (SCS Soil Surveys) indicating soils with structural limitations, hydric properties, or K value greater than 0.35 on slopes greater than or equal to 15%.
- ☐ Nontidal or tidal wetlands and buffers (National Wetlands Inventory or Maryland Department of the Environment)
- ☐ Critical Habitat Areas
- ☐ Forested areas and unforested areas including tree lines extending offsite
- ☐ Priority retention areas with priority ratings (see page 3-1)
- ☐ field sampling locations
- ☐ location, description, and size of forest stands
- ☐ location of trees or stands which have trees that are:
  - ☐ - rare, threatened, and endangered species of plants (MD Natural Heritage Program)
  - ☐ - part of an historic site or associated with an historic structure
  - ☐ - designated by MD DNR or local authority as a champion tree for that species
  - ☐ - specimen trees of 30" dbh or greater (local jurisdictions may vary)
  - ☐ - trees with at least 75% of the diameter of the State champion tree of that species
- ☐ Cultural features, dumps, etc.

3. Forest Stand Analysis

- ☐ site description
- ☐ methodology
- ☐ summary for each stand describing stand composition, stand structure, stand condition, retention potential relating to proposed development, existing or proposed management recommendations, stand function (water quality benefits, specific wildlife habitat value, and other land use objectives, including recreation, timber management, etc.)
- ☐ recommendations for specific areas such as specimen trees
- ☐ field sampling data sheets, if required, including property name, name of person collecting data, date of data collection, and complete data for <u>each</u> sample plot
- ☐ forest stand summary sheets including property name, location, name of person preparing summary, date of preparation, and summary for <u>each</u> forest stand

4. Application

- ☐ complete information including signature (COMAR 08.19.04.02)

Priority Retention Area as described in Chapter 2 that may go off the site or across State lines must be shown on the FSD

Full FSD Checklist[2]	Figure 2:6

2.2.2 Full FSD Requirements

Full FSD requirements are summarized in the checklist in **Figure 2:8**. The following is a suggested step-by-step procedure for preparing a Full FSD. It corresponds with the flow chart in **Figure 2:9** which outlines the process and the maps for the sample site in **Figure 2:13 and A:7 -- A:8**.

Step 1. Prepare Preliminary Map for Field Verification

It is helpful to prepare a preliminary Forest Stand Map or Environmental Features Map before doing any field verification or sampling. These maps use site characteristics such as soils and hydrology to make a preliminary determination of the location of forest stands on the site. This step is suggested for organizing data which may be useful in the later development of a Forest Conservation Plan, as well as fulfilling the requirements of a Forest Stand Delineation. The site features are important in deciding which areas shall be retained and which unforested areas may be targeted for afforestation or reforestation if planting is required.

a. Create base map

Using recent aerial photography, soils surveys, topographic maps, nontidal wetlands maps, and information from a preliminary field visit, the preparer may locate on a preliminary Forest Stand Map many abiotic, and some large scale biotic, site characteristics (**Figure A:7**). Environmental features will include:

- topographic contours or spot elevations
- perennial and intermittent streams and their buffers
- 100-year floodplains
- steep slopes
- wetlands
- cultural features such as roads, structures, and disposal areas, property boundaries, and other features which will be required for the Final Forest Stand Map may be drawn in, especially if they will require field verification
- any other important information the preparer feels may be helpful to evaluate the site

Information should also be obtained about the likelihood of trees, shrubs, or plants which are on federal or State lists of rare, threatened or endangered species, and critical habitats. This may be obtained from map information available through the Maryland Department of Natural Resources, Natural Heritage Program. Applicants to the State Program will be requested to contact the Department about this procedure.

b. Add soils

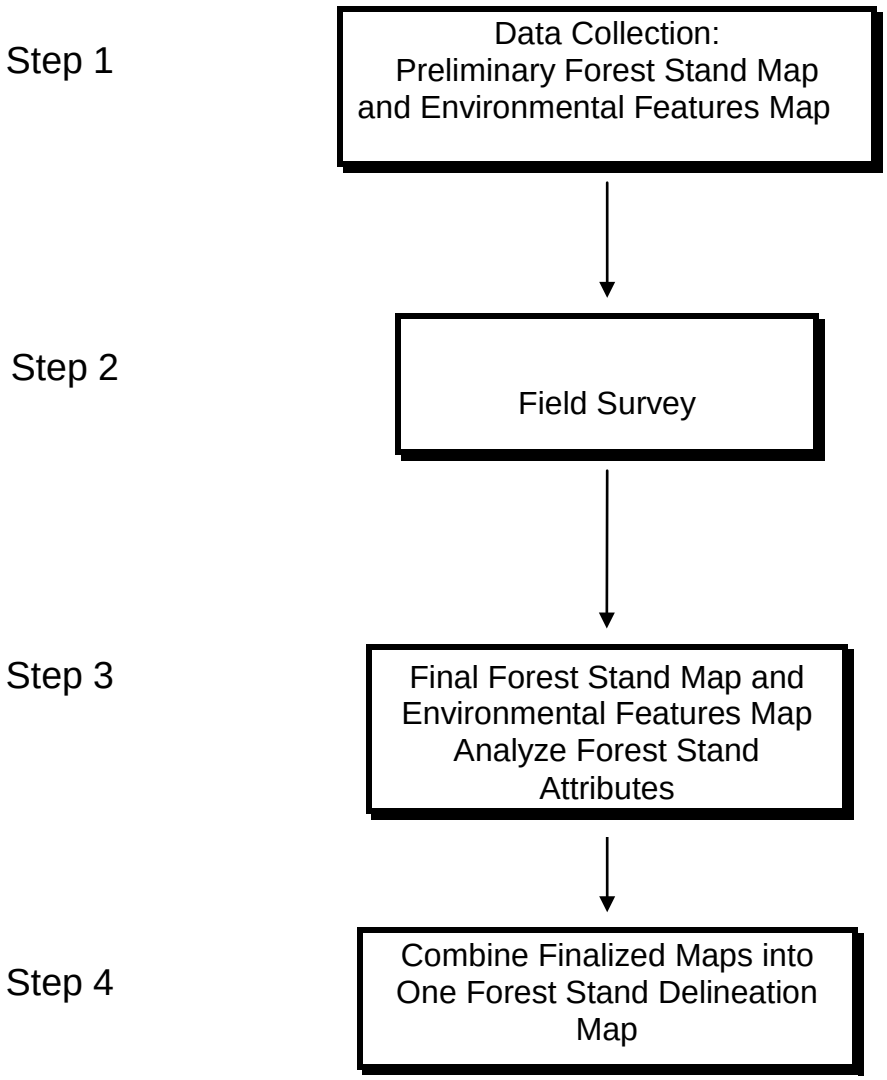
Soils are added to the base map using the USDA Soil Survey (**Figure A:8**). These soils may be further delineated, interpreted, or classified as:

- hydric
- soils containing hydric inclusions, or poorly drained soils
- erodible soils
- well-drained
- other classifications useful in determining location of forest stands, or in later

[2] Refer to most recent checklist

determination of locations for reforestation or afforestation

Another useful source of information is the Natural Soil Groups Technical Report (Maryland Department of State Planning, 1973). This may help to correlate USDA soils map units with soil characteristics.



Full FSD Procedures | **Figure 2:7**

c. Add forest boundaries

Using aerial imaging, add the outlines of existing forest on the site and adjacent to the site. Depending on the source map scale and resolution, distinctions may be made between different stands using criteria such as evergreen or deciduous, past management practices, or relative canopy height and cover.

d. Start preliminary delineation

Begin the preliminary delineation of forest stands by determining possible stand boundaries using the forest cover information from (c) above and the various abiotic factors noted in (a) and (b). Sketch the stand boundaries on the preliminary forest stand map.

Forest stands are relatively homogenous areas of forest usually one acre or larger. They occur because of similar growth conditions e.g. soil nutrients; soil drainage patterns, aspect, and similar management or past conditions; selective thinning in recent years; abandonment of agricultural lands; and other causes.

Step 2. Assess Forest Stands and Environmental Features

This step describes the forest stands and verifies the environmental features on the site.

a. Determine methodology

On the basis of an initial survey, but before beginning sampling, determine how to adequately describe each stand. This may be done by sample plots. Appendix C contains references on sample plots.

Sample locations should be selected randomly located on 1/20 acre plots. Because statistical precision requires a certain minimum number of plots per stand and forested area, the following sampling criteria should be used to estimate the number of sample plots required:

- one plot per 2 acre of forest stand area;
- two plots minimum per stand;

This will produce an adequate description of each stand. If there is only one stand on the site and it is less than one acre, it will still require two sample plots.

b. Measure preliminary stand size

Using a planimeter, dot grid, or other means, estimate the size of each stand and the number of plots required. In the example, plots are located on the Forest Stand Map (**Figure A:9**).

c. Collect field data

Locate plot centers and flag or stake locations. Locations of plots may be verified by reviewers prior to FSD approvals. Record desired data with plot and stand identification.

Throughout the sampling process, examine the surrounding forest to note any additional features which should be shown on the final map. Areas which contain historic, Champion, or trees greater than 30" DBH should be noted or flagged. Nontidal wetlands which have not been delineated or for which a jurisdictional determination is required should also be assessed at this time.

The example uses the Forest Sampling Data Worksheet (**Figure 2:8**) to record data on basal area, density of trees by size class, percent of canopy closure, percent of invasive cover, understory, herbaceous species, and other information. Further information on how to obtain this data or how it is described is available in Appendix C.

Step 3. Analyze the Field Data and Summarize in a Written Narrative.

The objective of this step is to evaluate each forest stand for potential retention. This evaluation will be used when preparing a Forest Conservation Plan and will be useful to subsequent designers and engineers planning the site.

a. Summarize stand characteristics

The first step is to create a stand summary description using the Forest Stand Summary Sheet (**Figure 2:9**). For each forest stand, a list of pertinent characteristics is compiled and described using the plot data collected. An average of numeric measures is used for the stand summary, such as for basal area. Guidelines for completing these data and summary sheets may be found in Appendix C.

– Stand composition. This is derived from species specific data, such as density, diversity and basal area; and species composition, dominant species, size classes, common understory species, successional stage, and other factors which may be appropriate.

– Stand structure. Density, basal area, cover percentages, and species composition in canopy and understory levels may be contrasted to cover percentages and species composition in 0-3' and 3'-20' understory layers, as appropriate.

– Stand condition. Regeneration potential and potential to recover from natural and development disturbances and other factors, as appropriate. Measures which may be used are basal area, canopy and understory cover, understory tree species, and presence/absence of insects, fungi, and disease. Past and present management and the effects of invasive exotic plant species, if present, should also be included.

– Stand function. Such measures as presence or absence of standing dead trees, duff or litter layer, structural measures, species composition, and others should be used to provide a description of functional value. Functions should be addressed such as: Existing or Proposed Water Quality Protection; Wildlife Habitat; and, timber management.

b. Compare forest stands

Forest stands are compared and contrasted for ranking by priority for retention. (See page 3-1).

1. Stands which contain Priority Retention Areas are ranked as Priority 1 Stands.
2. Stands which contain priority areas identified by a local land use plan, local forest conservation program, or other criteria adopted by a local forest conservation program are ranked as Priority 2 Stands.
3. All other stands are ranked as Priority 3. Each Priority 3 stand will be compared and ranked in order of its functional value relating to water quality protection, wildlife habitat, and at least one other objective such as timber management, aesthetics, or recreation.

Property:_____ Prepared By_____

Stand #: F-1 Plot #: 3 Plot Size: 1/20 – acre

Date:_____

Basal Area in sf/acre: 180	Size class of trees > 20' height within sample plot

Tree Species	# of Trees 2-5.9" dbh			# of Trees 6-11.9" dbh			# of Trees 12-19.9" dbh			# of Trees 20-29.9 dbh			# of Trees > 30" dbh			Total
Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	
Chestnut Oak																
Striped Maple																
Scarlet Oak																
Black Oak																
Black Cherry																
Total Number of Trees per Size Class																
Number & Size of Standing Dead Trees																

List of Common Understory Species 3'-20':
Black Cherry
Black Gum

% of Canopy Closure

C	N	E	S	W	Total 100%

Percent of Invasive Cover per Plot (All Layers):
0

Plot Successional Stage:
Mature
Upland

List of Herbaceous Species 0'-3':
Lycopdium
Early Low Blueberry
Poison Ivy

% Understory Cover 3'-20'

CN	NN	EN	SN	WN	Total 0

% of Herbaceous Cover 0'-3'

C N	N N	E Y	S	W	Total

Comments

Sheet 1 of 14

Forest Sampling Data Worksheet **Figure 2:8**

Property Name:. _____

Location: _____
(Town, County, ADC Map#, and Grid Coordinates)

Prepared By: _____ Date: _____

Stand Variable	Stand # _____	Stand# _____
1. Dominant species/Codominant species*		
2. Successional stage		
3. Basal area in s.f. per acre		
4. Size class of height dominant species		
5. Percent of canopy closure		
6. Number of trees per acre		
7. Common shrubs per acre		
8. Percent of understory cover 3' to 20' tall		
9. Number of woody plant species 3' to 20' tall		
10. Common herbaceous species 0' to 3' tall		
11. Percent of herbaceous & woody plant cover 0' to 3' tall		
12. List of major invasive plant species & percent of cover		
13. Number of standing dead trees 6" dbh or greater		
14. Comments Sheet _____of _____		
Forest Stand Summary Worksheet **Height dominance; i.e. creates the canopy**		**Figure 2:9**

c. Written Narrative

The analytical narrative should begin with a brief introduction describing overall site conditions including the sampling method used, forest association or species composition and condition, any past or present management, presence or absence of rare, threatened, and endangered species, historic sites, critical habitats, disease, insects, or exotic plant invasion on the site.

Following this description, the stand composition, structure, condition, and function of each individual stand should be described. A suggested approach is:

- **Stand composition**

Are there species and individuals present which will not withstand development stresses? What management methods should be considered to mitigate such stresses? How will species composition be altered by disturbances within the stand? How will the presence of invasive species within the stand affect potential reforestation or afforestation areas? How may these species or their effects be controlled if appropriate?

Individual specimen trees located outside of forested areas are also discussed in the Forest Stand Summary Analysis. Their location, condition, recommendations, and justification for retention or removal are noted.

Measures include: dominant and codominant species, common understory and herbaceous species, specimen trees.

- **Stand structure**

Is the current structure likely to be impacted by disturbance or stress? How may this affect certain habitat types and stand functions?

Measures include: basal area, density, canopy closure, presence or absence of multiple layers.

- **Stand condition**

Is the stand healthy and regenerating? What are the observed disease or pest infestation problems which may be exacerbated by development stress or disturbance.

Measures include: density and basal area, understory species, successional stage.

- **Stand function** (Different measures from which functional values may be deduced appear in **Figure 2:10**.).

  #1 Maintaining or enhancing existing water quality protection benefits.

  Where is the stand in relation to sensitive areas located on the site? Does it serve a buffering function to surface runoff or groundwater flow between, for example, a stream and an agricultural area or proposed developed area? How is the stand configured to serve this function? How is the stand accomplishing these benefits? Does the present soil or litter appear to be eroded or increasing in organic matter? Does a complex stand structure mitigate soil erosion and sediment losses? Does the successional status of the stand affect nutrient uptake or loss?

  #2 Maintaining or enhancing existing habitats for threatened or endangered species.

What wildlife species are currently using this stand as habitat? Where are these habitats located? What is the size and configuration of these habitats? Where is the stand in relation to other commonly used habitats? Is the stand a corridor or a patch? How is the stand currently functioning i.e. will a small increase in size or infill afforestation be beneficial to this habitat?

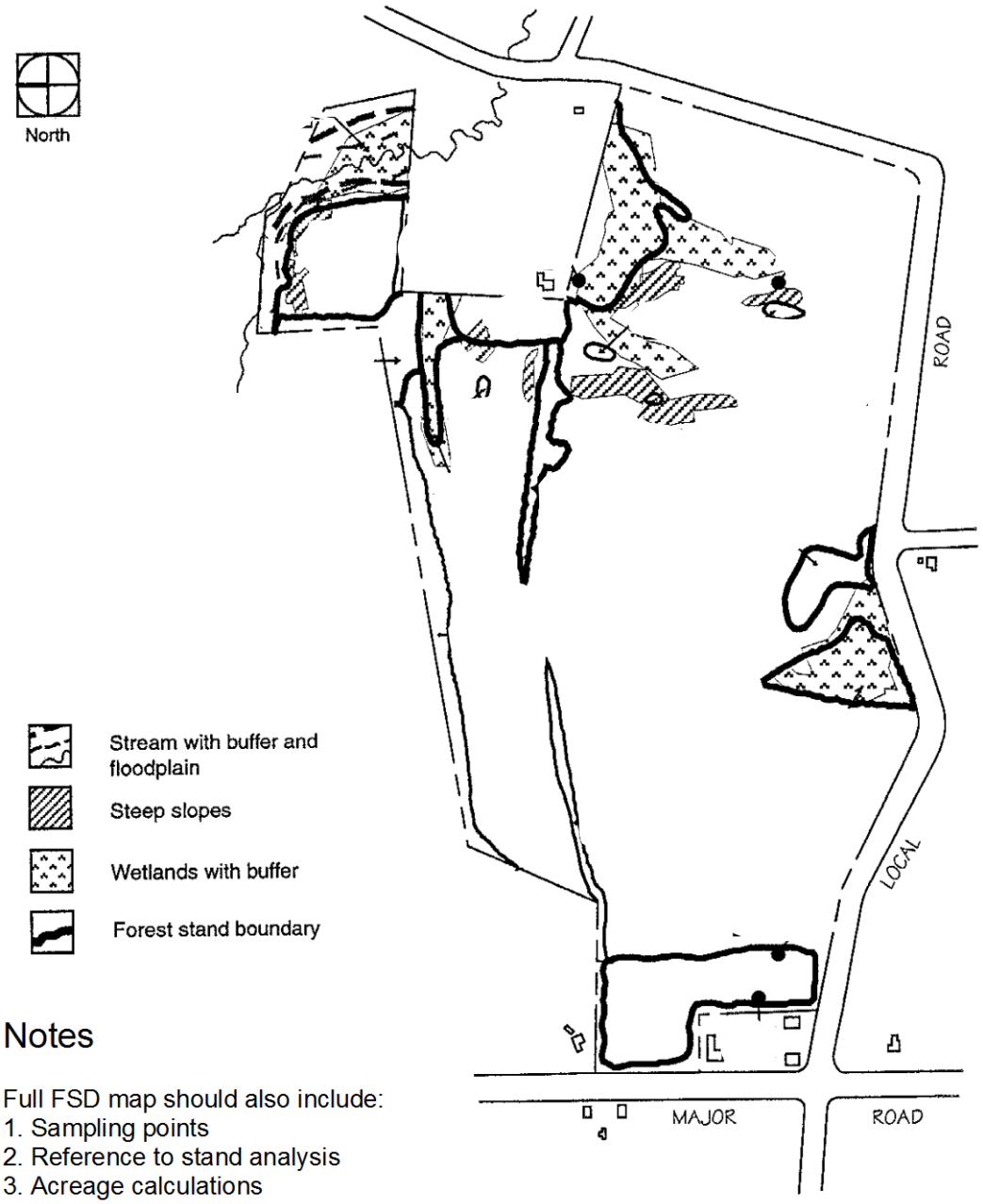
#3 Accomplishing landowner or other special local program objectives. Sample objectives may include: existing or proposed recreation, education, research, visual screening, etc.

Step 4. Create Final FSD Map

All preliminary field maps are compiled into one final map for submittal (**Figure 2:11**). If too much information is to be shown on one map, use a second map of the same scale.

The FSD map may include certain elements of the narrative to correlate stand descriptions and stand priority for retention with the location of each stand and the environmental features. Priority locations for reforestation or afforestation should also be noted (Section 3.1).

Water Quality • Roughness is a factor used in calculating probability and amounts of surface runoff. This is equivalent to the amount and type of vegetation present on a site. Forest vegetation is considered more "rough" than grassland.	**Measures** Y Canopy cover, understory and herbaceous cover type and amount – Presence of woody plants and perennial grasses, or species composition with deep or tough roots. Annual plants generally are not well rooted and therefore do not provide good soils retention.
• Water absorption potential of soils and vegetation	Y Canopy, understory and herbaceous cover Y Structural diversity (Many layers absorb falling water drops and slow their velocity) Y Organic matter accumulation on top of and in first soil layers.
• Water retention of vegetation, soils and Topography	Y Presence of wetlands, swales, ravines - Density and structural diversity of vegetation of areas will enhance water retention. Y Drainage classification of subsoil - Poorly drained soils have different chemical properties well drained soils
• Nutrient removal from surface and subsurface flows	Y Width and connectivity of forest buffers adjacent to streams and other water bodies
Wildlife Habitat • Available food - often species specific, e.g. gray squirrel consumes hard mast (nuts)	**Measures** Y Species composition which provides: forage, browse, mast, fruits, grasses, etc.
• Available cover - provides shelter from predators or environment (shade, warmth, special needs during breeding)	Y Structure, density, presence or number of snags (standing dead trees), species composition.
• Available water - often obtained from surface water.	Y Presence of streams, riparian buffer zones and wetlands (consider adaptation of constructed retention/detention systems)
• Available space is needed, especially for predator range, but also to sustain breeding populations. Usually species specific and may want to use largest predator rule if possible to cover maximum extent possible.	Y Contiguous corridors, large patches, landscape scale matrix of forested and related habitat. Y Lack of fragmentation, Y Presence/absence of linear corridors or barriers
Landscape Uses • Shelter from environmental conditions such as wind or noise • Absorption of particulates and pollutants • Visual buffer or screen	**Measures** Y Location, species composition, structure Y Location, species composition Y Location, species composition, deciduous vs. coniferous
Assessing the Priority of Stands	**Figure 2:10**



Notes

Full FSD map should also include:
1. Sampling points
2. Reference to stand analysis
3. Acreage calculations
4. Priority Forest Retention Areas (see Figure 2:5 and page 3-1)

Source: UMCP

Full FSD Map	**Figure 2:11**

Chapter 3

Forest Conservation Plans

Contents:

3.0 Introduction
- **3.0.1 Minimum Elements Required in All Forest Conservation Plans**
- **3.0.2 Who May Prepare a Forest Conservation Plan?**

3.1 Determining Priority Forests and Priority Areas
- **3.1.1 Forest Conservation Plan Requirements**
- **3.1.2 Sample Procedure for Locating Forest Retention Areas**
- **3.1.3 Calculation of Retention, Reforestation, and Afforestation**

3.2 Forest and Tree Protection
- **3.2.1 Planning, Design, and Protection**
- **3.2.2 Construction Techniques**
- **3.2.3 Long-Term Protection Instruments**

3.3 New Forest and Tree Planting
- **3.3.1 When and Where It Is Necessary**
- **3.3.2 Planting Plan Requirements**

3.4 Maintenance and Monitoring
- **3.4.1 Elements Required in Maintenance Agreements**
- **3.4.2 Suggested Implementation Guidelines**
- **3.4.3 Special Planting Site Suggestions**
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3.5 Enforcement of Forest Conservation Plans
- **3.5.1 Inspections**
- **3.5.2 Penalties for Violation**
- **3.5.3 Appeal of Enforcement Action**
- **3.5.4 Amending a Forest Conservation Plan**

3.0 Introduction

The Forest Conservation Plan (FCP) is a planning and construction document that provides specific plans for retaining and protecting existing forested areas, particularly in priority areas, during subdivision or construction. The FCP also includes details for replanting selected areas when necessary. No changes may be made to an approved FCP without the approval of the reviewing authority.

This chapter provides the requirements and suggests a process for developing a plan that meets the intent of the Forest Conservation Act and is divided into five principal topics:

- **Determining Priority Forests and Priority Areas** – Section 3.1 discusses how to determine where priority areas are located and how much forest to retain.

- **Retained Forest and Tree Protection** -- Section 3.2 covers protection through planning and design, construction techniques, and long-term protection agreements.

- **Forest and Tree Planting** -- Section 3.3 covers afforestation and reforestation plans, information on when and where planting is required, and how planting should occur.

- **Maintenance and Monitoring** – Section 3.4 discusses maintenance agreements and their implementation.

- **Enforcement** -- Section 3.5 outlines Forest Conservation Plan enforcement.

Priority Area 1: High

- critical habitats of rare, threatened, or endangered species

- trees, shrubs, or herbaceous plants associated with:
    - Intermittent and perennial streams and their buffers
    - Slopes over 25 percent
    - Hydric soils
    - Soils with a K value greater than 0.35 on slopes of 15% or more
    - 100 year flood plain

- trees, shrubs, or herbaceous plants that are part of a stand that has one or more of the following characteristics:
    - stands or portions of stands with high forest structural diversity (as defined in Appendix C)
    - contiguous forested areas of approximately 100 acres that connect the largest or most vegetated tracts of land within and adjacent to the site
    - forested areas which provide a corridor 300 ft. wide or more of primarily native vegetation between two larger forested tracts

- individual trees with one or more of the following characteristics:
    - trees that are part of a historic site or associated with a historic structure
    - trees designated as a national, state, or local champion tree
    - trees measuring 75 percent or more of the diameter measured at 4.5 feet above the ground (DIAMETER OF BREAST HEIGHT) of the designated state, County, or municipal champion tree
    - trees with a Diameter of breast height of 30” or greater

Priority Area 2: Moderate

- stands or portions of stands with good structural diversity (see Appendix C)
- contiguous forested areas approximately 20 acres or more in size connect the largest or most vegetated tracts of land within and adjacent to the site.
- forested stream buffers up to forest corridor width (50 ft. – 300 ft. wide)

Priority Area 3: Low

- stands or portions of stands with poor forest structural diversity or areas with none of the characteristics mentioned in priority areas 1, 2, or 4.

Priority Area 4: Disturbed

- approximately 40 percent of land covered with exotic or invasive species[1] (See Appendix F)

The completion of Step 1 provides a visual guide to the areas to be completely avoided during the site planning process (Priority Areas 1 and 2) and those areas to target for major construction activity (Priority Areas 3 and 4).

Step 3 Acreage Calculation

The applicant should calculate the acreage covered by each priority area noted on the map and provide this information in tabular form.

[1]A high percentage of exotic or invasive species is used in this step to identify areas of forest that have suffered significant disturbance in the recent past. (See Appendix F for additional information)

3.0.1 Minimum Elements Required in All FCP's

Figure 3:1 summarizes requirements for phased submissions of preliminary and final FCP's. All FCP's submitted for approval shall contain the following minimum elements:

- **Application** form signed by the applicant.

- **Approved** Forest Stand Delineation.

- **Forest conservation map**. This map is drawn at the same scale as the grading or subdivision plan submitted for approval. It locates and describes forest retention, reforestation, or afforestation areas either on or off the site. It shall show the limits of disturbance and the location of protection devices for forest retention areas. Further information about locating retention and planting areas follows in Section 3.1. Section 3.2 contains information about protection during construction.

- **Forest retention, reforestation or afforestation calculations**. These may be submitted in the form of the suggested worksheet in Appendix C. Further information may be found in Section 3.1.

- The **means for long-term protection** of forest retention areas and planting areas. Further information about long-term protection agreements is in Section 3.2.

3.0.2 Who May Prepare a Forest Conservation Plan?

A FCP must be prepared by a Maryland Licensed Forester, Maryland Licensed Landscape Architect, or other Qualified Professional. A stamp or certification by the preparer shall appear on the submission.

Qualified Professionals are approved by the Department of Natural Resources-Forest Service as set forth in criteria adopted in COMAR 08.19.06. Lists of DNR Qualified Professionals, applications, and criteria are available upon request from the DNR - Forest Service.

FCP's and other construction and subdivision documents use engineering, surveying, land planning, landscape architecture, biology, forestry, soil sciences, and legal skills. FCP's should be developed and implemented in conjunction with an interdisciplinary design and construction team to maximize effective and efficient resource protection and site development.

Submission of Forest Conservation Plan Elements	Forest Stand Delineation		Forest Conservation Plan		Amended FCP/ Enforcement
Application	Simp	Full	Prelim	Final	
	3	3	3		
Table Showing: Parcel size and ID	3	3	3	3	3
Total tract area			3	3	3
Net tract area			3	3	3
Total existing forest area	3	3	3	3	3
Land use category, threshold % and area			3	3	3
Area of proposed clearing			3	3	3
Area of retention			3	3	3
Area for planting			3	3	3
Stand Summary Analysis		3			
Map Site/Vicinity Map	3	3	3	3	3
Environmental Features Map	3	3	3	3	
Location/description of existing forest area	3	3	3	3	3
Stamp/Certification by preparer	3	3	3	3	3
Priority Areas Priority retention areas		3	3	3	3
Priority planting areas		3	3	3	3
Limits of Disturbance/Building Restriction Lines	3		3	3	3
SRA, utility easements, stormwater mgmt			3	3	3
Stockpile areas				3	3
Forest Retention Areas Forest Protection Devices/amended Sediment/erosion control plan			3	3	3
Location			3	3	3
Specifications/Details			3	3	3
If 0-30% of CRZ is disturbed, forest and tree protection measures and/or practices				3	3
Construction Sequence			3	3	3
Demonstration that priority areas cannot be retained, if applicable			3	3	3
Location/Protection	3		3	3	3
Submission of FCP Elements[2]					**Figure 3:1**

Priority Retention Area as described in Chapter 2 that may go off the site or across State lines must be

[2] Refer to most recent checklist

shown on the FSD

Submission of Forest Conservation Plan Elements (continued)	Forest Stand Delineation		Forest Conservation Plan		Amended FCP/ Enforcement
Map (continued)	**Simp**	**Full**	**Prelim**	**Final**	
Planted areas					
Offsite planting requires					
Legal right to plant/maintain				3	
Planting Plan **Specifications, site prep, planting** **Schedule w/species, stocking (number, spacing or distribution) size, condition, plant source**			3	3	3
Construction/planting sequences				3	3
Management and Monitoring				3	3
Protection			3	3	3
Reinforcement planting				3	3
Binding agreement				3	3
Financial security				3	3
Long-Term Protection **Agreement between parties**				3	3
Specifications/Details for protection (signs)		3	3		3
Location of Retention and Planting Areas			3	3	3
A record plat with a metes and bounds description is required at final submittal. If a record plat is not required; a written metes and bounds description or strip plat is acceptable.					
Submission of FCP Elements (continued)					**Figure 3:1**

Priority Retention Area as described in Chapter 2 that may go off the site or across State lines must be shown on the FSD

3.1 Determining Priority Forests and Priority Areas

This section provides a framework for retaining priority forests and priority retention areas located on a development site using the Forest Stand Delineation and the requirements established below. This section also contains a suggested procedure and examples designed to assist site planning for these areas. Information about calculating the required size of retention areas is also contained in this section.

3.1.1 Forest Conservation Plan Requirements

In order to rank and compare forest stands for potential priority for retention, one must determine if priority areas exist on the proposed development site and where they are located. Forest Retention Areas may be entire forest stands which are identified as priority forests in the Forest Stand Delineation or portions of stands. The overall process for forest retention is shown in **Figure 3:2**. The following describes how to identify Priority Areas for forest retention:

1. Identify forest stands in the priority areas referenced in Natural Resources Article 5-1607 such as sensitive areas...

   ... in 100-year floodplains.

   ... in intermittent and perennial streams and their buffers.

   ... trees, shrubs, and plants on steep slopes.

   ... trees, shrubs, and plants located in critical habitats.

   ... in contiguous forest that connects the largest undeveloped or most vegetated tracts of land within and adjacent to the site. Contiguous forest is either 100 acres or larger, or is 300 feet or more in width and connects to forest area located offsite that is 100 acres or more.

   ... trees, shrubs, and plants listed on the State (DNR) or Federal (U. S. Fish and Wildlife) lists of rare, threatened or endangered species.

   ... trees associated with an historic site or structure, Champion Trees, or specimen trees.

   Nontidal wetlands are priority areas for retention and planting. If forested nontidal wetlands have been identified through delineation or jurisdictional determination subject to Natural Resources Article 8-1201 — 8-1211 and COMAR 08.05.04, they are credited in the forest retention area if they are not disturbed. Any forested nontidal wetland permitted to be cut or cleared and required to be mitigated under the regulations shall be located on the FCP map and subtracted on an acre-for-acre basis from the total amount of forest to be cleared for the purpose of calculating reforestation. In other words, subtract the area of disturbance regulated under wetlands regulations from the area of disturbance regulated under the Forest Conservation Act before computing the Act's reforestation requirements.

3.1.2 Sample Procedure for Locating Forest Retention Areas

The overall process for forest retention is shown in **Figure 3:2**. The following is a suggested procedure for locating forest retention areas and corresponds to the maps shown in **Figures A:11 through A:14**.

For the example site, the step-by-step process begins by locating priority areas and forest stands followed by locating and identifying specimen trees. It continues in Section 3.2 with guidance for delineating the exact line of disturbance with a tree by tree evaluation before construction or final FCP approval.

Step 1 Locate and Protect Priority Areas Identified from the FSD.

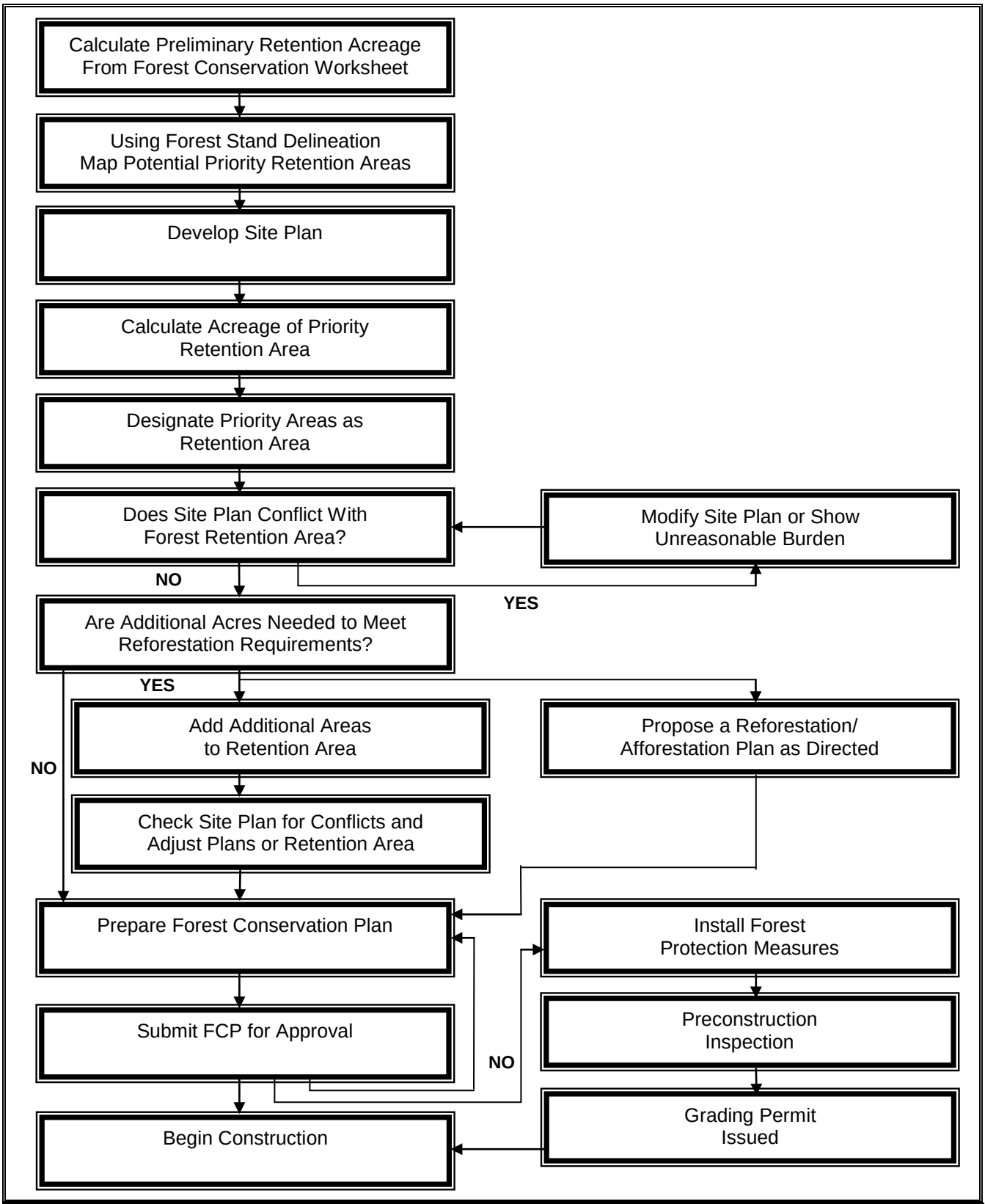
These areas must appear on the FCP with site improvements; therefore, a current site plan or subdivision plan will be required for this step. If no site plan has been prepared, ensure that site planning objectives include protection of these priority areas.

If a site or subdivision plan has already been prepared prior to preliminary approvals, ensure that no conflicts exist between protecting priority areas and other site objectives such as public safety, active open space recreation, stormwater management, adequate parking areas, or utility access. If conflicts exist, investigate alternative designs. Information about uses for Forest Retention Areas is found in Section 3.2. If alternative designs are not feasible to protect priority areas, investigate alternative means to protect or mitigate priority areas from disturbance.

Once all priority areas have been designated for protection or adequate demonstration is made concerning disturbance of these areas, identify means to protect or, if necessary, improve additional forest areas to meet planning objectives.

Step 2 Prepare FCP Map

Locate all protected priority areas and additional protected forest retention areas or specimen trees on the FCP Map.



Forest Retention Area Decision Matrix | **Figure 3:2**

FOREST CONSERVATION WORKSHEET

Forest Thresholds: Industrial/Institutional – 15% minimum forest cover
All other zoning 20% minimum forest cover

A. Proposed Forest Area Removed:_____

Reforestation Required:

Required Reforestation = All forest area removed is to be reforested at a ratio of one acre planted for every acre or portion thereof removed.

AFFORESTATION CALCULATION

B. Total Net Tract Area: _____
C. Threshold Required: 15% or 20% _____
D. Existing Forested Area: _____
MINUS FOREST CLEARED: _____
PLUS REFORESTATION: _____
(If applicable)
EQUALS FOREST CREDIT: = _____
E. C minus D: _____
(If C minus D > 0, this is required of afforestation. If C minus D < 0, no afforestation is required).

AGRICULTURAL DISTRICTS F.C. WORKSHEET

REFORESTATION CALCULATION

A. Total number of lots _____
B. For each lot, total proposed forest area removed. _____
C. For each lot, if more than 20,000sq. ft. Reforestation at 1:1. _____
D. For each lot, if more than 25,000sq. ft Reforestation at 2:1 _____

(Separate calculations must be performed for each lot. Use additional worksheets if necessary).

E. Total reforestation required for all lots _____

AFFORESTATION CALCULATION

A. Total Net Tract Area: _____
B. Threshold Required – 20% _____
C. Existing Forested Area _____
PLUS REFORESTATION= _____
(IF APPLICABLE)
D. B-C =Afforestation requirement: _____

Figure 3:3

3.1.3 Calculation of Retention, Reforestation, and Afforestation

The Forest Conservation Act provides guidelines for the amount of retention, reforestation, or afforestation appropriate to protect priority forests and priority areas, as well as additional forested areas on development sites. The amount of forest which is retained or planted will be determined by the zoning or land use of the development site, the size of the development, and the amount of forest existing and to be cleared. In addition, the area of the site may be reduced by that area where forest clearing is restricted by another local ordinance or program.

The objective of the FCP in site planning is to maintain as much forest as is practical, while protecting all priority forests and sensitive resource areas on the development site.

Information required to calculate the retention, reforestation or afforestation for a site includes:

- **Net Tract Area**. Except in areas zoned for agriculture, commercial, business, industrial, or those used for institutional purposes, the total area of a property including the area to be developed and any nondeveloped area, and including both forested and nonforested areas, to the nearest 0.1 acre, reduced by the area found to be within the boundaries of the one-hundred year floodplain, unless disturbance will occur in the floodplain.

  For regulated activity other than subdivision, in areas zoned commercial, business, industrial or those used for institutional purposes, the net tract area is the total area of the limits of disturbance. Institutional purposes include schools, colleges, universities, government offices, parks and facilities, fire stations, religious establishments, and hospitals.

- In areas zoned for agriculture, the net tract area is that part of a property which will be developed for which land use will be changed or will no longer be used for primarily agricultural activities, reduced by the area found to be within the boundaries of the one-hundred year floodplain, unless disturbance will occur in the floodplain. If any portion of an agriculturally zoned property is deducted from the net tract area, the final FCP approval shall require a note restricting this area from changes in land use, development or redevelopment, unless a FCP is submitted.

- **Zoning Category** (**Figure 3:4**).

Zoning Category	**Retention/Afforestation Threshold**
Agricultural	20%
Residential	20%
Institutional Use	15%
Business, Commercial and Industrial	15%
Conservation	20%

Retention/Afforestation Thresholds — **Figure 3:4**

- **Retention and Afforestation Threshold Percentage** (**Figure 3:4**).

- **Existing Forest Cover**. This is measured to the nearest 1/10 acre and determined from the current approved Forest Stand Delineation (Section 2.2).

The Forest Conservation Worksheet may be completed and appended to the plan.

Size of Retention Areas

Forest Retention Areas shall contain a minimum of 10,000 square feet (0.23 acres) of continuous forest cover. This 10,000 square foot minimum area may include critical root zones as defined in Section 3.2. Alternatively, where there are trees which are identified as priority for retention according to Natural Resources Article 5-1607 (c) (see Section 3.1), the retention area shall contain the critical root zone of the individual tree or trees, but the 10,000 square foot minimum is not a requirement.

Requirements for FCP's

Each FCP map shall contain a table showing the elements and amounts to the nearest 1/10 acre required for the retention, reforestation, or afforestation calculations. These include (although some may not be applicable to the development proposal):

Total parcel area
Area in 100-year nontidal floodplain
Net Tract Area
Zoning Category, pertinent threshold percent and area
Total area of existing forest cover
Total area of proposed forest clearing
Total area of reforestation
Total area of afforestation
Total area in retention Areas

Nontidal wetlands are priority areas for retention. Any forested nontidal wetland permitted to be cut or cleared and required to be mitigated under the regulations shall be located on the FCP map and subtracted on an acre-for-acre basis from the total amount of forest to be cleared for the purpose of calculating reforestation.

During final site planning, the forest retention area proposed in an earlier preliminary FCP may require adjustment subject to final grading or sediment and erosion control plans. In addition, field determination of the retention area boundaries will require inclusion or exclusion of specific trees along the boundary if critical root zones are affected. The result will be a staked limit of disturbance. This construction phase of the FCP is discussed with Critical Root Zones in Section 3.2.1.

All credited Retention Areas shall be protected by a long-term protection agreement (Section 3.2).

3.2 Forest and Tree Protection and Resource Management

This chapter has focused on site planning during which priority forests and priority retention areas are located. The next sections focus on specific protection mechanisms for the retained forest. Many of these protection mechanisms will also be used in planted forest after construction. While using this section, remember that all forest credited for retention shall have a long-term protection agreement in

place at all times after development project completion. Further information about these long-term protection agreements may be found in Section 3.2.3.

3.2.1 Forest and Tree Protection: Planning and Design

Forests which are retained and protected not only maintain forest functions, but also serve new residential communities or businesses by providing passive recreation. These forests can also be managed to enhance resource values on private or public property by providing a clean watershed for a municipal water supply.

Using calculations based on the net tract area, a development proposal may be phased to allow clearing for the current phase while allowing forest to remain. Forest areas left on the site may therefore continue to contribute valuable functions in preserving water quality or habitat. A Forest Stand Delineation which has been approved for the entire parcel may be renewed and updated if needed during this phased construction.

Construction activities may not occur in Forest Retention Areas.

Contiguous forest requires protection through planning. For example, protection measures for large areas of contiguous hardwood forested habitat may include:

- Minimize disturbances during the May-August breeding period. Such disturbances include vehicular traffic, intensive public use, construction noise and others.
- Minimize habitat fragmentation by developing or disturbing existing edges, and restricting creation of new edges or openings. Where possible, use alternative site design techniques (Section 1.3).
- Minimize fragmentation by retaining continuous canopy and understory cover. For example, narrow private drives and road rights-of-way may meander to maintain existing trees and their canopies.
- Maintain existing habitat, such as standing dead trees which are nesting and feeding areas.
- Minimize long-term disturbance by restoring temporarily disturbed areas to pre-disturbance conditions, such as reforestation in native vegetation.
- Minimize long-term alterations in forest species composition or structure.

The recommended measures above do not necessarily apply to coniferous forested areas when the objective of preserving habitat for forest interior dwelling birds (FIDB) is sought, since threatened FIDB species in Maryland generally inhabit hardwood forests. However, these or other protection measures in coniferous forests may be appropriate to protect habitats of other wildlife species.

Forest Protection Requirements in the Forest Conservation Plan

The Final FCP map shall locate and describe any protection mechanisms to be installed to protect Retention Areas during and after construction. These mechanisms shall be field located and approved by inspection prior to the start of construction.

Any clearing, grading or construction within 100 feet of the Retention Area depending on field conditions will require protection devices, including but not limited to, fencing or adapted sediment and erosion control devices and signs as indicated in the approved Forest Conservation Plan. All protection devices shall remain in place until construction completion, final inspection, and an occupancy permit, unless waived by the approving authority. More information on protection devices can be found in Section 3.2.2).

Furthermore, the edge of the Retention Area will need to be staked by the applicant and approved by the approving authority prior to clearing. This field edge should be adjusted along the Critical Root Zones of trees in the proposed Retention Area (**Figures A:16 and A:17**).

Critical Root Zones

The Critical Root Zone of a tree is the zone in which most of the roots live. Ninety-five percent of the roots of most trees will be found in the upper 12-18" of the soil. Most 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, consider not only the visible portion of the tree, the trunk and canopy, but the below ground portion as well.

The true size of the critical root zone is related to the species and size of the tree and the condition of the soils, including texture and average moisture. 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 should be used unless other methods are demonstrated to protect the complete root zone:

- For the edges of stands, the Critical Root Zone shall be a circle around each edge tree with a radius of 1.0 foot for each 1.0 inch of Diameter of Breast Height; the minimum radius should be 8 feet.

- For Retention Areas less than 10,000 square feet and isolated specimen trees, the Critical Root Zone should be a circle around each edge tree with a radius of 1.5 feet for each 1.0 inch of Diameter of Breast Height.

Inclusion of a specific tree inside the retention area will require an evaluation of its resistance to disturbance. This will require an examination of pest or disease infestation, tree decay, susceptibility to windthrow, and soil compaction.

Forest Protection Procedures

Forest protection procedures discussed in this and the following sections are summarized in **Figure 3:5**.

Step 1 Field locate the proposed retention boundary as shown on the FCP.

Step 2 Stake and flag visually the proposed limit of disturbance. If this does not agree with the preliminary approved retention area, revise the FCP map and calculations to show adjusted retention areas if needed.

Step 3 Evaluate tree conditions and critical root zones.

Step 4 Field adjust and re-stake the retention boundary. In general, if more than 30 percent of the critical root zone is to be disturbed, the tree should not be included in the Retention Area. Some soil disturbance may be mitigated by selective stress reduction pruning or other methods. These methods are discussed in Section 3.2.2.

Step 5 Clear and grub along Limit of Disturbance.

Step 6 Notify approving authority for inspection approval of installed devices.

Step 7 Proceed with construction subject to final approvals.

Step 8 Notify approving authority following completion of construction for final inspection.

Step 9 Temporary Protection devices shall be removed after final approval.

Tree Quality Best Management Practices (BMP) on Wooded Lots

The Forest Conservation Act is intended to conserve and increase the amount of forested land in the State of Maryland. That means that a high priority is placed on the retention of existing forest land during development. The retention priorities established in this Manual clearly favor conservation of forest resources over removal and reforestation at another location. That can create conflict in use, especially when new homeowners are not well versed in the requirements and restrictions placed on the land that they just purchased. It is the responsibility of those involved in the property transfer process to make sure that property owners are informed of applicable laws, regulations, and easement restrictions that apply to their property. It is always desirable not to locate new forest plantings on subdivision lots. However, when the site is being developed is already forested, there is no option but to place a restrictive easement over it that is intended to protect the existing forest resource. For that reason certain standards are needed that allow for a minimum of conflict between the intended use of the property and the goal of protecting and conserving the forest resource.

Managing tree and forest quality on a subdivision site requires the application of management practices that recognize three elements: 1) tree and site asset protection; 2) appreciation of asset value and sustainability of asset functions over time; and 3) minimizing liability risks. Tree Quality BMPs can be grouped in to four categories: 1) pre-development site evaluation; 2) development design considerations; 3) construction protection measures including post construction damage mitigation and cleanup; and 4) post development long-term resource management measures. All of these are included in the Forest Stand Delineation/Forest Conservation Plan development process. However, when developing a wooded site these considerations are heightened. This is due to the potential conflict that exits between the intended use of the land and the need to protect a previously existing resource that is now being asked to survive under severely modified conditions. Forest trees cannot always survive under such conditions. For that reason consideration should be given to their survival potential in their altered setting.

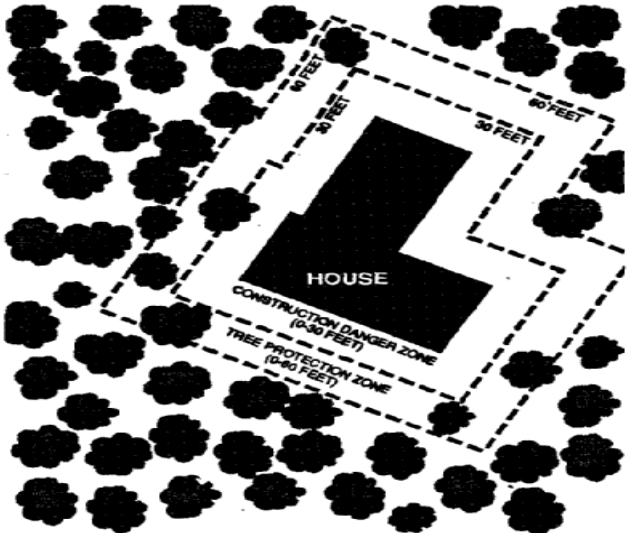
In the site evaluation factors such as proposed lot size, tree density, species composition, and tree condition are all considerations. The attributes of a forest, such as tree density and species distribution are those that will be factors in retention decisions. However, even marginal forests are often claimed for retention on development sites. When developing wooded sites for residential use site design is also a consideration in the retention credit decision. It is difficult to maintain forest function and values on lots smaller than one acre.

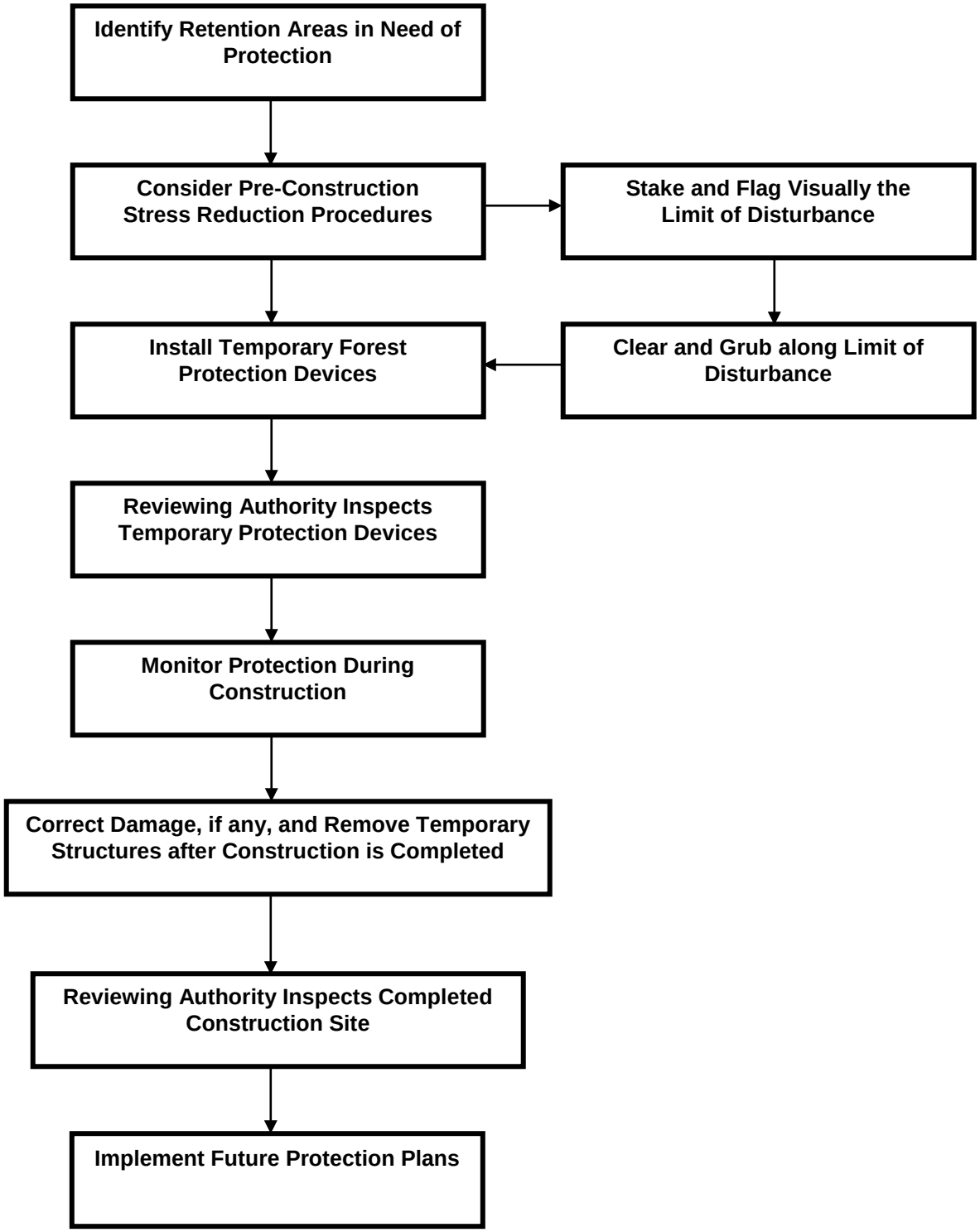
When designing subdivisions on sites that are wooded and acceptable for development the following standards apply:

1. A Construction Danger Zone shall be established around all proposed structures of 30 feet from the structure perimeter. If a tree is within 30 feet of a structure it is in the Construction Danger Zone and shall be removed to facilitate a safe construction site. Trees within this zone are easily damaged and often decline in health and die. They also often become a hazard to the residence during that period and are costly to remove.

2. Trees between 30 and 60 feet from the structure may or may not be removed at the discretion of the owner. However. High quality trees in this zone should be protected during construction with barriers and stem, branch and root protection. The entire area within 60 feet of the structure is the Tree Protection Zone. Trees in poor condition in this zone should be removed. No part of the Tree Protection Zone may be included in the retention credit calculation. This area is to be treated as forest removed.

The implementation of the Tree Protection Zone as an exclusion area around a new residential structure will minimize tree die-off after construction and allows for better use of residential properties while still allowing for an effective forest resource to be maintained.





Forest Protection Procedures | **Figure 3:5**

3.2.2 Forest and Tree Protection: Construction Techniques

The FCP not only locates the forest retention boundary but also includes details and specifications for forest protection. As a construction document, it directs construction contractors and others in the correct design, installation, timing, and placement of specific protection devices and protection measures.

This section guides the applicant through the construction phase of a project, ensuring that construction activities will not adversely affect the Forest Retention Areas. Examples of details or specifications are referenced in this section and located in Appendix D. A Maryland Licensed Tree Expert or Certified Arborist will also be able to provide information about specific tree protection strategies.

Effects of Disturbance

Throughout planning and construction, applicants should monitor the effect of the proposed activities on the forest retention areas (**Figure A:17**). Effects may result from:

- **Soil and root compaction** – Avoid unnecessary compaction wherever and whenever possible. Soils and roots may be aerated when needed. Compacted soils may require additional treatment before planting is conducted.

- **Root injury** – Avoid affecting any critical root zone of retained areas. Roots may be pruned when needed to reduce effects of damage to uptake or support functions. Special machinery or techniques may be required. Another mitigating activity for root injury or soil disturbance is limited crown reduction to reduce water loss through transpiration.

- **Limb or trunk injury** – This will affect not only the appearance of retained trees, but their ability to take up nutrients and water through the cambium layer just under the bark and, when more extensive, their support. Avoid whenever possible, or prune before construction activities affect tree canopies.

- **Too much water** – Excess soil moisture will drown the tree, limiting the ability of roots to absorb oxygen. Do not allow standing water for more than 2 days.

- **Too little water** – Grading will alter the soil moisture regimes in the Critical Root Zone, particularly in grade cuts. Lowered water table levels should be compensated for by additional monitoring and watering when needed. Avoid grade cuts around a Forest Retention Area when this is likely.

- **Disease** – Nearby disturbances may weaken tree resistance to insects, fungi or other pests. Additional water, fertilizer and other protection strategies may be advisable to reverse decline.

Some species of trees or individual trees may not be suitable for retention at the retention boundary without certain treatments. Reasons for this include:

- **Susceptibility to windthrow** – Individual trees which grow in a forest are protected from prevailing winds or sudden gusts. Trees growing in conditions which limit adequate structural root development, such as hydric soils, or species which adapt by shallow rooting may not be appropriate in a new edge condition.

- **Sunscald** – Canopies which are opened and allow more sunlight during the growing season may create drought stress conditions for certain shade tolerant species. Generally, this may be avoided by limiting cutting to the dormant season.

Susceptible trees may require removal or trimming. Plant communities located in interior forest conditions protected by a forest ‘edge’ from extreme sun, wind, or temperature fluctuations, may require treatment to

adapt to the proposed relocated edge. Selective clearing and replanting methods as discussed in Section 3.3 Forest and Tree Planting, are a means to mitigate this type of disturbance.

Protection Requirements in the Forest Conservation Plan

Forest Protection During Construction

Following are requirements for all FCP's which propose forest clearing:

- The **locations** of all protection devices shall be referenced on the FCP map.
- **Details and specifications** required to implement the proposed protection measures shall be included.
- A **construction sequence** which includes clearing, grading or installation of sediment and erosion control measures; installation and removal of protection devices; inspections; and, other activities that may be required to implement the proposed protection measures.
- **Equipment**, vehicles, machinery, dumping or storage, or other construction activities, burial, burning, or other disposal of construction materials, must not be located inside forest retention areas.
- Any **fires** permitted in the construction area shall conform with state and local regulations for fire control and must be a minimum of 100 feet from the retention area or its canopy.
- Forest Retention Area **protection devices** shall be:
  - visible;
  - well-anchored;
  - approved in the field prior to clearing, grading, or when construction commences; and,
  - remain in place and maintained until construction completion, final inspection, and an occupancy permit is issued, unless waived by the approving authority.
  -
- If during any inspection, it is determined that any part of a tree is in an unsafe or dangerous condition, then that part of the tree shall be removed. If the entire tree is affected, it shall be removed in its entirety. If the hazardous condition is questionable, then the permittee shall employ a certified arborist to inspect the tree and certify that the condition of the tree is not a hazard and not expected to be a hazard in the foreseeable future.

Field adjustments may be made subject to approval of an amended FCP. Suggested specifications are summarized in **Figure 3:6.**

Critical Root Zone Protection

When 30 percent or less of a Critical Root Zone in a Forest Retention Area is disturbed by clearing, grading, or construction, the following additional protection measures shall be required.

When warranted by disturbance to the Critical Root Zone of a Retention Area, the FCP must contain plan specifications for pre-construction stress reduction:

- root pruning
- crown reduction or pruning
- watering
- fertilizing
- mulching
- other measures which may be needed

Evaluation criteria and implementation guidelines for these techniques are summarized in **Figure 3:7**.

Special construction techniques may include, but are not limited to:

- tree wells
- retaining walls
- root aeration systems
- raised sidewalks with aeration over roots
- pier wall supports over Critical Root Zone
- tunneling through Critical Root Zone

Appendix D contains sample specifications and details for these techniques. Additional references are found in Appendix E.

Post-Construction Protection Measures

When warranted by damage to the Retention Area during construction, the following may be required:

- stress reduction measures as above;
- tree or limb removal; or,
- replacement planting.

An amended FCP which addresses additional reforestation may be required for the final inspection approval or to satisfy enforcement requirements.

A protection checklist such as in **Figure 3:8** may be used by contractors to ensure that forest retention areas will be protected.

Suggested Specifications for Temporary Protection during Construction

- Combine forest protection devices with sediment and erosion control devices when possible.
- Avoid injuring roots when installing anchor posts.
- When using fencing, it should be at least 4' high.
- Attach highly visible flagging.
- Fences or devices should be securely anchored, at least 1/5 of the anchor post should be below ground level.
- Signs should be posted at all retention areas clearly identifying the area.

For Forest Protection Only (see also Appendix D)

- Highly visible signs (see Figure D-5),
- Blaze orange plastic mesh fencing (Figure D-6),
- Two to three strand wire fence with highly visible flags (Figure D-7),
- Snow fencing with highly visible flags on anchor posts (Figure D-7).

For Combined Forest Protection and Silt Fencing in Accordance with Established Best Management Practices or Sediment and Erosion Control Standards

- Filter cloth on wire mesh
- Silt fence with wire strand and highly visible flags (Figure D-9),
- Perimeter dike or swale. Construction of this device will be inside the limits of disturbance only. Highly visible flags will be placed along the dike and will be maintained throughout the construction phase of the project (Figure D-10).

Permanent or Constructed Protection Devices Include:

- Raised sidewalks (Figure D-11)
- Root aeration system (Figure D-12)
- Tree wells (Figure D-13).
- Retaining walls (Figure D-14).
- Reinforced pier and panel wall (Figure D-15).
- Tunnels through Critical Root Zone where ditches are used (Figure D-16).

Forest Protection Devices	**Figure 3:6**

PRACTICE	IMPLEMENTATION GUIDELINES
Root Pruning - Will the critical root zone be affected by construction activities such as grade changes, digging for foundations, roads, or utility construction?	Prune before construction disturbance as shown in Appendix D, Figure D-2. Cut cleanly using well-maintained pruning equipment. Cover exposed roots immediately with topsoil, peat moss, or other suitable material. For trees with Diameter of Breast Height greater than 15 inches, conduct root pruning up to one entire growing season before construction disturbance. Monitor for signs of stress and apply water if needed.
Crown Reduction or Pruning – Has the root system been significantly reduced (more than 30%) or are there dead, damaged, or diseased limbs?	Prune at optimal time of the year for the type of plant: For ornamental flowering trees, after flowering and before bud set For non-ornamental flowering trees, in late winter, early spring, or mid-summer. No more than 1/3 of the crown should be removed at one time (Figure D-2) Monitor for signs of stress.
Watering - Will construction activities alter the hydrology of the site? Has or will root pruning occur?	Water only as necessary. Monitor to ensure that over watering does not frequently occur. Monitor for signs of stress and re-evaluate method (see Figure 3:8)
Fertilizing - Is or will the tree be stressed? Has or will root pruning occur?	Use low nitrogen and slow release fertilizers and apply in late fall or early spring (Figure A:19) For small trees (less than 3" caliper or Diameter of Breast Height), broadcast methods may be appropriate. For larger trees, avoid root injury while using punch hole method or pressurized injection method (Figure D-3). Do not apply fertilizer closer than 3 feet from tree trunk for pressurized injection method. Monitor for sign of stress and re-evaluate method.
Forest and Tree Protection Practices	**Figure 3:7**

Step 1: Pre-Construction Phase

Stress Reduction, if needed
__ Root pruning
__ Watering
__ Fertilizing
__ Mulching

Temporary Forest Protection Devices
__ Forest protection fences or
__ Combined sediment control and tree protection
__ Forest Retention Area signs

Permanent Forest Protection Devices
__ Tree wells
__ Root aeration system
__ Retaining walls

__ On-site inspection by approving authority
Include On Site Plan
__ Forest Retention Areas
__ Isolated specimen trees
__ Employee parking areas
__ Equipment staging areas

Pre-Construction Meeting
__ Discuss penalties
__ Inspect installed protection devices

Step 2: Construction Phase

Monitor
__ Soil compaction
__ Root Injury
__ Trunk wounds
__ Limb injury
__ Flooded conditions
__ Drought conditions

Step 3: Post-Construction Phase

Stress Reduction
__ Root pruning
__ Watering
__ Fertilizing
__ Mulching

Repair of Tree Damage
__ Root repair
__ Removal of dead limbs
__ Soil aeration

Other
__ Removal of dead or dying trees posing an immediate safety hazard
__ Removal of temporary tree protection structures

Forest and Tree Protection Checklist	**Figure 3:8**

3.2.3 Forest and Tree Protection: Long-term Instruments

Every FCP must provide for long-term protection of Forest Retention Areas and areas covered by a Planting Plan using the long-term protection agreements approved by the approving authority. These agreements shall at minimum:

- Limit uses in retention and planting areas to ones that are consistent with forest conservation, including passive recreational activities, wildlife management, and forest management practices that are consistent with a forest conservation program;

- Preserve all priority forests and priority areas specified in the FCP;

- Be binding on all parties; and

- Be in place in perpetuity at all times after development completion. Long-term protection for planted areas may be instituted at the release of a bonding requirement.

Some types of long-term protection agreements may provide for re-assignment to a different party, renewal of terms, and other periodic evaluation and replacement, with notice to and approval by the approving authority. Each may require periodic monitoring and inspections. A long-term protection agreement may be one or more of the following, as approved by the approving authority:

- Conservation easement
- Deed restrictions
- Covenants running with the land
- Forest Conservation and Management Agreement

Conservation Easements

These convey interest, usually in perpetuity, in the property to another party who is designated as the easement holder through an executed deed. The easement holder, as a third party, monitors and enforces the terms of the easement. Easement holders may include local non-profit land trusts, the Maryland Environmental Trust, and local jurisdictions.

Easements that satisfy federal and state requirements may provide certain benefits – lower estate and inheritance taxes due to reduced development potential of the property and a 15-year property tax credit on the unimproved portions of the property.

Further information on easements is available from:

The Maryland Environmental Trust
100 Community Place
Crownsville, MD 21032-2023
410-514-7900

Deed Restrictions and Memorandum of Understandings.

These instruments vary principally in their method of enforcement, but are generally binding on the land purchaser. Restrictions and Memorandum of Understandings for forest areas shall be recorded in the land records for that property. Graphic indication of the forest retention areas must be shown on the record plat for the property and cross-indexed with the land records.

Restrictions, when applied by an approving authority as a condition of a plan approval, are enforced by that authority through building inspections e.g. setbacks such as those established for buffers.

3.3 Forest and Tree Planting

This chapter has reviewed planning and protection of forest retention areas on development sites. The Forest Conservation Act also requires that FCP's include an afforestation or reforestation plan when appropriate. After techniques for retaining forest on a site have been exhausted, afforestation and reforestation may be required on the site or, if demonstrated as necessary, off the site

When afforestation or reforestation is required, the FCP shall contain a planting plan. When the afforestation or reforestation is to occur off the site, the planting plan shall contain certain information about the proposed planting site. Planting plans are discussed in detail in Section 3.3.2.

3.3.1 When and Where Is Planting Necessary

Afforestation

For sites with little or no existing forest as verified in a Forest Stand Delineation, the Forest Conservation Act sets standards for afforestation depending on the zoning category and the size of the tract.

Afforestation is the establishment of tree cover on areas from which it has always or very long been absent, or the planting of open areas which are not currently in forest cover.

Afforestation is required on a tract which has less forest than the designated afforestation threshold for that zoning category.

Reforestation

Reforestation is the creation of a biological community dominated by trees and other woody plants containing at least 100 trees per acre with at least 50 percent of those trees having the potential of attaining a 2 inch or greater diameter measured at 4.5 feet above the ground (Diameter of Breast Height) as defined in the Code of Public Local Laws and Ordinances of Carroll County Maryland, Chapter 115. Reforestation also includes landscaping under an approved landscaping plan that establishes a forest that is at least 35 feet wide and covers an area at least 2,500 square feet. Credit applies only in priority funding areas.

When Will Afforestation and Reforestation Be Conducted?

The following steps outline a procedure for determining if afforestation or reforestation is required and where it is appropriate.

Reforestation

1. Determine if required forest retention, especially in priority areas, will be accomplished as shown in the preliminary FCP or the current site plan. If not, assess if the site plan may be modified to retain more forest on the site.
2. If the site plan cannot be modified to retain forest and reforestation is required, determine if priority areas for reforestation can be utilized. The Forest Stand Delineation should contain information about onsite environmental features which are priority planting areas. Investigate modifying the site plan to plant these areas. In addition, investigate reforestation of forest areas which are temporarily disturbed during construction and which will be appropriate for long-term protection.

Afforestation

1. Determine if the necessary planting may be accomplished in priority areas as shown in a Forest Stand Delineation. Modify the site plan if needed.

If onsite planting in priority areas cannot be reasonably accomplished, investigate priority offsite areas as alternatives.

These procedures are summarized in **Figure 3:9.** The comprehensive procedural checklist in **Figure 3:10** may assist the preparer of FCP's in reforestation and afforestation evaluations. Information about planting plans is in Section 3.3.

Priority Areas for Afforestation and Reforestation

Forest Stand Delineations locate the environmental features which are priority afforestation and reforestation areas, as defined in Natural Resources Article 5–1607 (d). Reforestation or afforestation shall occur in priority areas. However, on-site planting is preferable, conditions may warrant an off-site location. Off-site plantings may either be initiated by the applicant on another property or may be satisfied through the use of an approved forest conservation bank. Planting locations shall be approved by the reviewing authority under an approved FCP. Methods for planting are discussed in Section 3.3.

Priority areas are:

- **Stream buffers**
  Forest buffers are to be established from the top of each normal bank of intermittent and perennial streams.

- **Forested corridors**
  Forested corridors should be established to connect existing and protected forests within or adjacent to the site. A width of at least 300 feet is desirable to facilitate wildlife movement.

- **Buffers for Critical Habitats**
  These areas may be designated by the Department of Natural Resources or by a local forest conservation program. A forested buffer shall be established as appropriate for these habitats. Information on critical habitats may be obtained from the DNR-Natural Heritage Program.

- **Stabilized slopes**
  Steep slopes of 25 percent or greater and slopes of 15 percent or greater with erodible soils having a K value of 0.35 or greater in the top layer which require stabilization shall be reforested. These slopes also include ravines and natural depressions.

- **Land use buffers**
  Afforestation or reforestation shall be used to establish buffers between differing or conflicting land uses where appropriate, or adjacent to highways or utility rights of way.

- **Total contiguous forest cover**
  Reforestation or afforestation shall be established in areas adjacent to retained forests on a development site where appropriate (**Figure A:15**).

Additional priority areas may be designated by a local authority in either a locally adopted land use plan or local forest conservation program.

Additional areas may be appropriate for reforestation or afforestation, but will require approval by regulatory or permitting authorities. For example, unforested nontidal wetlands and their buffers, and 100-year nontidal floodplains may be appropriate for water quality protection benefits; however, the applicant must verify any conditions or requirements with the MD Department of the Environment.

BANKING

A person may create a forest mitigation bank from which applicants may purchase credits to meet the afforestation and reforestation requirements of this ordinance. Notwithstanding anything in this

Ordinance to the contrary, property that is not forested, as of the date of application for a Bank Establishment Plan may be the subject of an application for the establishment of Forest Bank.

The application is just the beginning of a process that involves several steps before a Forest Bank can actually be used for credit. Once the application and Bank Establishment Plan have been approved, the area still must be certified as a Forest Bank. Without this certification, no credit will be given.

Use of a Forest Bank will be approved on individual projects only when higher priorities established in the ordinance are deemed impossible or impractical or when complying with those higher priorities would create an undue hardship.

The County will review the application for a Forest Bank and shall determine, based upon the site priorities established in the Forest Conservation Technical Manual and Ordinance, whether the location, size and other characteristics of the property are conducive to the successful establishment of a forest and to achieving the goals of this Ordinance. After reviewing the application, the County will approve or deny the application based upon these conditions.

The County will develop and maintain technical guidelines and specifications to be used in the establishment, review, and acceptance of Forest Banks. These guidelines and specifications are to be included in the Forest Conservation Ordinance, Section 19.

Please refer to the Carroll County Forest Conservation Ordinance for specific direction in the development and use of Forest Banks.

A person may create an Off-Site Reserve for which applicants may plant off site afforestation/reforestation requirements of this ordinance. Notwithstanding anything in this Ordinance to the contrary, property that is not forested, as of the date of application for an Off-Site Reserve may be the subject of an application for the establishment of an Off-Site Reserve.

Once the application and Off-site Reserve plan have been approved, the area still must be certified as an Off-Site Reserve. Without this certification, no approval for planting in the Off-Site Reserve will be given.

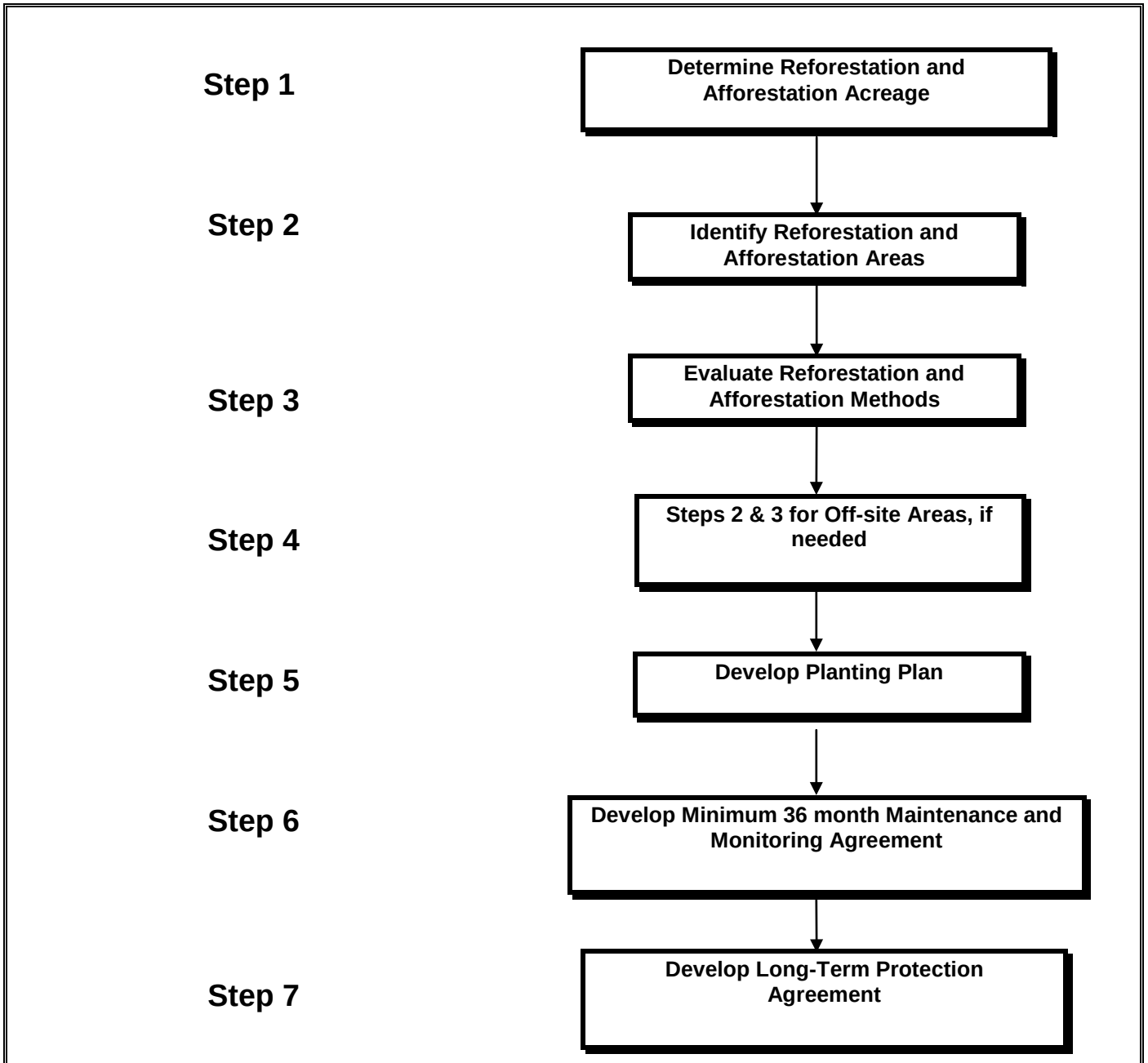
The use of an Off-Site Reserve will be approved on individual projects only when higher priorities established in the ordinance are deemed impossible or impractical or when complying with those higher priorities would create an undue hardship.

The County will review the application for an Off-Site Reserve and shall determine, based upon site priorities established in the Forest Conservation Technical Manual and Ordinance, whether the location, size and other characteristics of the property are conducive to the successful establishment of a forest and to achieving the goals of this Ordinance.

After reviewing the application, the County will approve or deny the application based upon these conditions.

The County will develop and maintain technical guidelines and specifications to be used in the establishment, review, and acceptance of Off-Site Reserves. These guidelines and specifications are to be included in the Forest Conservation Ordinance, Section 20.

Please refer to the Carroll County Forest Conservation Ordinance for specific direction in the development and us of Off-Site Reserves.



Reforestation and Afforestation Procedures

Figure 3:9

Step 1: Determine Reforestation and Afforestation

__ Forest Conservation Worksheet

Step 2: Identifying Priority Reforestation and Afforestation Areas

__ Locate reforestation and afforestation areas from priority areas on FSD

Step 3: Evaluate Various Reforestation Methods

Preferred Sequence for Afforestation and Reforestation
__ Onsite afforestation or reforestation
__ Offsite afforestation or reforestation
__ Alternate sequence for certain specific projects

Afforestation or Reforestation Methods
__ Selective clearing and supplemental planting to enhance existing forest
__ Forest creation using:
- __ transplanted or nursery stock
- __ whip and seedling stock
- __ natural regeneration, when appropriate

__ Landscaping
__ In a priority funding areas:
- __ street trees
- __ park trees
- __ buffer establishment

Step 4: Developing a Planting Plan

Site Assessment
__ Past and future land uses
__ Soils evaluation
__ Species selection
__ Plant material selection
__ Stock specifications

Pre-Planting Considerations
__ Planting site preparation
__ Planting period
__ Plant material storage
__ Onsite inspection

Planting Specification
__ Planting pattern
__ Techniques

Post-Planting Considerations
__ Soil stabilization
__ Protection devices

Step 5: Minimum 36 month Maintenance and Monitoring Agreement

__ Watering
__ Fertilizing
__ Competing vegetation
__ Protection from pests, diseases, mechanical injury
__ Reforestation planting plans for mortality after year one
__ Name of company or individual responsible for tree care
__ Schedule of site visits
__ Areas with special maintenance concerns

Reforestation and Afforestation Checklist	**Figure 3:10**

3.3.2 Planting Plan Requirements

The preceding section discussed the priority locations for afforestation and reforestation and when these activities are required. This section discusses how planting may be accomplished and the requirements for Planting Plans in FCP's. A Planting Plan shall be required in a FCP when afforestation or reforestation is proposed.

The Planting Plan shall include:

- **Locations** of afforestation or reforestation areas. These will be shown on the FCP map. When these areas are located offsite, the planting plan shall also include a map of the proposed planting site showing:

  – location of the site (vicinity map);
  – soils classifications; and
  – environmental features which are priority areas as shown for a simplified Forest Stand Delineation.

- **Specifications** for conducting the afforestation or reforestation activities. A planting schedule table will be included which lists:

  – species;
  – number of plants, spacing or distribution of proposed planting;
  – size of plants;
  – condition;
  – recommended sources of plant materials; and,
  – other requirements for certain planting techniques as noted below.

- How the proposed afforestation or reforestation activities are included in the **construction sequence**, providing for notification to and inspections by the approving authority. Afforestation or reforestation planting shall be finished within one year or two growing seasons after development project completion, except as allowed for in the Code of Public Local Laws and Ordinances of Carroll County Maryland, Chapter 115.

A binding maintenance and monitoring agreement to ensure protection and survival requirements for the planting areas is required for reforestation or afforestation. Specific requirements for these are discussed in Section 3.4. This agreement shall contain financial security as specified by the County. This agreement shall be in place for a minimum of 3 years after the planting is finished.

Selecting Planting Techniques

The Forest Conservation Act lists several techniques for accomplishing reforestation and afforestation which must be considered during the development of a planting plan. The following criteria shall be used to evaluate methods appropriate for a planting site.

Selective Clearing and Supplemental Planting (Woodlot Improvement)

Disturbances near Forest Retention Areas create new environmental conditions inside the Forest Retention Area. Selective clearing and supplemental planting mitigates the effects of nearby clearing on Forest Retention Areas so that they will withstand the changes in the modified environment. Modifying or creating a new forest edge, selective thinning to reduce safety hazards from unstable trees, and limiting competition from invasive exotic plants are included.

This technique may be used only when management of the Forest Retention Area as a result of nearby clearing is recommended in the approved Forest Stand Delineation and when it meets one or more of the conditions under design guidance.

- If located in a priority sensitive area, the functions of a Forest Retention Area will be enhanced by additional planting. This may include additional plants to create higher structural diversity, increase total density up to optimum stocking levels, or retard surface water runoff.

- The height of existing individual trees in the Forest Retention Area exceeds the width of the retention area or species susceptible to windthrow, such as Virginia pine (Pinus virginiana), are located within one tree height of a structure, and these individuals will pose a safety hazard. These trees may be removed or pruned and appropriately selected trees planted in the retention area. Natural regeneration may be a planting alternative if understory densities of appropriate species exceed optimum stocking levels.

Design Guidance:

Tulip poplars or other grade sensitive species need to be removed if subjected to significant grade changes within their critical root zone.

If sun-sensitive species are abundant on stand margin, supplemental planting of tolerant plant materials is recommended, or these species may be removed. (See Appendix I)

Snags 6-8 feet in length may be left for the benefit of wildlife, with consideration of safety.

Requirements for this technique shall include:

- Trees in Forest Retention Areas proposed for removal are field located, marked by a qualified professional, and then approved by Carroll County before removal;

- Best Management Practices shall be used;

- All clearing and planting activities shall be monitored under a minimum 2-year maintenance and monitoring agreement; and,

- Stocking levels shall be determined by approved forestry methods.

- Applicant must show selective clearing is the best alternative for the site.

- Selective clearing objectives must be clearly defined in the reforestation plan. Selective clearing is not acceptable for purely aesthetic reasons.

- Specific trees targeted in the selective clearing must be noted on plans.

- Selective clearing must be done in such a manner that remaining trees and understory are not disturbed in the process.

- Stumps should not be removed under any circumstance.

- Selectively cleared areas must be planted with appropriate supplemental.

Invasive Exotic Plants

Exotic plants are plant species that are not native to the area where they are growing. Some exotic species are native to the United States but are now distributed outside their natural range due to transportation by humans or due to human-caused breakdown of natural barriers to dispersal. A good example is long-braced beggar-ticks (Bidens polylepis), native to the midwestern U.S. but not to Maryland, which has recently invaded Maryland wetlands and may now be the most common Bidens species in Maryland.

Hundreds of exotic plants occur in the wild in Maryland. Most plants used in horticultural applications are not native to Maryland, and many can escape into the wild. However, most exotic species do not pose a serious threat to native vegetation in undisturbed areas.

Invasive exotic plants are pests because they displace native species and can change the structure and composition of natural communities. They lack the predators, competitors, diseases, or parasites that help control their populations in their native habitat. They compete successfully against existing native species. Examples of such exotic species which are also invasive in native plant communities are Norway maple (Acer platanoides), tree of heaven (Ailanthus altissima), bush honeysuckles (Lonicera species), multiflora rose (Rosa multiflora), Japanese honeysuckle (Lonicera japonica), kudzu (Pueraria lobata), and common reedgrass (Phragmites australis). A list of invasive species appears in Appendix F.

The presence of exotic species usually indicates a history of site disturbance and may indicate a degraded natural community. Many species of exotic plants, particularly woody vines, can retard forest regeneration. The worst species are those that cause damage, are easily established, and readily dispersed, such as Japanese honeysuckle (Lonicera japonica) and devil's tearthumb (Polygonum perfoliatum). Some species, such as kudzu (Pueraria lobata) and bamboos, are extremely persistent and destructive, but are unlikely to become established unless planted. English ivy (Hedera helix), climbing euonymus (Euonymus fortunei), burning bush (Euonymus alatus), Japanese honeysuckle, and Norway maple (Acer platanoides) are particularly pernicious in forested environments because they are adapted to low light conditions and can invade high quality forests with closed canopies. Bird-dispersed species such as Japanese honeysuckle can readily invade the interior of forested habitats by colonizing light gaps caused by fallen trees. Some species, such as wisteria (Wisteria species) and Japanese honeysuckle, can rapidly invade the shady interior of a forest from a sunny forest edge. They send out ground level vines that are subsidized by the rapidly photosynthesizing portions of the plants growing in full sun. Other species, such as tall fescue (K31 fescue) (Festuca elatior), sericea lespedeza (Lespedeza cuneata), and crown vetch (Coronilla varia), although not strongly invasive, should not be planted in or adjacent to natural areas because they are extremely persistent and are unlikely to be naturally replaced by native species.

Extreme caution is warranted when using any exotic species for natural resource management. Managers should assess objectives and minimize likely future effects on natural plant communities.

Maryland Noxious Weeds

There are many plant species that can become a problem in forest management and competing with newly planted or established trees.

There are six noxious weeds that have a legal requirement to be controlled (annotated Code of Maryland, Title 9, Subtitle 4. (Weed Control)) and are as follows: Johnsongrass (Sorghum halepense), Canada Thistle (Cirsium arvense), Bull Thistle (Cirsium vulgare), Plumeless Thistle (Carduus acanthoides), Musk Thistle (Carduus nutans), Shattercane (Sorghum bicolor).

Lands invaded by noxious weeds shall not be selected for afforestation/reforestation areas.

See Appendix F for control and eradication of noxious weeds.

For more information on noxious weeds contact the Department of Agriculture, Office of Plant Industries and Pest Management, Weed Control.

Use of Transplanted or Nursery Stock Greater than 1.0 Inches Diameter of Breast Height.

This is a preferred reforestation or afforestation technique when sites are monitored and managed adequately to ensure maximum survival beyond an initial 3-year agreement. Installed irrigation or a landscape contract may be added to the planting plan.

Proper planting details and specifications in the FCP are essential to the successful implementation of this technique. Examples of these are located in Appendix D. Nursery or collected transplant stock and planting specifications shall comply with the current American Standards for Nursery Stock (American National Standards Institute). Container stock is usually preferred over bare root or balled and burlapped stock, particularly for spring period planting.

Mulching is highly recommended to a depth of 2 to 4 inches. Alternatively, a planted ground cover may be added.

Staking or guying is not recommended except in areas of high wind and when trees are taller than 8 feet. Movement which does not shift the root ball strengthens the trunk. Temporary staking shall be removed by the end of the management and monitoring agreement period.

Wrapping shall also be removed from trees by the end of the management and monitoring agreement period.

Transplant stock may require additional treatment such as root pruning. Species and individuals should be chosen carefully and root disturbance minimized. A type of transplant technique which may be considered when appropriate is transplanting plugs from existing forested areas proposed for disturbance.

Use of Whip and Seedling Stock

This technique may be desirable when sites will not be carefully monitored. Some mortality is expected, but no fewer than 55 percent of plants must remain from a minimum planting density of 700 plants per acre at the end of a 3-year monitoring period. A longer term management and monitoring agreement may be used to ensure that forest will be established. Management during this period will usually require control of competition and predation.

Standards for hardwoods and conifers vary. Hardwood seedlings shall be 1/4 to 1/2 inch caliper with roots 8 inches or longer. Conifer seedlings must be 1/8 to 1/4 inch caliper with roots 8 inches or longer and top growth 6 inches or more. Roots must not be planted in a “J”. Root disturbance and desiccation shall be minimized through appropriate packaging and handling. Suggested storage and planting specifications and details may be found in Appendix D.

While sometimes desirable to control predation and speed growth rates, the use of tree shelters with seedling stock on the planting site should be evaluated and monitored to ensure detrimental impacts to wildlife or plants will not occur. In most cases only 100 tree shelters per acre are used.

When whip or seedlings are used the trees must be visible for inspection in order for release of bond monies. When tree shelters are used the shelters must be removed prior to bond release.

Credit for Landscaping:

Landscaping as defined below can be counted towards the reforestation or afforestion requirements.

1. 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 where appearance is of concern. These areas include high-density residential uses, commercial and industrial uses, mixed use and planned development, and institutional uses.

Evaluation Criteria:

1. The landscape area must be a minimum of 2500 square feet with an average width of 35 feet. Landscape Stock must be 1 ½ to 2 ½ inch caliper at installation. Credit applies only in priority funding areas.

2. Areas adjacent to external roads, property boundaries, site entrances or other highly visible locations are areas for consideration.

3. Areas adjacent to structures on high use activity areas.

4. A transition buffer to a reforestation or afforestion area.

5. Areas adjacent picnic areas, playgrounds or other recreation areas.

6. Such situations as public road setback areas, right-of-way buffers, property line buffers, the edge between residential and non-residential land uses, or the demarcation of rural housing clusters from active farm operations may be suitable for these buffering type plantings.

7. A minimum of 100 trees per acre must be planted. Ground plane must be mulched, ground cover or seeded with native grasses and wildflowers. Turf grass is discouraged. A minimum of five trees species are required.

Provisions for Smaller Tracts.

The following provisions apply to tracts that are one acre or less:

A significant number of smaller development tracts may not contain areas that can be defined as forest. On these tracts, an emphasis should be placed on preserving specimen trees and stands of trees that are valuable for compatibility reasons. A planting of tree cover instead of forest cover will be acceptable for meeting planting requirements.

Afforestation percentages for smaller properties will be calculated in terms of tree cover (canopy at 20 years).

Depending on the size of the tract, planting areas that are 2,500 square feet with a minimum width of 35 feet may be accomplished. Full credit for Forest Conservation requirements for these type of landscaped areas may be granted if the square footage provided in the landscaped cover is equal to the square footage of the required forest or tree cover. Credit applies only in priority funding areas.

Where landscaped areas of 2,500 square feet with a minimum width of 35 feet are not feasible, landscaped areas that are less than 2,500 square feet in size may qualify as credit towards the afforestation/reforestation requirement when contiguous to an existing forest or priority planting area such as streams, steep slopes, wetlands, etc.

The amount of credit applied towards reforestation and afforestation for landscaping on sites one acre or less will vary depending upon whether the plan is designed to establish forest cover or tree cover. Credit is based on either canopy at 20 years for newly planted trees or protected critical root zones for existing trees.

All Landscape Credit Areas must be placed in a perpetual easement.

When Forest Conservation buffers are provided, landscape buffers are not required.

Approved Landscaping

This technique may be used for onsite areas which are 2,500 square feet or larger, and an average of 35 feet wide, and which are landscaped according to the following criteria:

- The planting plan includes long-term management measures to ensure survival of the landscaped area, such as measures to control competition, limit predation, and ensure watering.

- The planting plan must include a canopy, understory, and ground cover, unless criteria for street trees are met.

- Cultivars of species native to the physiographic region may be used along with other species and cultivars as approved by the approving authority.

- When the site is located in a municipality with a tree management plan, an existing population center as designated in a county master or comprehensive plan adopted to conform with the Economic Growth, Resource Protection and Planning Act of 1992, or other area as designated in an approved local forest conservation program, the planting plan may specify street trees which are planted in tree lawns appropriate to the planting site and which meet the criteria below. A tree management plan may include a tree care protection ordinance or a master plan for trees planted in public rights-of-way.

Street Trees

Trees planted with plenty of space for root growth survive longer. Tree lawns credited for planting require long-term protection measures, including protection of areas from street widening and other infrastructure improvements. This may be accomplished by adopting and implementing a local tree management policy.

Urban soils are generally poor growth media because poor fertility, texture, and structure reduce growth rates and stunt trees. Street trees are also subject to stress from drought and pollution. Limited root space further restricts tree growth and longevity. Because roots feed and water the tree, most roots are located within the top two feet of soil. Roots of large trees may occupy up to twice the volume of the tree crown, extending up to 3 canopy diameters from the tree trunk. Many typical street tree planting holes have been less than 20 cubic feet or 3.5 square feet, whereas, a mature 25-inch tree may require at least a 1200 cubic foot or 400 square foot planting space.

However, this does not require that only one tree shall be planted in this area or that the space may not be narrow and linear if necessary to accommodate sidewalks, utilities, and curbs. As a landscape technique, the purpose is to achieve screening, noise attenuation, buffering, air cooling, and particulate filtering. Street trees may be planted in tree lawns under the following conditions:

- A minimum tree lawn width shall be established by mature tree size. Small trees (less than 30 feet tall) will require a tree lawn at least 2.5 feet wide; medium trees (30-45 feet tall) at least 4 feet wide; and large (taller than 45 feet) at least 5 feet wide.

- Spacing intervals of trees should ensure that a continuous canopy will be maintained at or before maturity.

- Only small trees may be planted in tree pits surrounded by impervious pavement. Tree pits for small trees must be a minimum of 4 feet by 4 feet. If larger trees are desired for tree pits, these should be surrounded by pervious surfaces approved by the reviewing authority.

- Credit for planted areas shall be calculated by the size of the mature tree canopy as described for each species and cultivar by Gerhold et al, eds. Street Tree Factsheets, 1993 (see Appendix E).

- Use of an appropriate size shall be determined by site constraints, such as overhead utilities and soil conditions.

- The planting plan, maintenance agreement, and long-term protection shall ensure that a continuous canopy will be maintained by maturity.

Naturally Regenerated Plant Communities

Relatively undisturbed soils, including some areas in past agricultural use, which have a suitable seed bank or other sources of propagules are appropriate for this technique when:

Physical and biological conditions exist within the central Maryland region to regenerate forests. It is important to take into consideration a number of factors for a successful project.

DESCRIPTION:

Cleared areas that are prepared and managed to encourage the regeneration of forest through natural recruitment by seed bank, wind disseminated seed, or clonal sprouting. Natural regeneration is appropriate for areas such as abandoned fields where natural regeneration is occurring and/or where fields set aside for natural regeneration have the necessary criteria for successful establishment of a forested community.

QUALIFICATION EVALUATION CRITERIA:

1. 50% of the proposed site must be within 100 feet of an existing forest dominated by greater than 75% native tree species.

2. Site must have less than 25% non-native woody species. If the site is dominated by non-native herbaceous species, then steps must be taken to eradicate these species prior to allowing for natural regeneration.

3. Physical conditions (soils, sunlight, moisture, etc.) are suitable for natural regeneration.

REQUIREMENTS:

1. A plan with a **detailed** description of the following is required:
    1. Description of the site, including a list of any trees and shrubs, including invasive species, on the site.
    2. Description of the existing adjacent forest, including a species list.
    3. The characteristics of the seed source.
    4. Slope and aspect of the site.
    5. Definition and delineation of site soils, including parent material, depth and moisture capacity.
    6. 10 - 1/1000 acre random sampling plots per acre with brief description of plots (trees, shrubs & dominant herbaceous plants). Sampling pots must be located on the plan.
    7. Once the sampling method has been determined, sample plots must be marked in the field for monitoring purposes.
    8. Description of the method of regeneration.
    9. Method of site preparation proposed (seeding, discing, subsurface tillage, etc.), note; bare soil must be exposed.
    10. Target forest association being designed.
    11. Must be prepared by a Maryland Registered forester

2. Construction equipment and general access must be prohibited from this area through signage, fencing and plan delineation.

3. A 36-month management program is required. If the required survival standards are not reached by the end of the 36-month period (1000 trees per acre), the monitoring period will be extended one additional year. If the natural regeneration fails within 5 years of the initial inspection, the site must be planted in accordance with Chapter 3 of the Carroll County Forest Conservation Ordinance. (A one-year inspection will not be required for natural regeneration).

4. Bonding of the site is required. If the site does not meet the required standards at 24 months, 50% of the bond may be released if the quantity of trees present are determined to be sufficient to meet the 1000 tree per acre requirement within one additional year.

5. A perpetual easement is required for all areas of natural regeneration.

6. A written report submitted by a Maryland Registered Forester verifying that there are 1000 trees per acre within the regeneration area is required for final approval and bond release.

Treatment of regeneration sites is extremely species and site specific. Therefore, it is required that a professional forester prepare the plan. Management and monitoring of these areas should be intensive. A progress report will be submitted at the 18 month period with final report due at the end of the 36 month period, both of which shall be prepared by a professional forester… Alternatively, a agreement period may be extended to ensure that tree density will be 1000 stems per acre after 7 years,…

The 3-year monitoring and management agreement must include supplemental planting to ensure a density at the end of the period of at least 350 tree seedlings per acre. Alternatively, the agreement period may be extended to ensure that tree density will be 1000 stems per acre after 7 years. Measures for controlling competition and predation when appropriate must also be included.

In addition to this method, broadcast seeding of appropriate tree species may be used.

Additional Planting Techniques

In some circumstances, under an approved maintenance and monitoring agreement, planted and naturally regenerated areas may be carefully managed to promote long-term forest creation. Structural composition of a forest as well as species composition is important. A forest canopy will determine the microclimatic conditions for understory growth. Techniques for creating a forest structure may include:

- Plant canopy trees in ultimately desired densities and proportions; mulch the ground beneath and around the trees; plant desired midstory and understory trees immediately.

- Plant and mulch canopy trees, plant drought-tolerant ground cover or let weeds grow, and add or encourage natural invasion by woodland understory and midstory as shade develops.

Basic Planting Plan Elements

Species Selection

Species native to the physiographic region of the state should be used unless a planting plan using landscaping techniques specifies cultivars or alternatives approved by the approving authority. Alternatively, plant selection may be established under an approved Forest Stewardship Plan or other forest management plan. Locally acclimated and genetic stock is preferred for hardiness and disease resistance as well as to conserve existing local genetic stock. Selection may be based on the forest association for the planting site, using the information collected in the Forest Stand Delineation or through adjacent forest communities. Forest associations have been described by Brush et al (1980) and by Eyre (Society of American Foresters, 1980).

Plant Stocking

Minimum densities at planting and at the release of the 3-year maintenance and monitoring agreement for types of stock are shown in **Figure A:1.** When planting a combination of sizes and stock types, these requirements may be prorated. The densities and spacing calculations do not imply that plants should be installed in a grid pattern. Plants grouped in clusters, random, or associated patterns may imitate natural forest establishment.

Site Preparation

Proper installation in undisturbed soils may not require extensive site preparation. When soils have been compacted, or organic or topsoil layers have been removed by grading, treatment will be necessary. Reserve topsoil should be replaced in the planting area. If supplemental fill is required, it may be mixed with the reserved topsoil. Nutrient, organic matter, soil texture, and other analyses may be required to evaluate soil amendments or treatments. Prevailing soil moisture conditions and changes in hydrology should also be evaluated for the proposed planting techniques. The proposed grading plan, prior site analysis, and onsite assessment will be important to this evaluation.

Standards for Trees Planted Adjacent to Electric Utility Rights-of-Way[1]

1) Any trees planted within 15 feet from the center of the distribution pole line (<69 kilo volts) shall conform to the recommended tree list for trees that grow less than 25 feet at maturity (Green Zone)[2]. Trees that do not conform to the recommended list for this planting zone may be removed at the sole discretion of the utility.

2) Any trees planted in the area beginning at the 15-foot line, up to 40 feet from the center of the distribution pole line should not have a mature height exceeding 40 feet (Yellow Zone)[2].

3) Utilities have the right to mitigate hazard trees that may be situated at any distance from the overhead lines that may have potential to damage said lines. This mitigation may be performed either by trimming or through complete removal of the tree. Hazard tree determination and mitigation technique selection will be at the sole discretion of the Utility.

4) Any trees that are allowed to regenerate to satisfy Forest Conservation Act or other vegetation enhancement requirements shall conform to the requirements noted in items 1 through 3 above. This document shall be appended to the County-approved Forest Management Plan, Declaration of Covenants, Conditions and Restrictions and within any duly recorded easements that may encumber the property through which the Utility easement(s) or pole lines are situated.

Protection Devices

To prevent damage to planted areas, post all reforestation and afforestation sites with appropriate signs and fences (Appendix D). Construction equipment must not enter planting areas.

3.3.3 FOREST HARVEST APPROVAL REQUIREMENTS

Development activities in Carroll County are subject to a series of environmental protection ordinances prior to initiation. Land development and subdivision are subject to the requirements of Forest Conservation, regulated under Chapter 115 of the Code of Public Local Laws and Ordinances for Carroll County. Under that code forest resources are protected during construction by the application of management practices and after through retention and replacement requirements. After development a protective easement is placed over the existing and added forested land. Grading, Erosion and Sediment

[1]Note that these recommendations are applicable to Screen, Buffers and Landscape Plantings as well as Forest Conservation Areas.

[2] Street Trees Fact Sheet/Penn State University/Planting Zones BGE Tree Planting Guide

Control is regulated under Chapter 121 of the Code of Public Local Laws and Ordinances for Carroll County.

Forest protection and conservation concepts are not in conflict with the practice of performing environmentally sensitive forest harvests. Properly executed harvests can improve a wood lot and enhance its ecological function while allowing the property owner to benefit from the resource financially. This is especially true if the land is destined for development as a sensitive harvest performed ahead of land development can result in improved conditions for wooded home sites. This fact allows the performance of harvests both in conjunction with development and after on land protected by protective easements.

Bear in mind that commercial forest harvest activity not associated with development is exempt from the requirements of the Forest Conservation Ordinance under most circumstances. However, the harvest activity is still subject to the other plan approval and permit requirements. The following outlines the different categories of forest harvest and the procedures that must be followed in each case. Most require a combination of approvals by Carroll County Government, the Carroll County Soil Conservation District (SCD) and the Maryland Department of Natural Resources (DNR):

1. Commercial forest harvests - Forest harvest activities that are not associated with development are exempt from the provisions of the Forest Conservation Ordinance provided that the land owner signs a Declaration of Intent stating that development is not intended for a seven year period or, if a Forest Management Plan prepared by a Maryland Licensed Forester is developed for the entire tract that utilizes Best Management Practices that encourage the growth of forest resources is filed with the County or, if the harvest involves a site that includes less than five acres of contiguous forest and the property owner is able to certify that 70 s.f. or greater of residual basal area will remain after the harvest that, at a minimum, meets the definition of a forest included in this manual. See the Code of Public Local Laws and Ordinances of Carroll County Maryland, or if a Timber Commercial Loggers must hold valid Maryland Forest Product License.

   Timber harvests retaining less 70 ft. of basal area will be permitted when silvicultural requirements within the stand justify dropping below this stocking level. This justification must be included in form of a Timber Harvest Plan.

   If the DOI option is taken, and any development occurs within that seven year period, then the developer would be subject to the requirements of the Ordinance and compliance would be based on the pre-harvest forest resource. This should only result in the planting of new forest if clear cutting were part of the harvest (Note: clear cut activities always require the filing of a Declaration of Intent). Commercial harvests also require erosion and sediment control plan approval by the SCD (see below) and the issuance of a grading permit by Carroll County. Commercial loggers must also be registered with the DNR.

   Any development that occurs on property after a harvest, regardless of whether or not the activity is within the five year Declaration of Intent period, would be subject to the requirements of the Forest Conservation Ordinance. The property is not exempt from the Ordinance, merely the forest harvest activity.

2. Forest harvests on land covered by a Forest Conservation Protective Easement - The protective easement that is placed over the forested land in compliance with the Forest Conservation Ordinance does allow for selective harvests to be performed. In this case a Forest Stewardship Management Plan must be prepared and the harvest must be performed under the supervision of a registered Forester. The FSMP will include a detailed timber harvest plan and will be reviewed by the Carroll County Forestry Board (COMAR 08.19.05.02F). The harvest will also have to be approved by Carroll County, an erosion and sediment plan would have to be approved by the SCD, and a grading permit issued by Carroll County. Post harvest basal area, trees per acre and stocking percentage must be within 70 feet of basal area based on species composition and stand condition.

3. Forest harvests on land intended for development - A third category allows developers to conduct a pre-development forest harvest as long as certain standards are adhered to. The harvest of forest resources is allowed on sites prior to the initiation of any development activities. This type of harvest may either be performed directly in conjunction with and coincidental to development activities, i.e clear cutting of road, utility and building sites with a select harvest being performed in other areas, or a select harvest may also be performed on a known development site as much as several years before the initiation of development activities. In both cases procedures must be followed tailored to the individual situation:

   a. Whether the harvest is performed in conjunction with or coincidental with development the applicant must survey the site and submit a Forest Stand Delineation (FSD) to Carroll County in compliance with requirements in this Manual, fully describing the site including the on-site forest resources. Compliance measures required by the Forest Conservation Ordinance required at the time of development will be based on that delineation. Pre-harvest conditions must be outlined including basal area, dominant class size, dominant tree species, age, trees per acre as well as the percentage of acceptable and unacceptable growing stock. The FSD must also include all of the other information required by the Carroll County Forest Conservation Technical Manual including the location of specimen trees. Consideration will be given to the condition of the site forest when making the approval decision. Forested site that fall below fully stocked or will not be approved for a pre-development harvest.

   b. If the harvest is done coincidental with development and only involves the removal of forest to allow for the placement of roads, utilities and the clearing of home or building sites, then the harvest activity must be clearly outlined in the Forest Conservation Plan along with other approval requirements. At the time of harvest the Erosion and Sediment Control Plan as well as the approved Forest Conservation Plan and grading permit for the development suffice as the approvals for harvest. No Declaration of Intent is required.

   c. If the harvest is to occur prior to the development or if a harvest is proposed on forested land that will be retained and protected then a Phase I Forest Conservation Plan (FCP) must first be developed that includes the following:

      (1). The approved FSD (prepared to the standards in the Forest Conservation Technical Manual),
      (2). Development of a Resource Management Plan based on DNR standards,
      (3). A post harvest description of the forest resource that includes basal area, dominant class size, dominant tree species, age, percent stocking, percent acceptable and unacceptable growing stock and trees per acre to remain,
      (4). An approved Erosion and Sediment Control Plan showing the location of main haul roads, landings, buffer areas, and any special conditions,
      (5). A narrative of the type of harvest proposed and why it will result in a better forest condition for the proposed development.
      (6). Any available information on the future development proposal.

   Approval of the harvest is only achievable if the post harvest conditions indicate an increase in the percent residual acceptable growing stock. Remaining forest stands must be 70 sq. ft. after the harvest unless under the management of a Forest Management Plan.

   Note also that the removal of any specimen trees must be substantiated as necessary and warranted.

After the harvest is complete it is required that the project Forester certify that the condition of the site is within the specifications approved in the Phase I FCP as being at least 70 sq. ft. by indicating post harvest basal area, trees per acre and percent stocking.

A select harvest that results in best growth and management improves the health of the remaining woodland as a whole by increasing the percent residual acceptable growing stock. When approving such harvest proposals it will be incumbent upon the applicant to prove that such an improvement will result.

The Phase I Forest Conservation Plan will be amended in the future when development plans are submitted for approval. It will, however, remain as a part of the final approved FCP. Harvest and Management plans must be developed to DNR standards.

Pre-development forest harvests must 1) be one that is within acceptable specification considered by the DNR to be resource sensitive, 2) results in an increase in the percent residual growing stock, 3) maintains a viable forest resource as well as healthy specimen trees, and 4) must provide for retention of Forest with minimal forest clearing.

Grading, Erosion and Sediment Control Plan Approval - In addition to that outlined above, all commercial forest harvest activities are also require the approval of an Erosion and Sediment Control Plan by the SCD and must also obtain a Grading permit from the Carroll County. The following outlines the procedure followed by the Soil Conservation District (SCD) in establishing the need for erosion and sediment control plan approval to forest harvest activities. The SCD has determined that an Erosion and Sedimentation Control Plan must be approved and implemented for commercial forest harvest activities. That action also triggers the need for a Grading permit in order that proper record keeping can be followed and enforcement maintained.

References - Management practices for Forest Harvest are outlined in the manual Maryland's Erosion and Sediment Control Standards and Specifications for Forest Harvest Operations, prepared by the Maryland Department of the Environment and the Maryland Department of Natural Resources, Forest Service. Erosion and Sediment Control practices for development activities are outlined in the Maryland Standards and Specifications for Soil Erosion and Sediment Control published by the Water Management Administration of the Maryland Department of the Environment in conjunction with the SCD. The plan must outline the location of haul roads, landings, and buffers and illustrate the control measures proposed for the harvest.

1. All commercial forest harvest activities are subject to the Code of Public Local Laws and Ordinances for Carroll County, Chapter 121, Grading and Sediment Control. This code requires activities that disturb 5,000 square feet of land area or more to gain plan approval from the SCD, secure a grading permit. If no plan approval is required then the other requirements are not triggered. Regarding forest harvest the SCD has been interpreting 5,000 square feet of disturbance to be equal to 20 trees per year per site. They qualify the requirement further by stating that the land in question must be large enough to support the removal of those 20 trees without consequence to the forest. Each determination is interpreted individually.

2. If the harvest is associated with and coincidental with development that then a separate plan approval is not required. Protective measures for forest harvest are integrated into overall site development controls. One grading permit will also suffice.

3. If the harvest is associated with development but is to be performed prior to any development activity then a separate plan approval and grading permit is necessary, first for the forest harvest and later for the development.

3.4 Maintenance and Monitoring

Newly planted trees and forest plant communities, regardless of the planting technique used, have some basic needs, primarily water and nutrients. They also need protection from competing vegetation (Figure D:22) and damaging agents such as predators, pests, and diseases. Some of these needs can be met by existing site conditions, others may require human intervention. The basic maintenance regime should be evaluated using baseline site environmental conditions, especially soil structure, nutrients, 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. These needs are illustrated in **Figure 3:11**.

Each Planting Plan shall include a binding minimum 3-year maintenance and monitoring agreement. This should detail how planted areas under the approved FCP will be maintained or monitored to ensure protection and satisfactory establishment, subject to inspection by the County, by the end of the term of the agreement.

3.4.1 Elements Required in Maintenance Agreements

Each maintenance agreement shall include:

- An **assessment** of existing conditions and needs for:
  - water
  - nutrients
  - control of competing vegetation
  - protection from disease, pests, predators and mechanical injury
  - reinforcement planting provisions if survival falls below required stocking levels (Figure A:18), and
  - other treatments if required for specific planting techniques (Section 3.3).

- A **plan** to conduct the needed treatments and monitor results.

- **Evidence** of legal right to implement the agreement on the selected planting site.

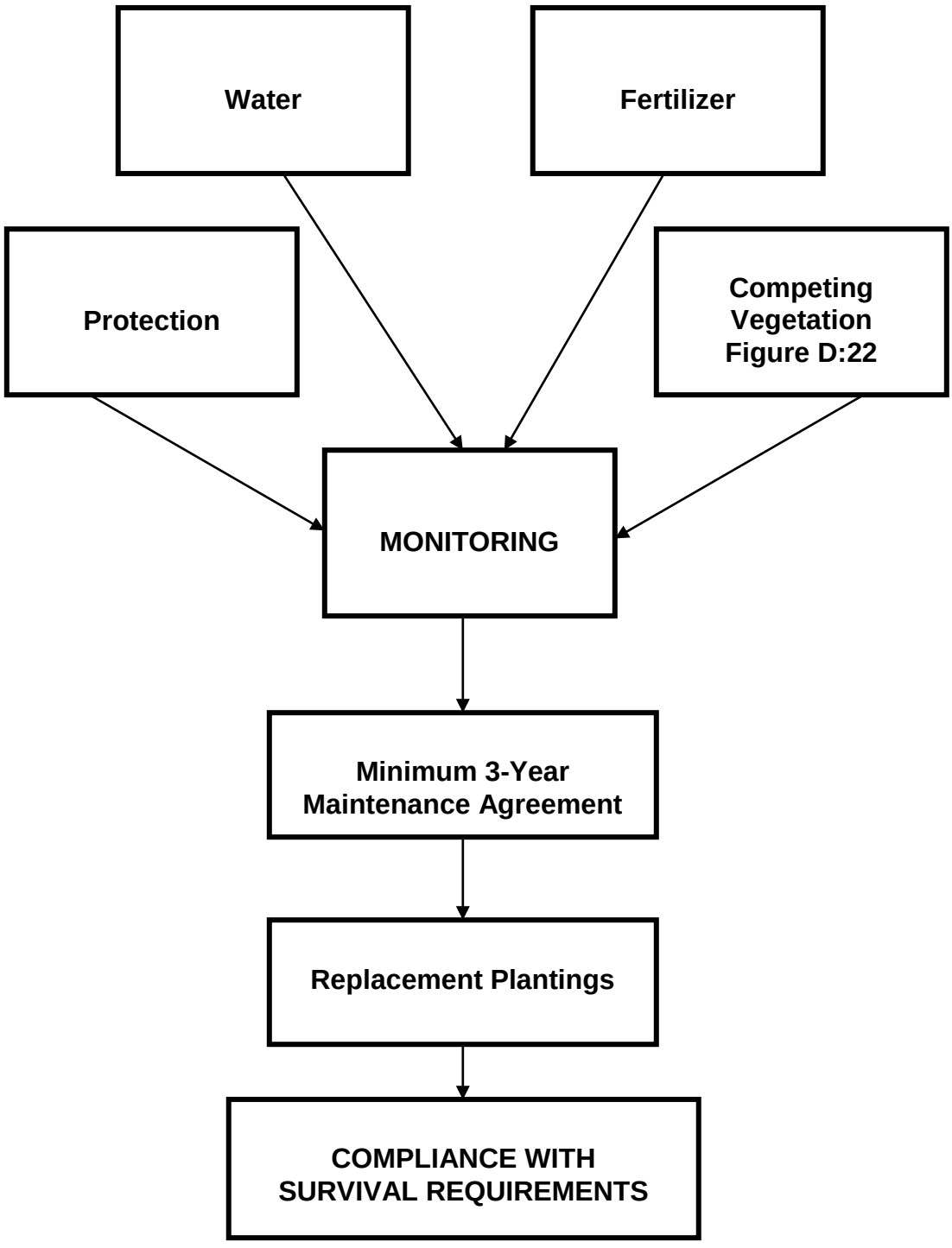
- **Certification** or agreement by a party responsible for care and monitoring. This certification is required for final FCP approval and shall be binding on the parties concerned. The applicant may be listed if a contractor is not.

- The **County** as a signatory or third party beneficiary of the agreement.

- Provision for **access and inspection** by the County.

- **Financial security** as approved by the County.

Release of the agreement and financial security will require evidence that a long-term protection agreement (Section 3.2) is in place for the site.



Maintenance Process | **Figure 3:11**

3.5 Enforcement of Forest Conservation Plans

The following summarizes FCP enforcement by Carroll County.

3.5.1 Inspections

Carroll County conducts field inspections of a site that is subject to a FCP. The timing of inspections shall be referenced in the construction sequence and planting plan included in the FCP. Forest Conservation inspections may be conducted concurrently with inspections to ensure compliance with sediment and erosion control regulations. Violations may result in penalties as outlined below.

- Where disturbance occurs within 50 feet of Forest Retention Areas during construction, an inspection occurs before construction begins to ensure that forest protection devices have been installed properly and retention areas are clearly marked. This inspection shall occur before any forest clearing is done. The applicant shall schedule this meeting when all forest protection devices are in place and ready for inspection.

- A second inspection follows completion of all construction activities to ensure compliance with the provisions of the FCP. Again, the applicant shall schedule this inspection with the County.

- Additional inspections may be required to ensure that a Planting Plan is successfully implemented.

- Other inspections or meetings may occur at the request of the County to ensure the FCP is implemented.

- Trees/shrubs must be visible at the time of inspection.

3.5.2 Penalties for Violation

Revocation of an Approved FCP

The County may revoke an approved FCP for cause, including violation of conditions of the plan, obtaining a plan approval by misrepresentation, failing to disclose a relevant or material fact, or change in conditions.

Stop Work Order

The County may issue a stop work order against an applicant who violates any provision of an approved FCP. The stop work order may remain in effect until the violation ceases and corrective action to restore or reforest the area takes place.

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Noncompliance Fees

An applicant that is found to be in noncompliance with an approved FCP may be assessed a penalty by the County. This may be at a minimum of 30 cents per square foot of the area found to be in noncompliance.

Violation of FCP

An applicant who violates the provisions of an approved FCP is liable for a penalty not to exceed $1,000 for each day a violation continues.

3.5.3 Appeal of Enforcement Action

A person who wishes to file an appeal must do so in accordance with Section 115-17 of the Carroll County Maryland Code of Public Local Laws and Ordinances.

3.5.4 Amending a FCP

After the FCP has been reviewed and approved, the applicant may request to amend it by submitting the amended plan to the County for review and approval. If grading, clearing, or other activities not approved by the approved FCP are conducted before the amended plan is approved, the applicant will be considered in violation.

The County may request an amended plan when a violation occurs. This amended plan may include post-construction forest and tree protection practices (Section 3.2) or additional planting to mitigate the violation.

Chapter 4

Linear Projects

Contents:

4.0 Introduction
4.1 Linear Projects
4.1.1 Forest Stand Delineation Requirements
4.1.2 Forest Conservation Plan Requirements
4.1.3 Selective Clearing and Supplemental Planting

4.0 Introduction

Some types of projects may require alternative procedures from those which have been described in the Manual. Following is a brief discussion of alternatives and conditions under which these may be used.

4.1 Linear Projects

These are projects whose configuration is elongated with equally parallel sides and used to transport a utility product or public service not otherwise contained in an application for subdivision, such as electricity, gas, water, sewer, communications, railways, county roads, and other vehicular distribution systems. Such projects may traverse fee simple properties through defined boundaries or through easement rights.

Examples of linear projects include a public sewer line installation, County Roads, some overhead electric transmission line installations, or a local transit line for rail service. However, when the proposed development also includes locations for stations, parking lots, or other uses with a relatively polygonal layout, the alternative procedures will apply to the linear portion only. In this case, the project will be divided into the two types and the relevant procedures applied accordingly.

A linear project which does not result in the cutting, clearing, or grading of more than 20,000 square feet of forest or forest that is subject to an approved forest conservation plan, is exempt from Chapter 115. Those linear projects which require Public Service Commission approval and highway construction activities subject to Natural Resource Article 5-103 are exempt. Applicants are advised to verify specific program standards for any project.

4.1.1 Forest Stand Delineation Requirements

Simplified Forest Stand Delineations may be submitted for approval on linear projects to determine if sufficient forested area is proposed for disturbance to require submission of a Forest Conservation Plan. In addition, Simplified Forest Stand Delineations may be submitted when:

- The proposed disturbance area is less than 40 feet wide and 120,000 square feet in area and no priority forest or priority retention areas are disturbed, or

- Alternative routes are being considered in studies to support an application for a Certificate for Public Convenience and Necessity.

A Forest Stand Delineation shall be submitted on a minimum project area extending 100 feet from the right-of-way centerline or 50 feet outside the proposed limit of disturbance if the right-of-way is wider than 100 feet.

4.1.2 Forest Conservation Plan Requirements

The net tract area shall be calculated using the area of the right-of-way, new access roads and storage, the limits of disturbance as shown on an application for sediment and erosion control approval, or as shown in an approved capital improvements program project description.

Linear projects, such as overhead utilities above an agricultural area, which do not result in a change of land use or land disturbing activities do not require afforestation. However, any forest cleared for construction or maintenance shall be cleared in conformance with Best Management Practices and protection measures as approved in a Forest Conservation Plan.

Forest conservation thresholds for linear projects shall conform to the thresholds specified for institutional uses.

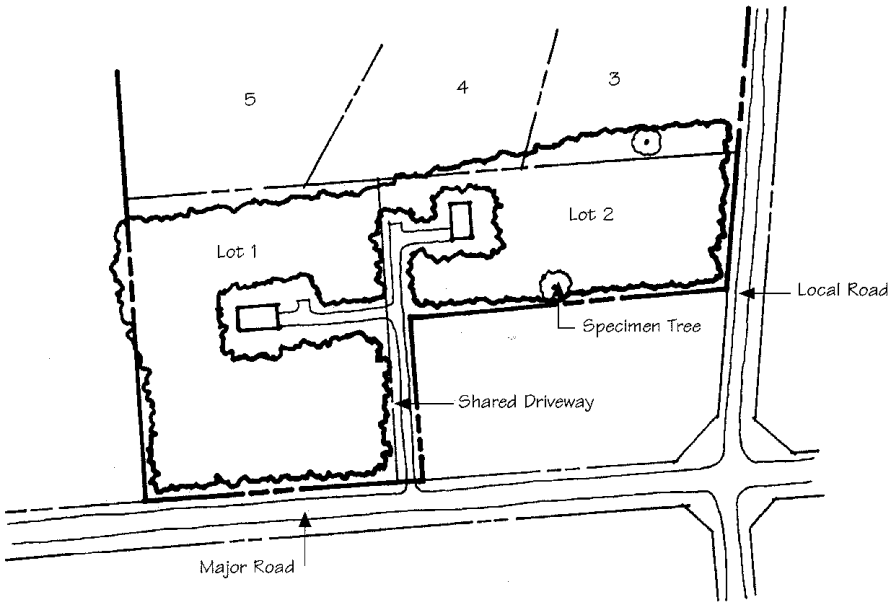
4.1.3 Selective Clearing and Supplemental Planting

This technique for planting may be proposed after all priority areas have been retained or the applicant has satisfactorily demonstrated that these areas cannot be left undisturbed. The following criteria shall apply:

- The Forest Conservation Plan includes a long-term protection agreement which may consist of a long-term management plan approved by the approving authority for all Forest Retention Areas.
- The Planting Plan includes measures for long-term management based on approved Best Management Practices and minimization of further forest disturbances; and,
  - for overhead utilities, the height of existing trees exceeds that allowable for safety during construction or during long-term management; or,
  - for underground utilities, plant surface roots are not disturbed within the Forest Retention Area by using tunneling or other methods.

APPENDIX A

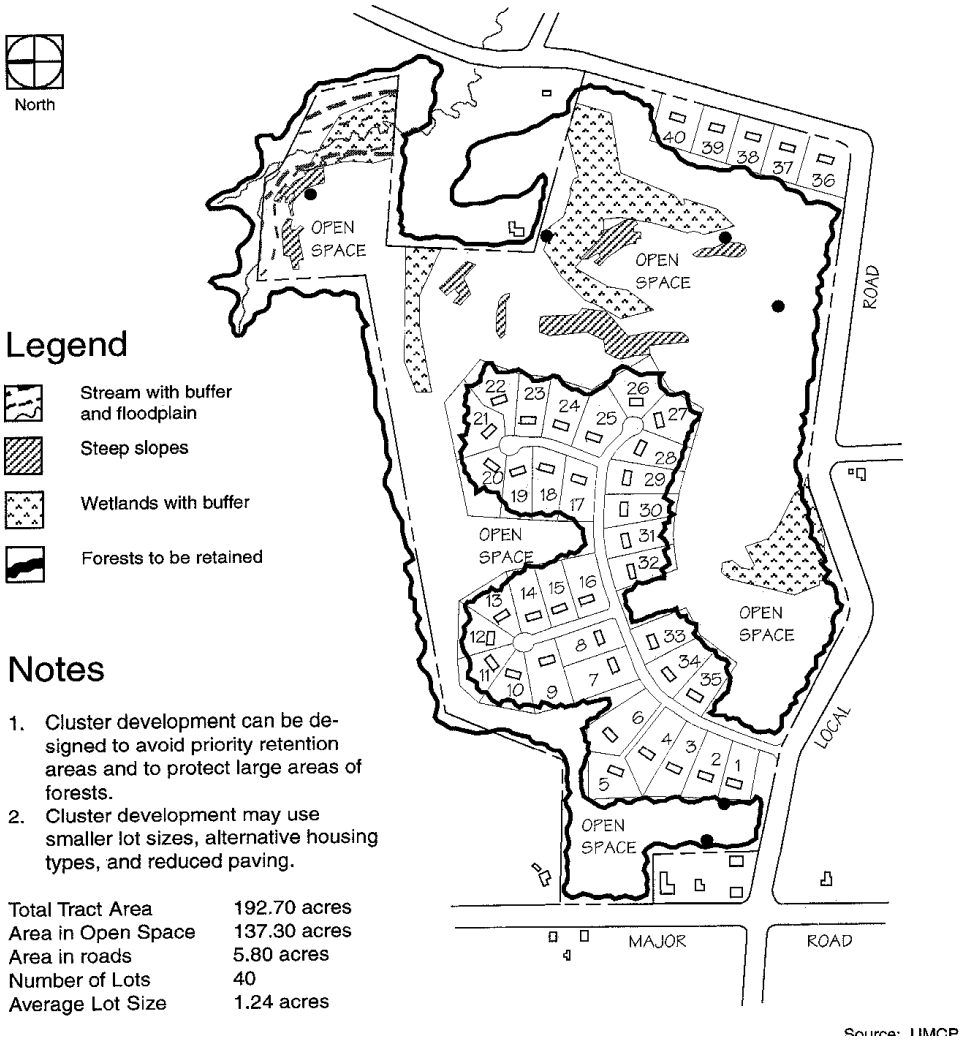
Illustrations



Notes:
1. Site plans can be designed to minimize the total acreage of disturbed forests.
2. Clearing for homes on forested lots should be limited to the area needed for home construction and grading, particularly where priority forests are involved.
3. Shared driveways can be used to limit forest clearing.
4. Forest clearing and/or retention on sewage reserve areas must meet local and state health code regulations. The maximum area need not be cleared immediately.

Source: UMCP

Site Clearing	**Figure A:1**



Legend

- Stream with buffer and floodplain
- Steep slopes
- Wetlands with buffer
- Forests to be retained

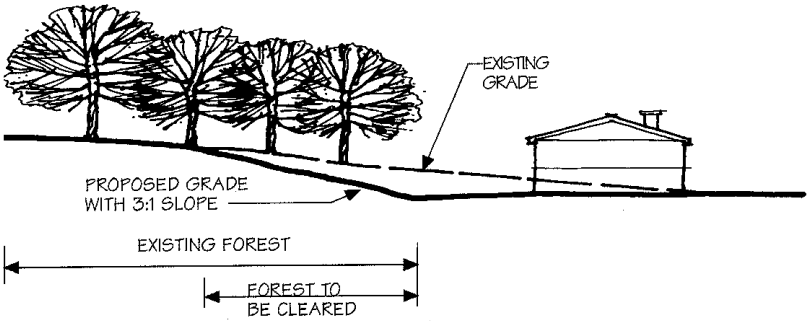
Notes

1. Cluster development can be designed to avoid priority retention areas and to protect large areas of forests.
2. Cluster development may use smaller lot sizes, alternative housing types, and reduced paving.

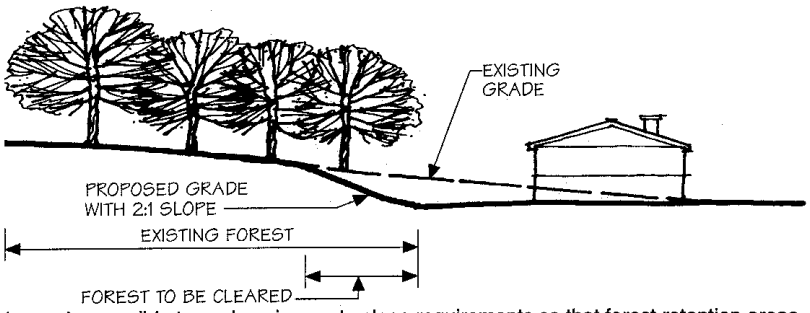
Total Tract Area	192.70 acres
Area in Open Space	137.30 acres
Area in roads	5.80 acres
Number of Lots	40
Average Lot Size	1.24 acres

Source: UMCP

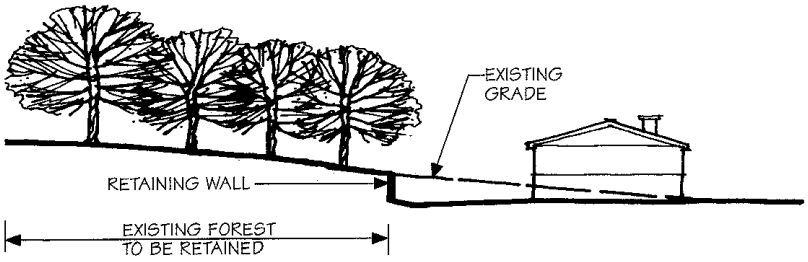
Cluster Development Plan | **Figure A:2**



Site grading may result in unnecessary loss of forests.



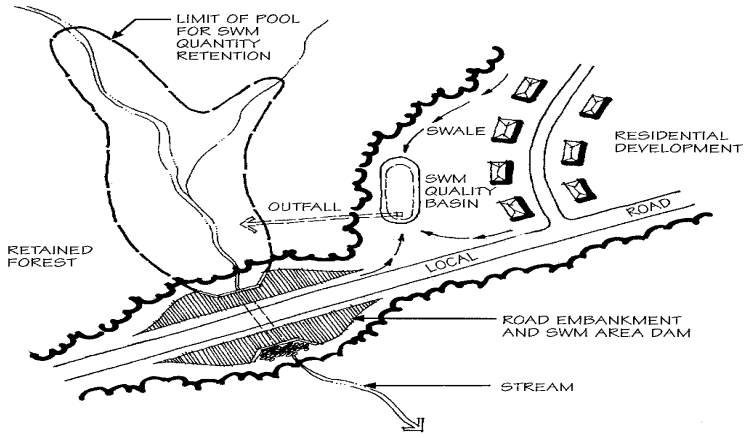
It may be possible to seek variances to slope requirements so that forest retention areas can be increased.



Consider utilizing retaining walls so that forest retention areas can be increased.

Source: UMCP

Grading	Figure A:3

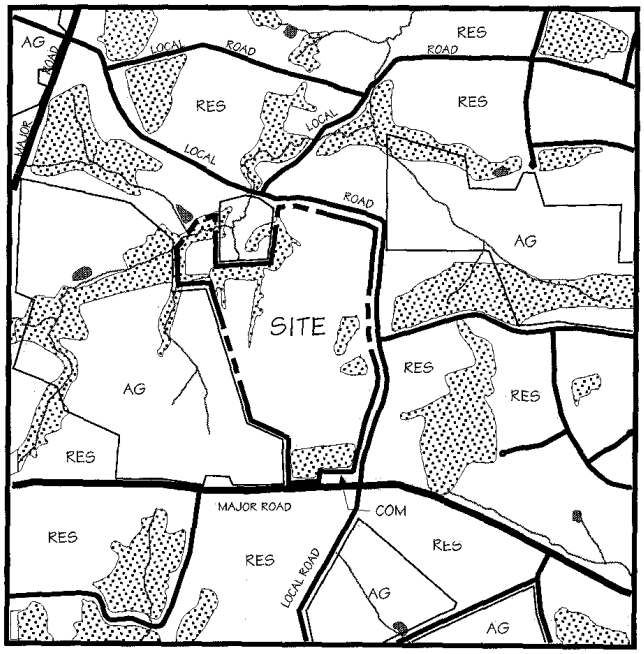


Notes

1. Stormwater management areas can be designed to minimize forest clearing and to incorporate the natural filtering capacities of forests and wetlands into the design.
2. The stormwater quality management basin is designed to remove silt, sediment, and other pollutants prior to discharge of runoff into the forested stormwater quantity management area.
3. Stormwater is detained in the forested area for a brief period of time prior to being released downstream. Floodplains and palustrine forest wetlands may tolerate innundation (extended detention) for up to 24 hours.

Source: UMCP

Stormwater Management	**Figure A:4**



Legend

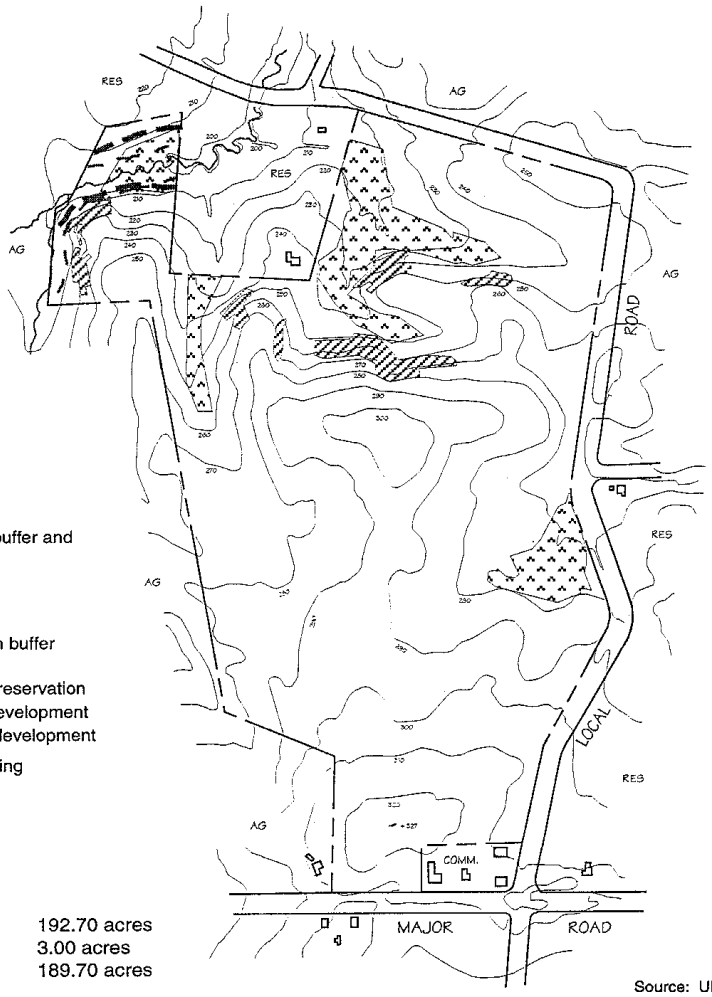
- Forests
- Streams and Pond
- AG — Agricultural Land Use
- RES — Residential Land Use
- COM — Commercial Development

North

Source: UMCP

Site Vicinity Map | **Figure A:5**

North



Legend

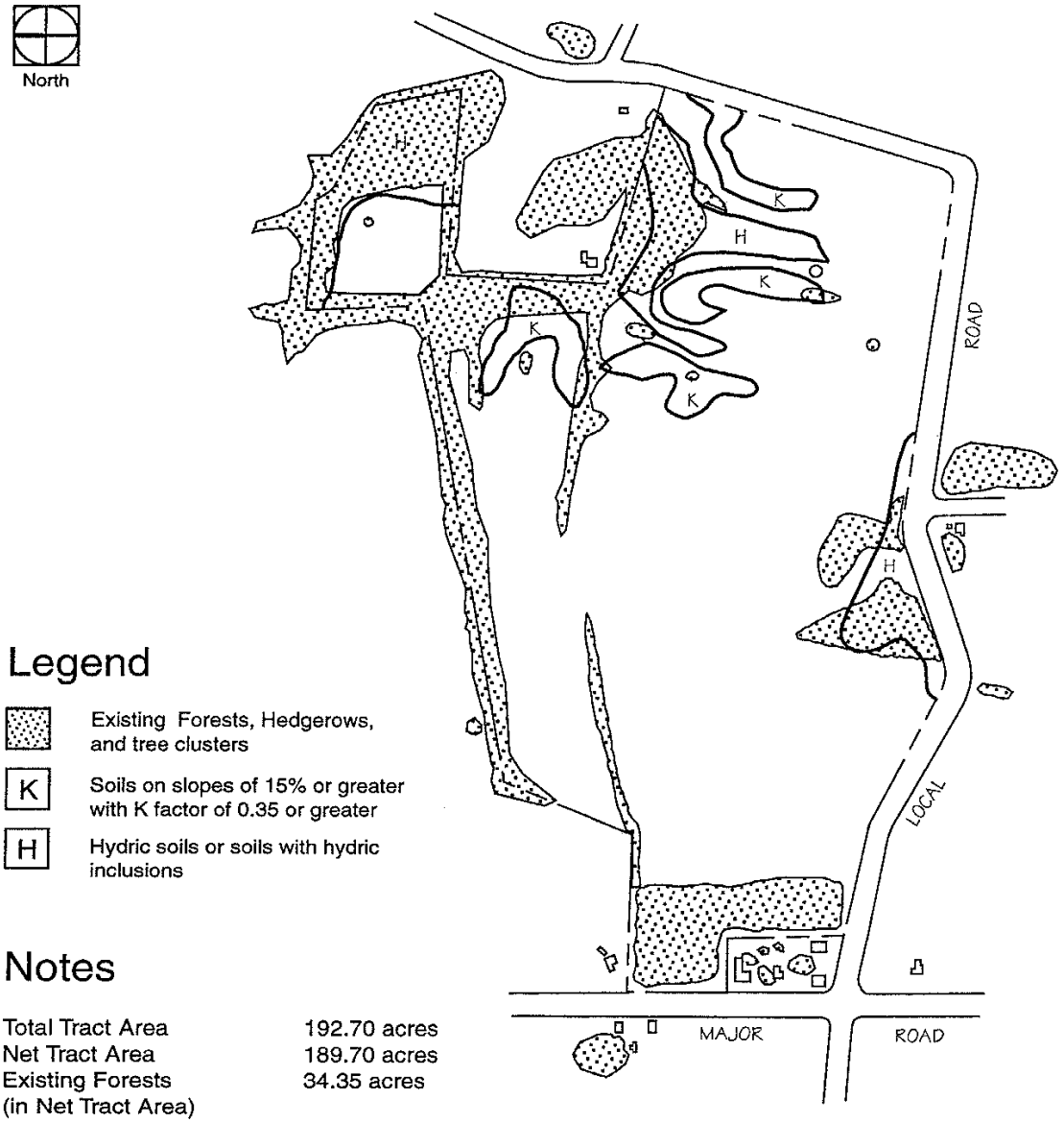
- Stream with buffer and floodplain
- Steep slopes
- Wetlands with buffer
- AG — Agricultural preservation
- RES — Residential development
- COMM — Commercial development
- Existing building

Notes

Total Tract Area	192.70 acres
Flood Plain Area	3.00 acres
Net Tract Area	189.70 acres

Source: UMCP

Preliminary Environmental Features Map | **Figure A:6**



Legend

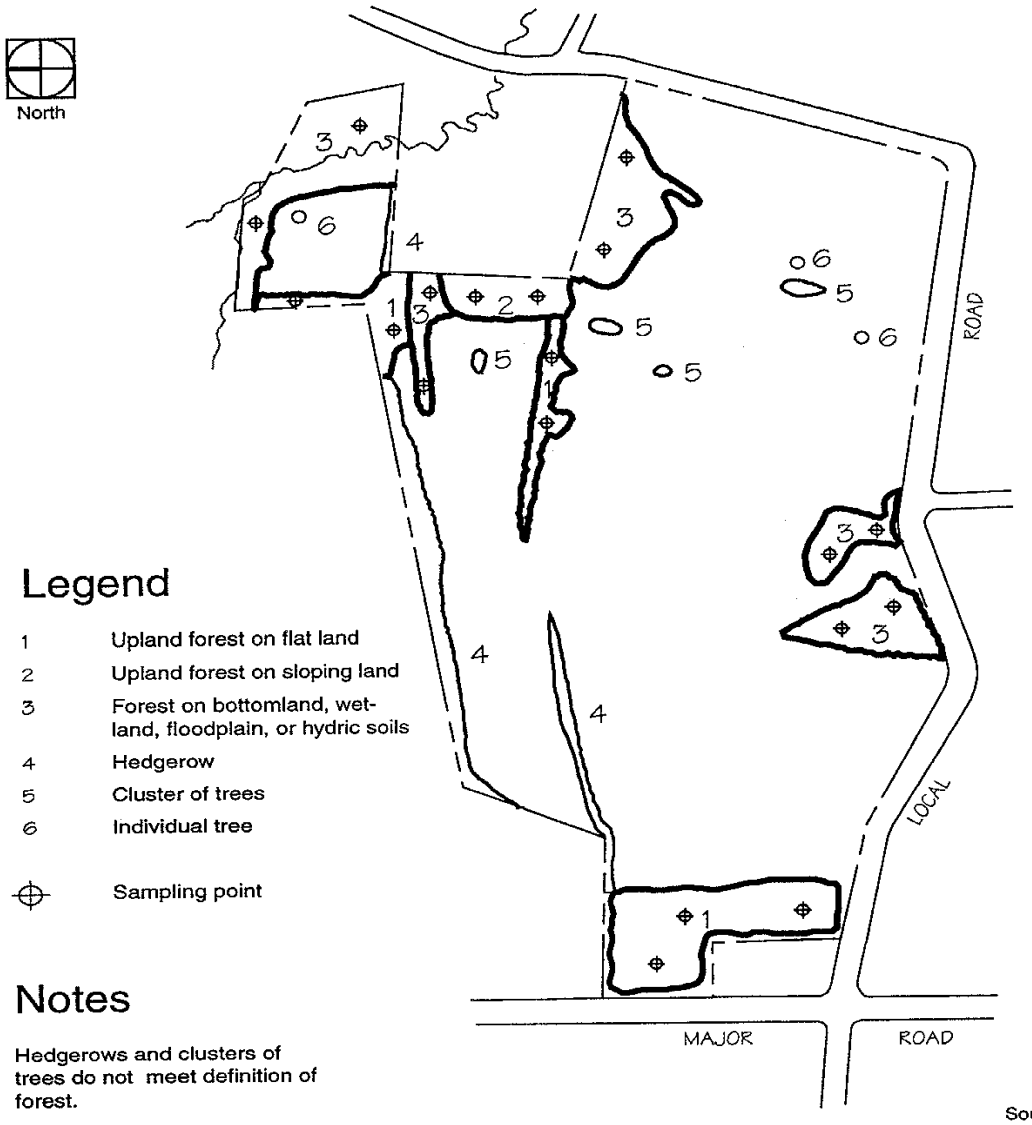
- Existing Forests, Hedgerows, and tree clusters
- K — Soils on slopes of 15% or greater with K factor of 0.35 or greater
- H — Hydric soils or soils with hydric inclusions

Notes

Total Tract Area	192.70 acres
Net Tract Area	189.70 acres
Existing Forests (in Net Tract Area)	34.35 acres

Source: UMCP

Soils and Vegetative Cover Map — **Figure A:7**



Legend

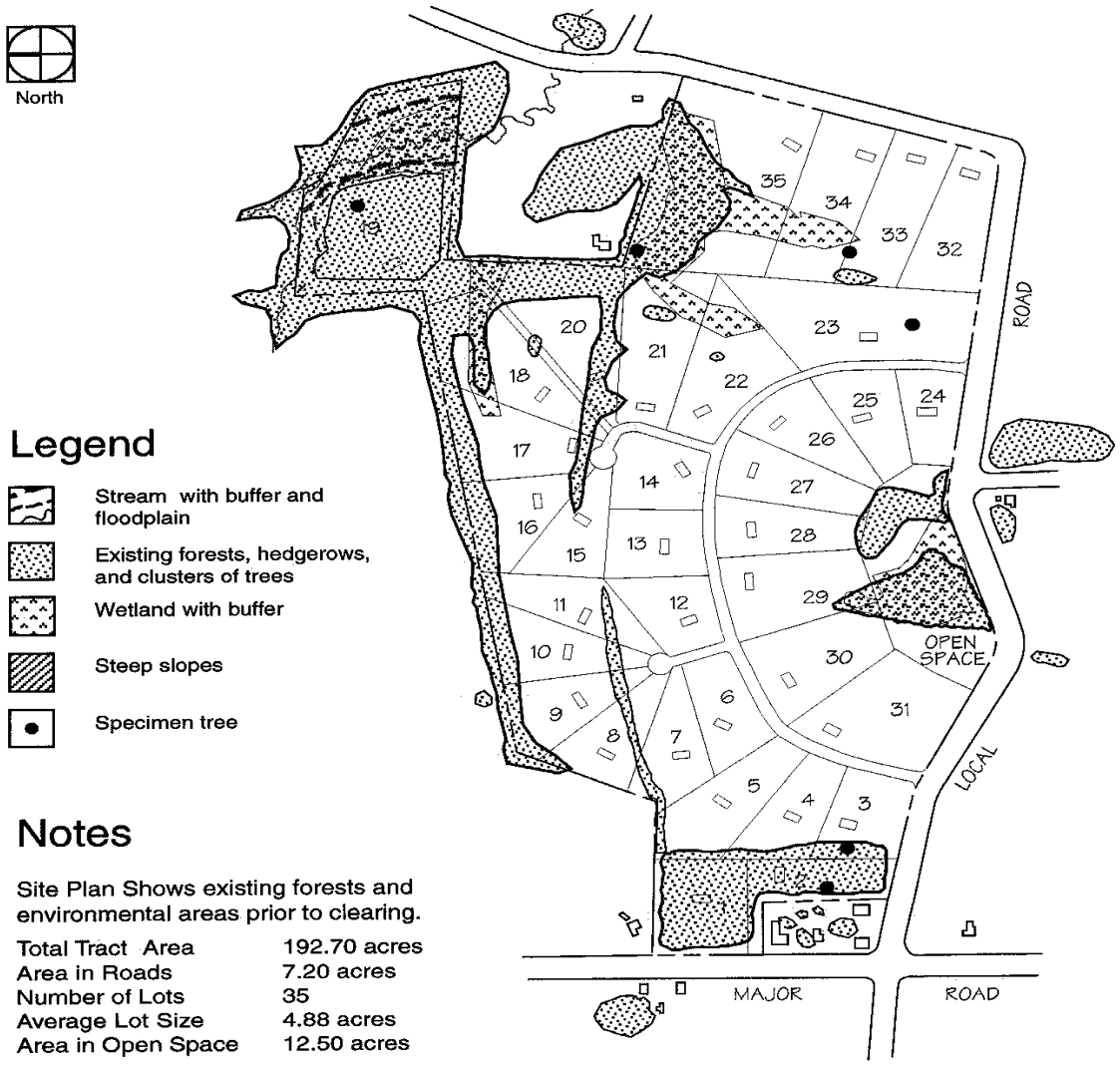
1	Upland forest on flat land
2	Upland forest on sloping land
3	Forest on bottomland, wetland, floodplain, or hydric soils
4	Hedgerow
5	Cluster of trees
6	Individual tree
⊕	Sampling point

Notes

Hedgerows and clusters of trees do not meet definition of forest.

Source: UMCP

Preliminary FSD Map with Sampling Locations | **Figure A:8**



Legend

- Stream with buffer and floodplain
- Existing forests, hedgerows, and clusters of trees
- Wetland with buffer
- Steep slopes
- Specimen tree

Notes

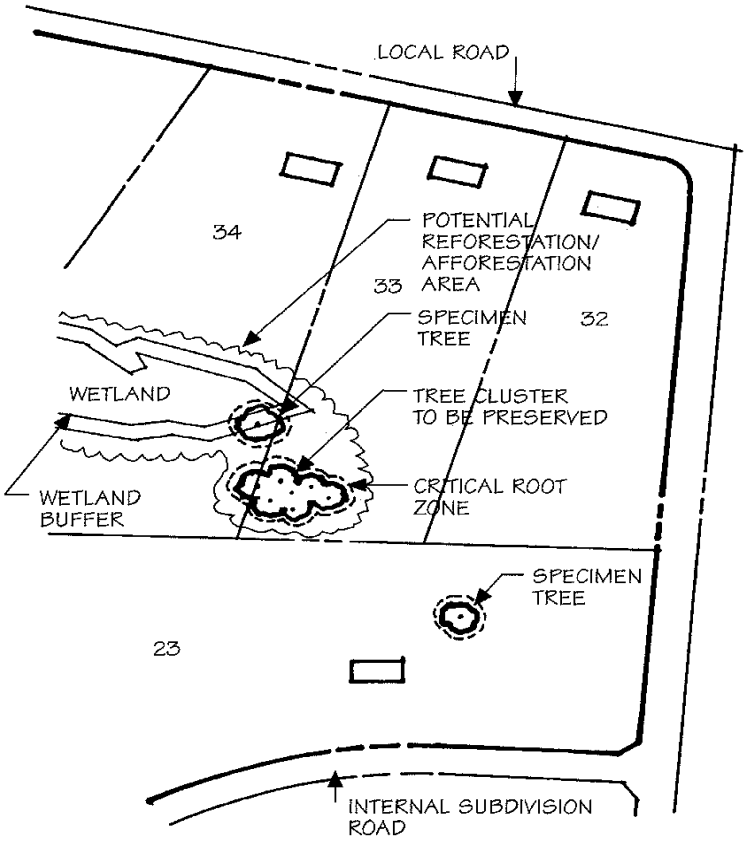
Site Plan Shows existing forests and environmental areas prior to clearing.

Total Tract Area	192.70 acres
Area in Roads	7.20 acres
Number of Lots	35
Average Lot Size	4.88 acres
Area in Open Space	12.50 acres

Source: UMCP

Site Development Plan before FCP

Figure A:9

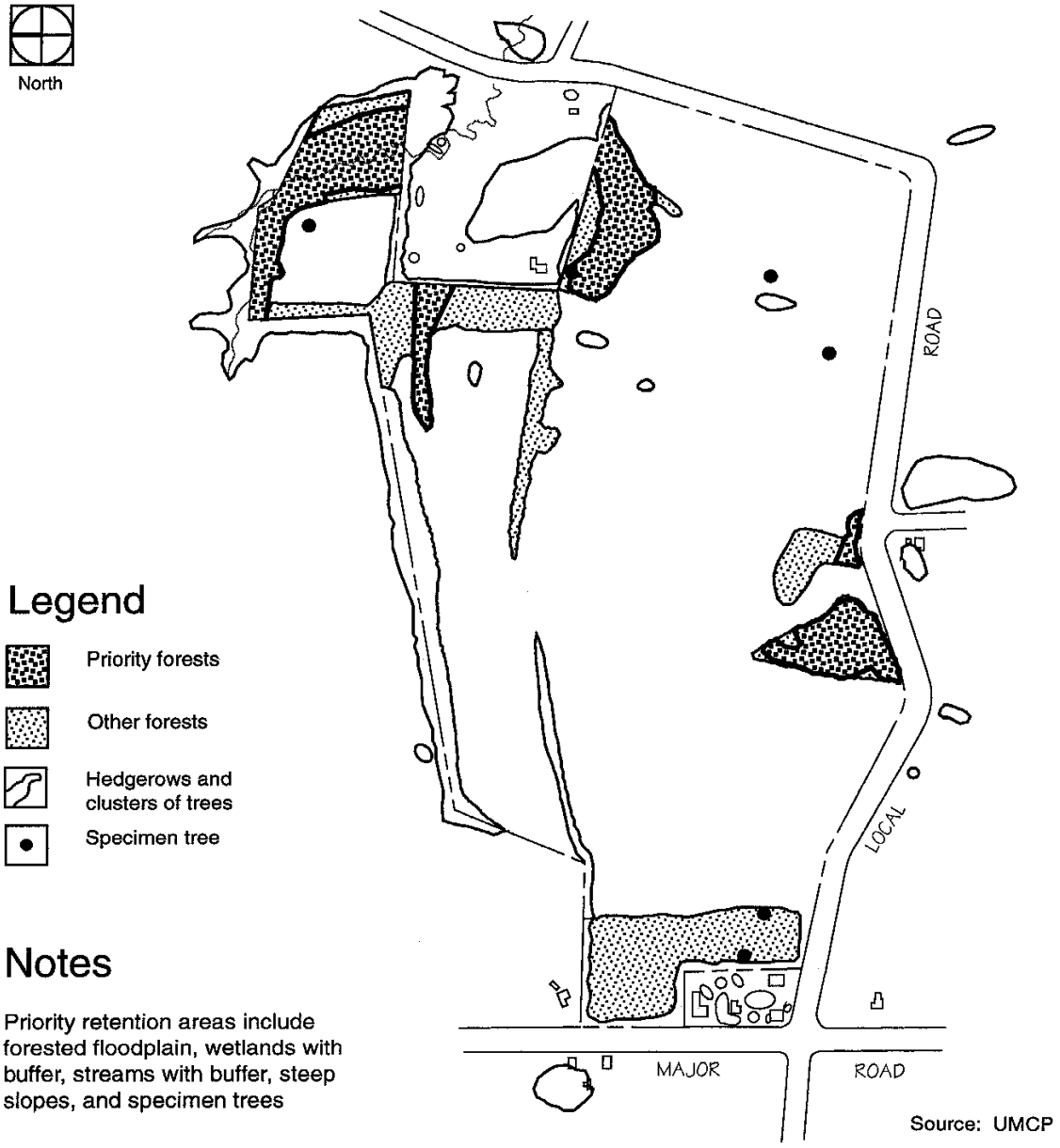


Notes:

1. Retained trees, shrubs, or plants may be incorporated into afforestation or reforestation plans.
2. If recommended in an approved FSD, some trees may be designated for retention if : all priority areas have been retained and protected; a minimum 10,000 square foot retention area is specified; and, all Critical Root Zone is included.

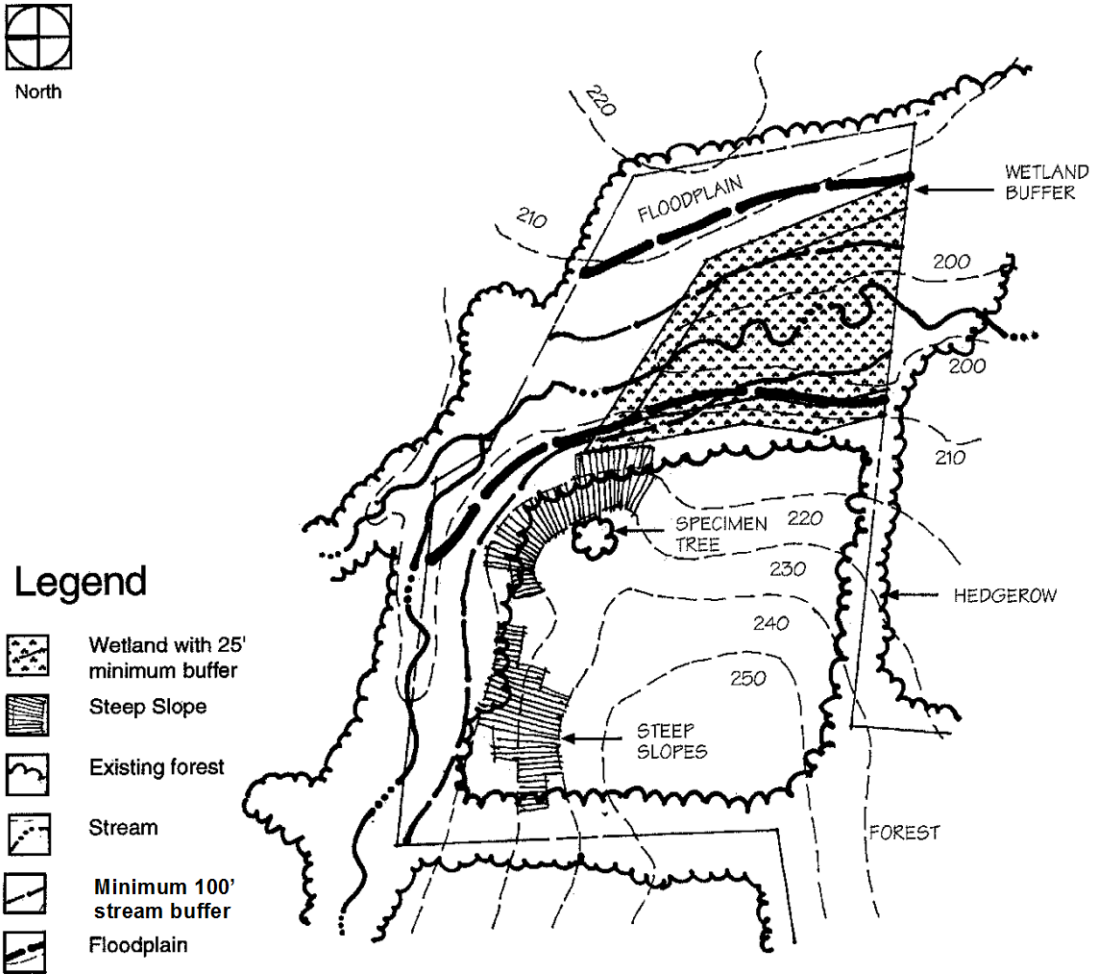
Source: UMCP

Retention Area Credit	**Figure A:10**



Priority retention areas as described in Chapter 2 that may go off-site or across State lines must be shown on the FSD.

Priority Area Map	**Figure A:11**



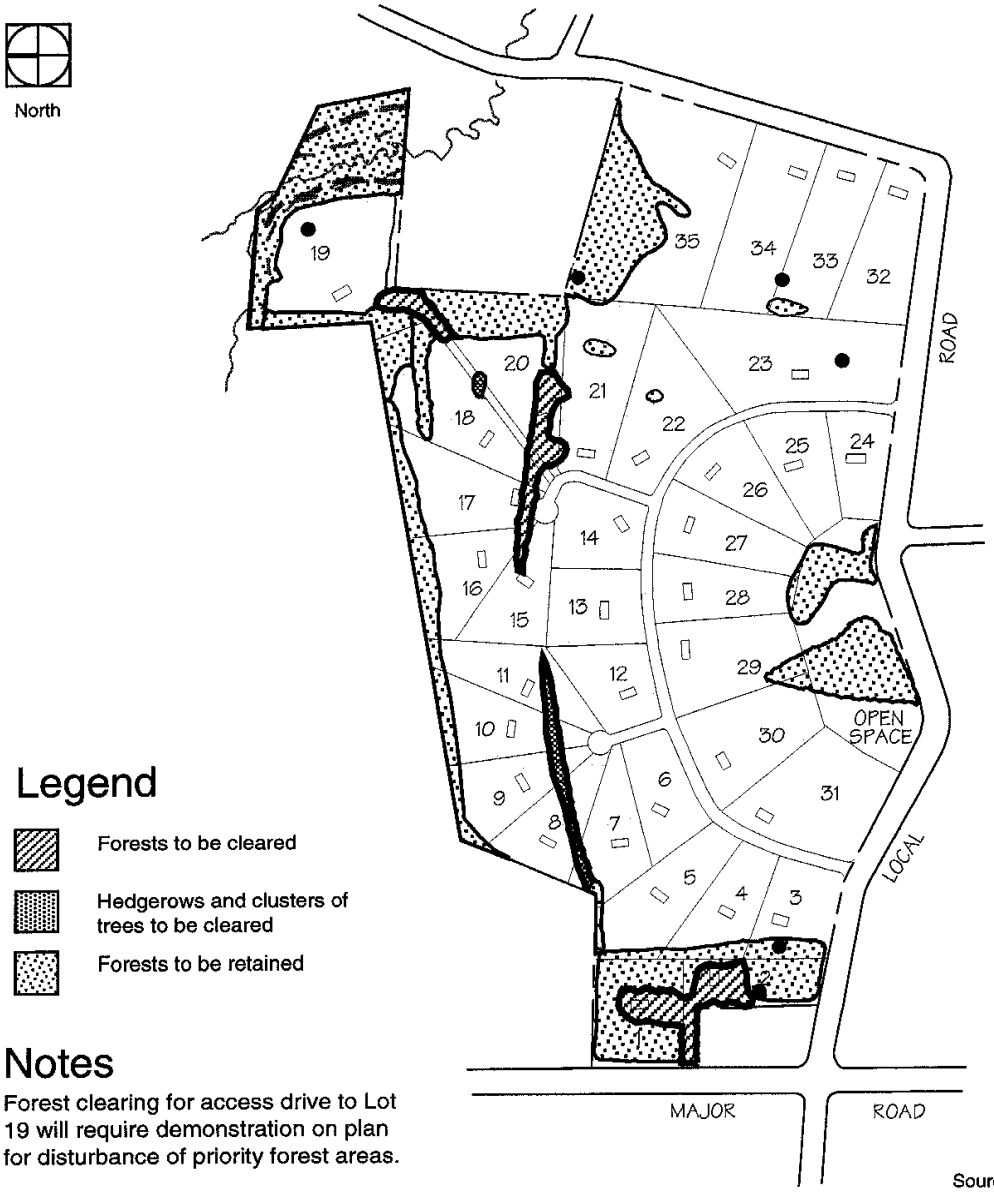
Notes

Forested steep slopes and nontidal wetlands are priority retention outside the floodplain.

Source: UMCP

Priority retention areas as described in Chapter 2 that may go off-site or across State lines must be shown on the FSD.

Closeup of Priority Areas	**Figure A:12**



Legend

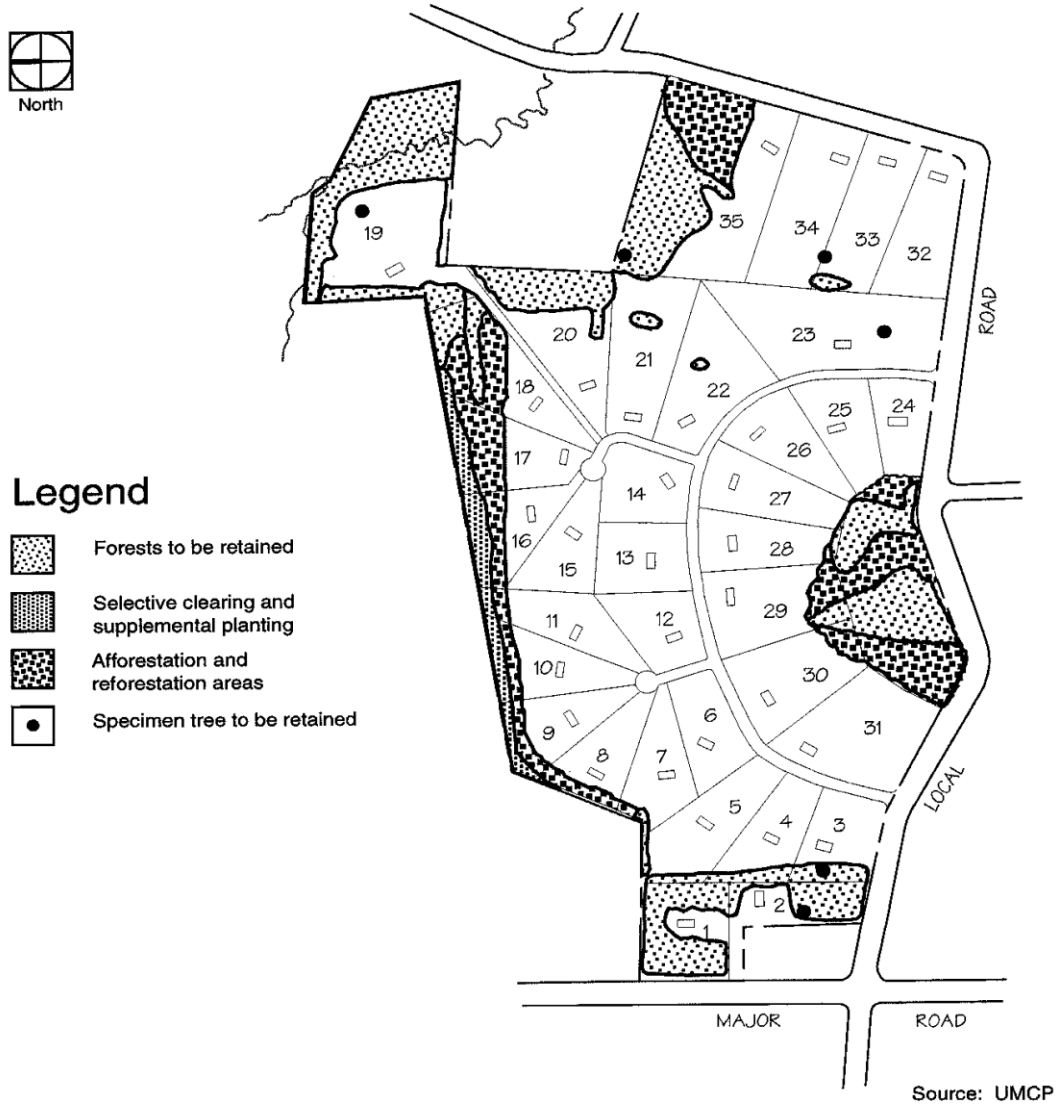
- Forests to be cleared
- Hedgerows and clusters of trees to be cleared
- Forests to be retained

Notes

Forest clearing for access drive to Lot 19 will require demonstration on plan for disturbance of priority forest areas.

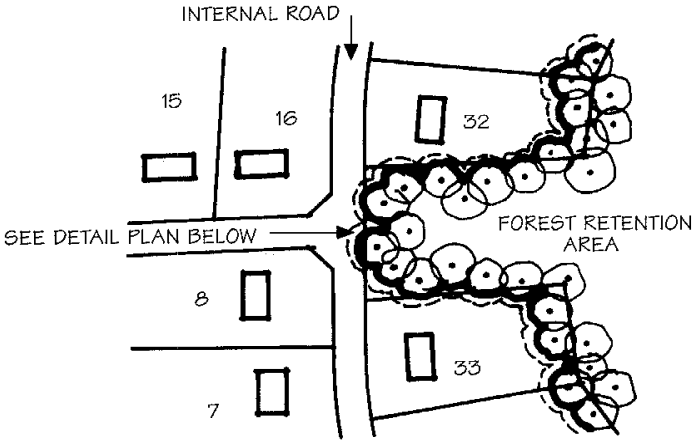
Forest Retention Map

Figure A:13

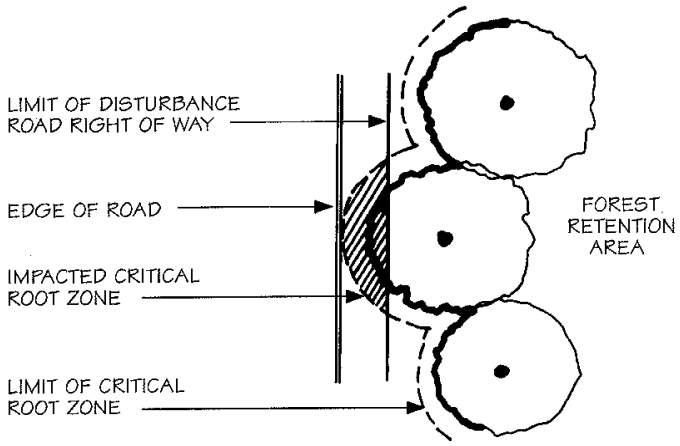


FCP Map

Figure A:14



SITE PLAN

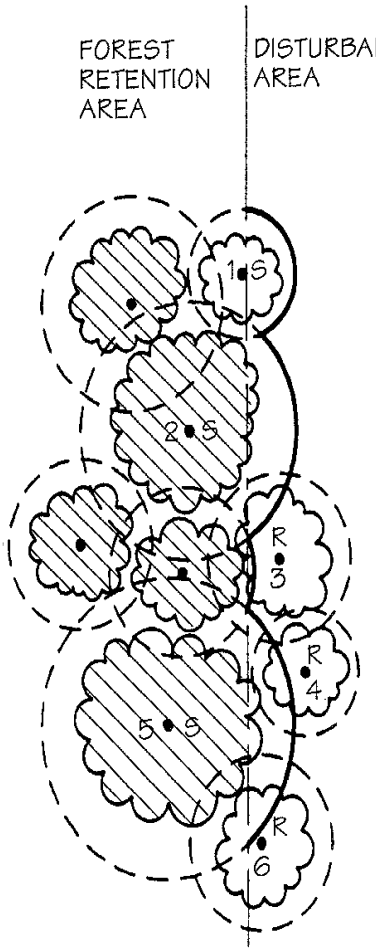


DETAIL PLAN

Notes:
1. Critical Root Zones in Retention Areas which are proposed for disturbance must be shown on the Forest Conservation Plan.
2. Pruning, tunneling, aeration systems and other protection mechanisms should be considered to ensure long term survival of retained trees.
3. See Appendix for tree protection devices to be used when retained trees are affected by development or construction activities.

Source: UMCP

Critical Root Zone Disturbance	**Figure A:15**



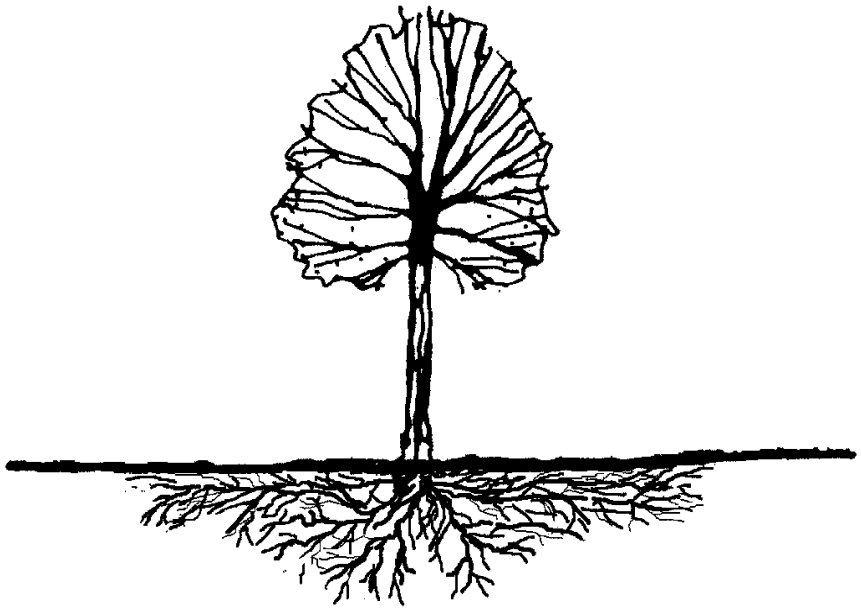
– – – – –	Critical Root Zone (CRZ)
—·—·—·—	Preliminary Retention Edge
————	Final Retention Edge
R	Remove
S	Save

TREE	STATUS	NOTES
1	Save	Preliminary retention edge impacting more than 30% of the CRZ. Can be moved to accommodate.
2	Save	Preliminary retention edge can be moved to protect the entire CRZ.
3	Remove	Tree is completely within the disturbance zone.
4	Remove	Tree is completely within the disturbance zone.
5	Save	Preliminary retention edge can be moved to protect the entire CRZ.
6	Remove	Preliminary retention edge is over trunk.

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

Source: Prince George's County Woodland Conservation Manual

Field Edge Determination | **Figure A:16**



PREVENT THE FOLLOWING IMPACTS:

CROWN
- Broken or damaged limbs
- Wounds to bark
- Disease/insect infestation
- Upper crown dieback

TRUNK
- Sun scald
- Wounds to bark
- Disease/insect infestation
- Wind-throw

CRITICAL ROOT ZONE
- Tearing/removal/crushing/burial
- Soil compaction
- Flooding
- Dessication
- Toxins
- Changes in soil pH
- Removal of understory

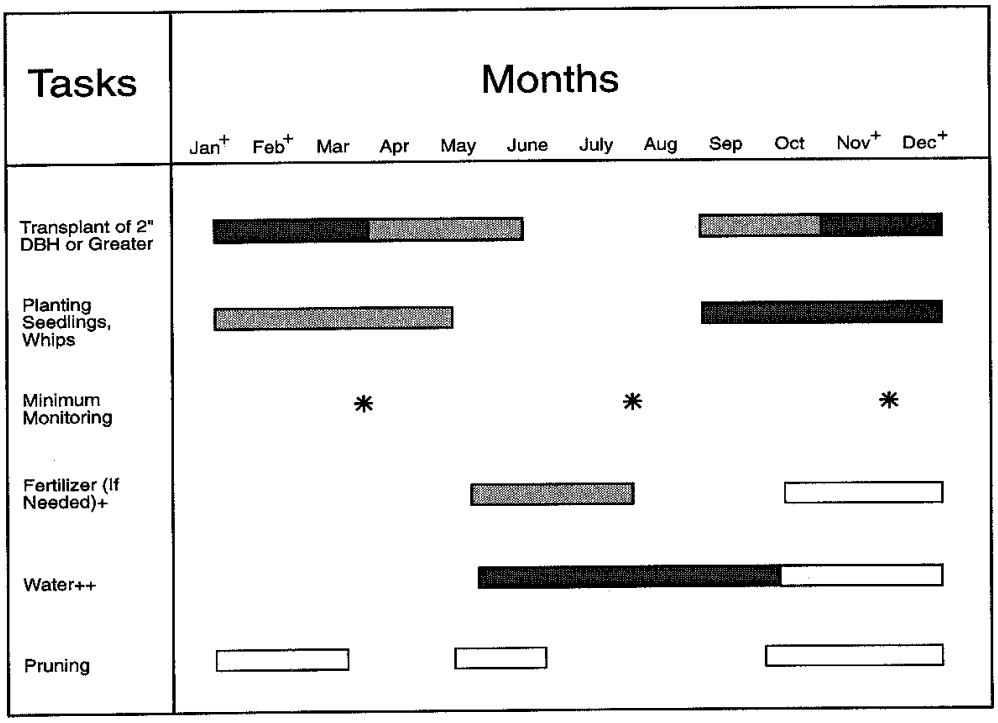
Source: Adapted from Forest Conservation Manual, 1991

Protecting Trees During Construction | **Figure A:17**

Size	**Number Required Per Acre**	**Approximate Spacing** feet on center	**Survivability Requirement** At the end of the second growing season	
Bare Root Seedlings or whips	700	8 x 8	55%	385
When using Tubex	436	10 X 10	75%	327
Bare Root Whips Container grown seedling tubes (minimum cavity width 1.5”)	450	10 x 10	65%	290
When using Tubex	350	12 X 12	75%	263
Container Grown 1, 2, 3 Gallon	350	12 x 12	75%	260
Container Grown 5, 7 Gallon or 1" Caliper B & B	200	15 x 15	85%	170
Container Grown 15, 25 Gallon or 1.5 - 2" Caliper B & B	100	20 x 20	100%	100

Notes:
1. These stocking and survival requirements are the minimum numbers estimated to meet the definition of forest from bare land.
2. In certain circumstances, any combination of the above mentioned stocking options, dry seeding, tree shelters, transplants, and/or natural regeneration may be appropriate strategies to fulfill the requirements of an approved FCD. They will be evaluated on a case-by-case basis by the approving authority.
3. Spacing does not imply that trees or shrubs must be planted in a grid pattern.

Site Stocking	**Figure A:18**



Recommended, Optimal time

Recommended with Additional Care

Recommended

\+ Dependent Upon Site Conditions

++ Dependent Upon Site Conditions: Weekly Watering is Strongly Recommended From May Through October Unless Weekly Rainfall Equals 1"

Notes:
1. Activities during November through February depend on ground conditions.
2. No fall planting of oaks and pines.
3. The planting and care of trees is most successful when coordinated with the local conditions. This calendar summarizes some of the recommended time frames for basic reforestation and stress reduction activities.

Source: Adapted from Forest Conservation Manual, 1991

Tree Planting and Maintenance Calendar

Figure A:19

APPENDIX B

Glossary of Terms

Act - the Forest Conservation Act, Natural Resources Article, 5-1601 et seq., Annotated Code of Maryland.

Afforestation - the establishment of a forest in an area on which forest cover has been absent for a long period of time or the planting of open areas which are not presently in forest cover.

Agricultural Activity - farming activities including plowing, tillage, cropping, installation of best management practices, seeding, cultivating, and harvesting for production of food and fiber products (except commercial logging and timber harvesting operations), the grazing and raising of livestock, aquaculture, sod production, orchards, Christmas tree plantations, nursery, and other products cultivated as part of a recognized commercial enterprise.

Applicant - An individual, partnership, firm, corporation, or other entity that undertakes or participates in the activities covered by this chapter.

Basal Area - the total cross sectional area of trees per unit area.

Caliper - generally, tree diameters measured at six inches above the root collar for diameters of four inches or less.

Champion Tree - the largest tree of its species within the United States, the state, county, or municipality as determined by the Maryland Department of Natural Resources and set forth in the Carroll County Technical Manual.

Codominant Trees - trees with crowns forming the general level of the crown cover and receiving full sunlight from above but little from the sides; trees with medium-sized crowns.

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

Contiguous Forest - a forest which connects the largest undeveloped or most vegetated tracts of land within and adjacent to a site.

Critical Habitat for Endangered Species - a habitat occupied by an endangered species as determined or listed under Section 4-2A-04 or Section 10-2A-04, Natural Resources Article, Annotated 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 deemed critical under Section 4-2A-06, or Section 10-2A-06, Natural Resources Article, Annotated Code of Maryland.

Critical Root Zone - a circular region measured outward from a tree trunk representing the area of the roots that must be maintained or protected for the tree's survival. For the purpose of this manual, critical root zone is one foot of radial distance for every inch of tree diameter (DBH) measured at 4.5 feet above the ground, with a minimum radius of 8 feet. For specimen trees the critical root zone shall be 1.5 feet for every inch of tree diameter.

Cultural Features - human structures, such as roads or buildings, that are within view of the proposed land use change and which affect site planning.

Department - the Maryland Department of Natural Resources.

Development - the subdivision of land and those divisions referred to as off-conveyances, and/or any change to improved or unimproved real estate, including but not limited to: construction; reconstruction; structural alterations; relocation or enlargement of any structure, road, driveway or appurtenance; grading; dredging; filling; paving; clearing; excavation; dumping; extraction or storage of soil or minerals; the storage of equipment or material.

Development Project Completion - the release of the development bond or acceptance of the project streets, utilities, and public services.

Dominant Trees - trees with crowns extending above the general level of the crown cover and receiving full sunlight from above and partly from the side; larger than the average trees in the stand.

Easement - a grant or reservation by the owner of land for the use of such land by others for a specific purpose or purposes, and which is included in the conveyance of land.

Erodible Soils - Soils with a K value of .35 or greater on slopes of 15 percent or greater.

Extenuating Circumstances - conditions requiring extension of a set time limit to process an application, render a decision, or conduct a public hearing.

Forest - a biological community dominated by trees and other woody plants covering a land area of 10,000 square feet or greater. This area must have a tree density of at least 100 living trees per acre with at least 50% of those trees having a 2-inch or greater diameter at 4.5 feet above the ground. A forest may include duff, leaf litter, understory, and forest areas that have been cut but not cleared. Forest does not include orchards or Christmas tree plantations.

Forest Conservation - the retention of existing forest or the creation of new forest at the levels prescribed by a state or local authority.

Forest Conservation Plan - the part of the development plan which ensures that forest retention, reforestation or afforestation will be accomplished.

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

Forested Slopes - an area meeting the definition of forest and growing on an area with a slope of 25% or more.

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 sufficiently uniform in species composition, arrangement of age classes, and condition to be a distinguishable, homogeneous unit.

Forest Stand Delineation - the description of the existing natural features and vegetation on a site proposed for development.

Forest Stewardship Plan - a plan establishing best conservation and management practices for a landowner in assessment of the resource values of forested property.

Forest Structure - a description of vertical and horizontal structural composition or diversity within a stand.

Growing Season - the period of consecutive frost-free days as stated in the current USDA Soil Survey for Carroll County.

Historic Sites - as defined by local, state, or federal Historic Registers.

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

Intermittent Stream - a stream in which surface water is absent during a portion of the year as shown on the most recent 7.5 minute topographic quadrangle published by the United States Geological Survey as confirmed by field verification.

Landscaping Plan - a plan, drawn to scale, showing dimensions and details for revegetating an area 2,500 square feet or greater in size and at least 35 feet wide, including maintenance and protection measures.

Linear Projects – a project whose configuration is elongated with equally parallel sides and used to transport a utility or public service not otherwise contained in an application for subdivision such as; electricity, gas, water, sewer, communications, railways, County roads, and other vehicular distribution systems. Such projects may travers fee simple properties through defined boundaries or through easement rights.

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

Maryland Registered Forester - an individual licensed in the State of Maryland as a professional forester according to Business Occupations and Professions Article, Title 7, Annotated Code of Maryland.

Natural Regeneration – means the natural establishment of trees and other associated forest vegetation with at least 1,000 woody, free to grow seedlings per acre in a 7 year period, which are capable of reaching a height of at least 20 feet at maturity resulting in the establishment of a forest community.

Net Tract Area:

a. Except in areas zoned for agriculture, commercial, business, industrial or those used for institutional purposes, the total area of a property, including the area to be developed and any non-developed area, and including both forested and nonforested areas, to the nearest 1/10 acre, reduced by the area found to be within the boundaries of the 100-year floodplain;

b. In areas zoned for agriculture, that part of a property which will be developed, for which land use will be changed, or which will no longer be used for primarily agricultural activities, reduced by the area found to be within the boundaries of the 100-year floodplain; and

c. For regulated activity other than subdivision, in areas zoned commercial, business, industrial or those used for institutional purposes, the total area of the limits of disturbance. Institutional purposes include schools, colleges, universities, government offices, parks and facilities, fire stations, religious establishments, and hospitals.

Nontidal Wetland - an area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal conditions does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation. The determination of whether an area is considered a nontidal wetland shall be made in accordance with the publication known as the “Federal Manual for Identifying and Delineating Jurisdictional Wetlands”.

Nontidal Wetland Buffers - Buffers established for nontidal wetlands as determined under Natural Resources Article 8-1201 et seq., Annotated Code of Maryland.

One-Hundred Year Floodplain – An area along or adjacent to a stream or body of water, except tidal waters, that is capable of storing or conveying floodwaters during a 100-year frequency storm event. A 100-year flood is a flood which has a 1% chance of being equaled or exceeded in any given year, as determined by the National Oceanic and Atmospheric Administration and the National Weather Service.

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.

Person - includes the federal government, a state, any county, municipal corporation, or other political subdivision of a state, or any of their units, or an individual, receiver, trustee, guardian, executor, administrator, fiduciary, or representative of any kind, or any partnership, firm, association, public or private corporation, or any of their affiliates, or any other entity.

Planned Unit Development - a development comprising a combination of land uses or varying intensities of the same land use in accordance with an integrated plan that provides flexibility in land use design approved by the local jurisdiction with at least 25% of the land permanently dedicated to open space.

Prime Agricultural Soils - agriculturally fertile soils as defined by the USDA Soil Conservation Service.

Priority Funding Area – an area certified by the local government as a designated growth area and as recognized by the State Department of Planning. A Priority Funding Area can be a designated village, industrially zoned land or an area otherwise satisfying the criteria outlined in Title 5, Subtitle 7B of the State Finance and Procurement Article, Annotated Code of Maryland.

Reforestation or Reforest - the creation of a biological community dominated by trees and other woody plants containing at least 100 live trees per acre with at least 50% of those trees having the potential of attaining a two-inch or greater diameter measured at 4.5 feet above the ground, within seven years. Reforestation includes landscaping of areas under an approved landscaping plan that establishes a forest at least 35 feet wide and covering 2,500 square feet of area. Reforestation for a linear project involving overhead transmission lines may consist of a biological community dominated by trees and woody shrubs with no minimum height or diameter criteria.

Retention - the deliberate holding and protecting of existing, trees, shrubs or plants according to established standards as set forth in the Forest Conservation Manual.

Retention Areas - areas designated onsite for forest protection; to be referred to as long-term Forest Retention Areas.

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 measures under certain conditions as established in an approved Forest Conservation Plan.

Slope Aspect - the orientation angle of the site to the sun.

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.

Specimen Tree – a tree having a diameter of 30 inches or more measured at 4.5 feet above the ground, or a tree having at least 75% of the diameter of the current State champion of that species, or a champion tree.

State Program - the State of Maryland Forest Conservation Program administered by the Department of Natural Resources.

Steep Slopes - areas with slopes greater than 25 percent.

Stream – a part of a watercourse, either naturally or artificially created, that contains intermittent or perennial base flow of groundwater origin, but not including a ditch that conveys surface runoff exclusively from storm events.

Stream Buffer - all lands lying within a variable distance measured from the top of each normal bank of any stream, and as defined in the Water Resource Management Manual.

Subdivision - any division of a parcel of land into two or more lots or parcels for the purpose, whether immediate or future, of transfer of ownership, sale, lease, or development, including those divisions referred to as off-conveyances.

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 or afforested or reforested areas during construction.

Tract - any property subject to an application for a grading permit, sediment control plan, or subdivision approval. If a property is included in a planned unit development, “tract” means the entire property subject to the planned unit development.

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.

Tree Line - the boundaries of existing forests as determined by the most recent aerial photography and field verification.

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

Variance - the allowance for deviation from the requirements of the Forest Conservation Act for circumstances where strict adherence to the Act would result in unwarranted hardship. Variance does not mean a zoning variance.

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 six inches above the root collar.

APPENDIX C

Worksheets and Preparation Guidelines

Property:_____ Prepared By_____

Stand #:_____ Plot #:_____ Plot Size:_____ Date:_____

Basal Area in sf/acre:

Size class of trees > 20' height within sample plot

Tree Species	# of Trees 2-5.9" dbh			# of Trees 6-11.9" dbh			# of Trees 12-19.9" dbh			# of Trees 20-29.9 dbh			# of Trees > 30" dbh			Total
Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	
Total Number of Trees per Size Class																
Number & Size of Standing Dead Trees																

List of Common Understory Species:

% of Canopy Closure

C	N	E	S	W	Total

Percent of Invasive Cover per Plot (All Layers):

Plot Successional Stage:

List of Herbaceous Species:

Number of shrubs and seedlings <2" (1/1000 acre)

C	N	E	S	W	Total

% of Herbaceous Cover

C	N	E	S	W	Total

Comments

Sheet __ of__

Forest Sampling Data Worksheet **C:1**

Property Name:_____

Location: _____(Town, County, ADC Map#, and Grid Coordinates)

Prepared By:_____ Date:_____

Stand Variable	Stand #_____	Stand #_____
1. Dominant species/Codominant species		
2. Successional stage		
3. Basal area in s.f. per acre		
4. Size class of dominant species		
5. Percent of canopy closure		
6. Number of tree species per acre		
7. Common understory species per acre		
8. Percent of understory cover 3' to 20' tall		
9. Number of woody plant species 3' to 20' tall		
10. Common herbaceous species 0' to 3' tall		
11. Percent of herbaceous & woody plant cover 0' to 3' tall		
12. List of major invasive plant species & percent of cover		
13. Number of standing dead trees 6" dbh or greater		
14. Comments Sheet___ of ___		

Forest Stand Summary Worksheet **C:2**

Figure C:3 Preparation Guidelines

Guidelines for Completion of Forest Sampling Data Worksheets and Forest Stand Summary Worksheets

1. Dominant species/codominant species: List the dominant and codominant species for each stand. This can be used to determine the Forest Association (Brush et al, 1980). The association can then be used to choose the species recommended for mitigation planting. Dominant species are the species which are largest or tallest.

2. Successional stage: Forests are characterized as early, mid or late successional, with characteristic growth rates and species composition. Additional information which may be helpful in assessment is available soil moisture, often described as xeric, mesic, or hydric. Species composition descriptions, such as bottomland or upland, may reflect these soil conditions.

3. Basal area in square feet per acre: Data can be taken with a prism, or calculated by knowing the DBH of all trees in the plot. To determine the basal area using a prism, total the number of “in” trees and multiply by the prism factor for each point sampled. To get an average for the stand, add this for all of the samples for the stand and divide this total by the number of sample points in the stand.

4. Size class of dominant species: This is the size class with the highest frequency of dominant trees.

5. Percent of canopy closure: This is the average of percent canopy closure of all the sample plots in the stand. Canopy closure may be obtained using a visual estimate for each plot.

6. Average number of tree species per plot: For each plot, this is a total of the number of different tree species appearing in the first column of the data sheet.

7. Common understory species 3' to 20' tall: List the 3 or 4 most common species that occur in the 3' to 20' layer.

8. Percent of understory cover 3' to 20' tall: This is the average of the percent of understory cover for each of the plots in the stand.

9. Number of understory species 3' to 20' tall: Count the number of different species in the understory layer.

10. Understory species 0' to 3' tall: List the 3 or 4 most common species that occur in the 0' to 3' layer.

11. Percent of herbaceous & woody plant cover 0' to 3' tall: Average the percent of herbaceous and woody cover for each of the plots in the stand.

12. List of major invasive plant species and percent of cover: For each of overstory (O), understory (U) and herbaceous (H) layers, list the major invasive plant species and the amount of area coverage. For example:

O - Norway Maple	20% (of the overstory layer)
U - Multiflora Rose	60% (of the understory layer)
H - Japanese Honeysuckle	40% (of the herbaceous layer)

13. Number of standing dead trees 6" dbh or greater per acre: Divide the average for all plots sampled by plot size. For example, if the average for all plots is 2, and the plot size is 0.1 acre, the number per acre is 20.

14. Comments: This may include other noteworthy information such as evidence of past management practices, cultural or historical features, specimen trees, wildlife notes or rare, threatened and endangered plant species.

Figure C:4 Forest Sampling Techniques

Basal Area may be measured as a total for all species, or by each species, using a basal area factor (BAF) prism. This plotless method is relatively fast and easy to use in large, homogenous stands. Basal Area may also be computed from actual diameters (DBH) for each tree measured in a plot. Using size class will give an inaccurate measurement.

Density (trees/unit area) may only be measured by using an area based plot method and counting the total number of trees or number of trees per species in each plot.

Frequency is used as a measure of the distribution patterns of species within a stand. If a species occurs in all plots sampled, it is considered to have 100% frequency. A high frequency for dominant species is an indicator of stand homogeneity.

To measure cover, two methods may be used: First, construct a sampling tube approximately 4-6" long and 2" in diameter from a paper towel or toilet paper roll, or a length of pvc pipe. Attach wires or string on one end of the tube in the shape of a cross with four evenly spaced openings.

Select at least 3 randomly located sample points in each stand. If a random plot sample method is used, these may coincide with plot centers.

1. Locate four points around the plot circumference and a fifth at the plot center. Walk to each point and look through the tube at the sample layer (canopy, understory or herbaceous).

   Record yes or no for each “hit” with the sample layer when viewed through the tube; i.e., green seen through the tube.

   Calculate the percentage of the five samples which were answered by yes for each plot. For four yeses, record 80% cover for that plot.

2. At each plot center or sample point in the stand if a plotless method is used, estimate the percent cover using a density scale chart for comparison. Charts are available from the S. E. Forest Experiment Station, P. O. Box 2680, Asheville, NC 28802. Use cover classes such as 0-10, 10-20, etc. for better precision.

For further information, see:

Avery, T.E. 1964. “To stratify or not to stratify.” Journal of Forestry 62:106-108.

Barbour, Michael G., Jack H. Burk and Wanna D. Pitts. 1987. *Terrestrial Plant Ecology*, 2nd Edition. Benjamin/Cummings Publishing Co., Inc., Menlo Park, CA. Chapter 9.

Ganey, Joseph L. and William M. Block. 1994. “A comparison of two techniques for measuring canopy closure.” Western Journal of Applied Forestry. 9:21-23.

James, F. C. and Shugart, H. H. 1970. “A quantitative method of habitat description.” Audubon Field Notes 24:727-736.

Figure C: 5 GUIDELINES TO COMPLETE A FOREST STAND SUMMARY SHEET

PROPERTY NAME:

PREPARED BY:

DATE:

FOREST ASSOCIATION (SAF cover type):

SIZE CLASS OF DOMINANT TREES: This is the size class with the highest frequency of dominant trees. Dominant trees are identified in the field by crown class (Position in the canopy).

NUMBER OF TREES/ACRE:

$$\frac{\text{Add \# of live trees on all plots in the stand X (1/plot size)*}}{\text{Number of plots in stand}}$$

*Note: 1/plot size = 1/(1/10 acre) = 10

BASAL AREA/ACRE: Data taken with a prism:

$$\frac{\text{Add \# “in” trees on all plots for the stand X prism factor}}{\text{Number of plots in stand}}$$

With a 10 factor prism, each “in” tree represents 10 square feet BA/acre.

NUMBER OF (STANDING) DEAD TREES/ACRE:

$$\frac{\text{Add \# dead trees on all plots for the stand X 1/plot size}}{\text{Number of plots in stand}}$$

LIST OF COMMON SHRUBS PER ACRE: This information is taken from the plot sheet (LIST OF UNDERSTOREY SPECIES) and the forest structure sheet (SHRUB AND SEEDLING COUNT 1/1000 ACRE PLOT). List the frequency occurring understory species.

NUMBER OF SHRUBS 1/1000 ACRE PLOT BY SPECIES

For the following categories, find the average percent over the five sample points on the field data sheet for each category. Each “yes” response represents 20% of cover. The “% yes” column of the data sheet is the information that goes on the stand summary sheet:

% CANOPY COVERAGE
% HERBACEOUS COVER
% DOWNED WOODY MATERIAL
% EXOTIC INVASIVE SPECIES

COMMENTS: This may include other noteworthy information such as evidence of past management practices or other cultural/historical features, specimen trees, wildlife notes, or threatened and endangered species occurrence.

Figure C:6 MARYLAND DNR – FOREST SERVICE
Planting Quality Check

PROJECT:_____ FCA FILE:_____
ADDRESS:_____ INSPECTOR:_____
_____ REVIEW DATE:_____
JURISDICTION:_____ PLANTING DATE:_____

SAMPLE PLOT LOCATION:_____
PLOT SIZE SELECTED: [ ] 1/10th (=37.2 Radius circle); [ ] 1/20th (=26.4' Radius circle) or [ ] Other:_____

SITE SUMMARY	
Size of Planting	
Species Planted:	
Spaces (betweenx along Rows)	
Site Prep:	
Planting Method:	

SAMPLING REQUIREMENTS:	
Site Size (Acres)	Min # of Plots Taken
1-10	2 Total
10-75	10 Total
75+	1 per 7 acres

Key:
- Correct
A Angled
D Planted Deeply
L Loose
M Multiple
S Shallow

Key:
- Correct
A Angled
D Planted Deeply
J J-Rooted
L Loose
M Multiple
R Roots Pruned (by installer)
S Shallow
T Twisted or Balled Up

Key:
I Compact Soil
II Wet Area
III Heavy Slash
IV Thick Duff
V Brush
VI Rocky
VII Sandy
VIII Thick Grass
IX Steep Slope (mach. Pltd?)

Plot Number	VISUAL INSPECTION: Planted Property	Planted Improperly	Plot Total (Std. #=_____)	DUG SEEDLINGS: 1	2	3	SITE CONDITIONS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
TOTAL:				Total # Dug			
%			Per Acre Average:	Total Satisfactory			
Per Acre Standard: (20% +/- range= _____ - min. max.				% Satisfactory Target = 85% Minimum = 70% (<70% = replant)			

COMMENTS:_____

PLANTING QUALITY FORM INSTRUCTIONS

I. Before beginning field checks and sampling determine the following information and add it to the "Planting Quality" form:

a) All site description information (ie: acres, spacing, site prep, planting method, etc.)

b) Determine the plot size you will use when sampling, and thus calculate the radius of plot circle (add this info. To form as requested)

c) Based on the seedling spacing chart, determine the "Per Acre Standard" and the acceptable range (+/-20%), and add info. To the form where requested.

d) Based on the "Per Acre Standard", and your plot size, determine the "Plot Total Standard #: as requested on the form. (For 1/10th acre plot, divide "Per Acre Standard" by 10. Example: for 700 seedling/acre, "Plot Total Standard " = 70.0 seedlings/plot, the goal)

II. Based on the sampling area's size and the sampling requirements (as shown on the form), layout out the number of sampling plots and their locations or a copy of the planting plan. Sampling areas should be determined based on planting layout, such as species and spacing similarities.

III. Supplies/tools needed to perform the sampling include;

a) A small planting shovel or space
b) A loggers tape, measuring tape or a remeasured chain/rope (to make plot radius)
(note: a planting spade with a hole in its handle for attaching the measuring tape is the best approach. A typical wood stake with a whole drilled into top can be used to hold end of tape/rope also.)
c) Planting gloves (as preferred)
d) a clip board for forms/plans, and calculator (if preferred)

IV. Perform "Visual Inspection" and "Dug Seedlings" sampling. Use the Key descriptions to note observations. Visually inspect all seedlings counted within the plot area (thus, quantities of "planted property" and planted improperly" should add up to "plot total"). At least 3 seedlings should be dug and inspected per plot.

Key descriptions are as follows:

A – Angled Seedlings (more than 30 degrees from vertical)
D – Planted Deeply (more than 1 inch of live needles buried)
J – J-Rooted (Over 1" of tap root turned 90degrees or more)
L – Loose (can be removed from hole with easy upward pull)
M – Multiple (more than one seeding in planting hole)
R – Roots Pruned (roots pruned by contractor without approval)
S – Shallow (the root collar is above packed soil)
T – Twisted or Balled (roots aren't straight and extending straight down)

V. List Site Conditions – Note any site conditions, planting problems or seedling conditions when severe enough to adversely affect survival.

VI. Once all plots are completed, compute the Visual Inspection percentages, and the Total Satisfactory # of dug seedlings to see if they have reached the target and minimums. Request replant if needed. (If all 10 plots will be taken, after completing approximately 5 plots, do informal calculations/totals to see if corrections are needed.)

Visual Inspection results-To determine…

-% planted properly: divide the properly planted total by the total seedlings counted and multiply by 10

-% planted improperly: divide total improperly planted

-per acre average: divide total # of seedlings inspected by # of plots taken, then multiply by 10

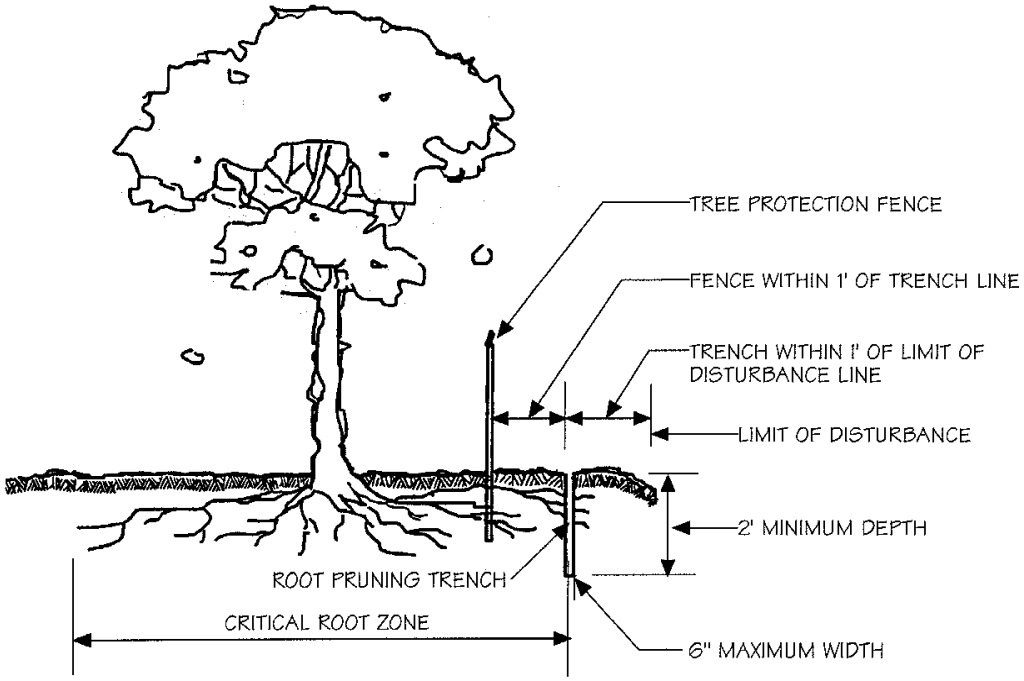
Dug Seedlings results – To determine…

-% satisfactory (per dug seedlings): divide the total satisfactory dug by the total number of dug seedlings (total dug = number of plots multiplied by three), then multiply result by 10.

VI. Unusual and unacceptable results should be discussed with the contractor immediately, and corrections must be made.

APPENDIX D

Sample Details and Specifications

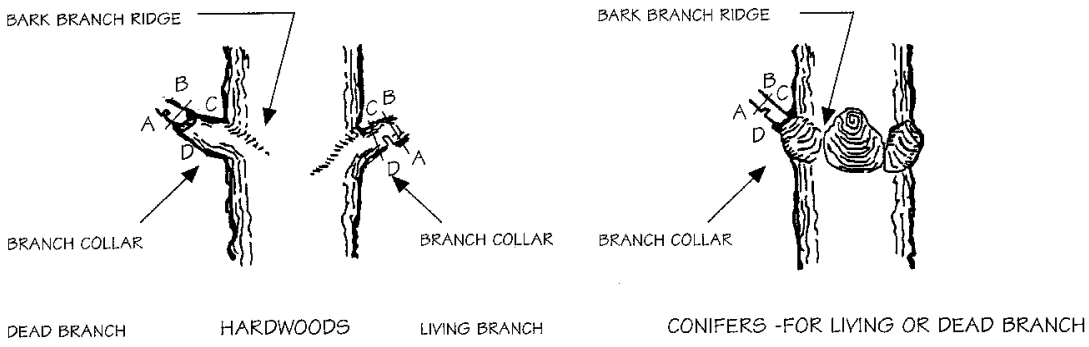


Notes:
1. Retention Areas to be established as part of the forest conservation plan review process.
2. Boundaries of Retention Areas to be staked, flagged and/or fenced prior to trenching.
3. Exact location of trench should be identified.
4. Trench should be immediately backfilled with soil removed or organic soil.
5. Roots should be cleanly cut using vibratory knife or other acceptable equipment.

Source: Adapted from Steve Clark & Associates/ACRT, Inc. and Forest Conservation Manual, 1991

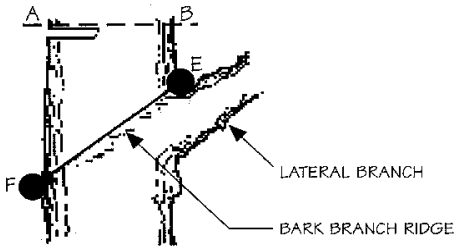
Root Pruning	**Figure D-1**

Pruning a Branch



Notes:
1. Remove branch weight by undercutting at A and remove limb by cutting through at AB.
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, angle of CD to trunk should be the reflective angle of the bark branch ridge to the trunk.
4. Only prune at specified times.
5. Remove no more than 30% of crown at one time.

Pruning a Leader to Reduce Size

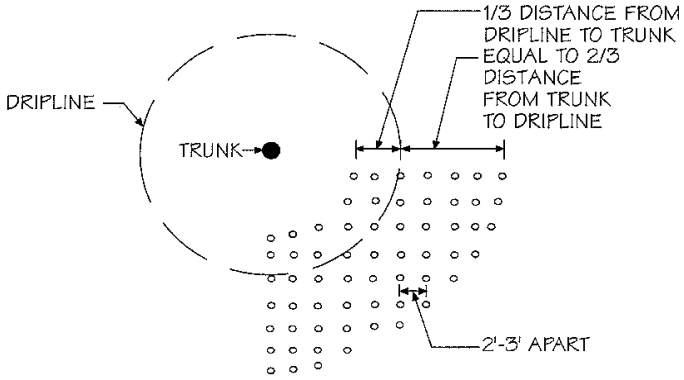


Notes:
1. Remove top weight by undercutting at A and remove limb by cutting through AB.
2. Remove stub at EF parallel to the bark branch ridge.
3. Only prune at specified times.
4. No more than 30% of crown to be removed at one time.
5. Diameter of lateral branch should be no less than 30% of the diameter of the leader.

Source: Fairfax County, Virginia:Vegetation Preservation & Planting, January 1986

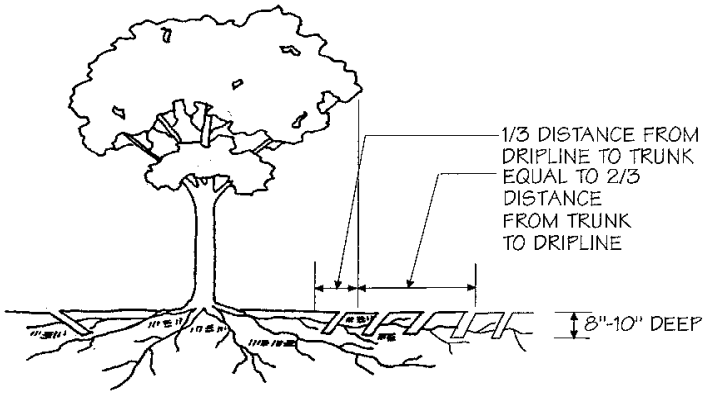
Tree Pruning	Figure D-2

Vertical Mulching or Fertilizing



Notes:
1. Auger holes 8"-10" deep, 2'-3' apart, 1"-3" wide.
2. Leave soil on ground.
3. Apply fertilizer 1/3 distance in from dripline to trunk.
4. Fertilize with 50/50 compost and pine fines.

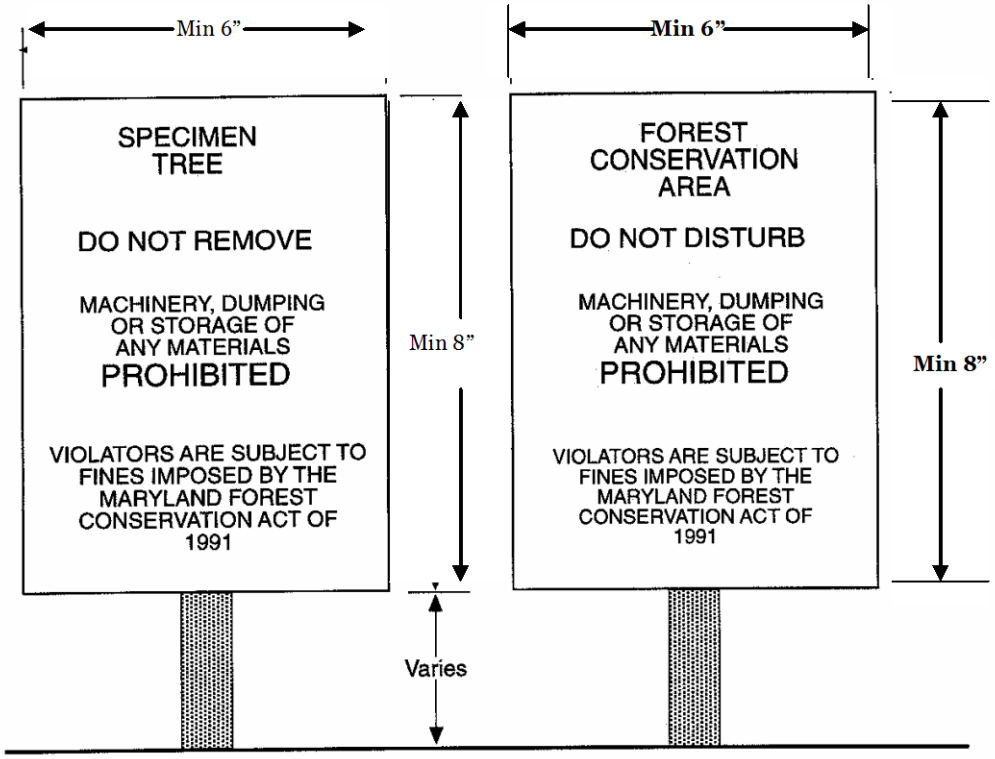
Application of Fertilizer by Injection



Notes:
1. Injection holes to be 8"-10" deep, 2'-3' apart.
2. Auger holes, do not poke. Leave soil on ground.
3. Apply fertilizer 1/3 distance in from dripline to trunk and extend 2/3 out from dripline.

Source: UMCP

Application of Fertilizers	Figure D-3

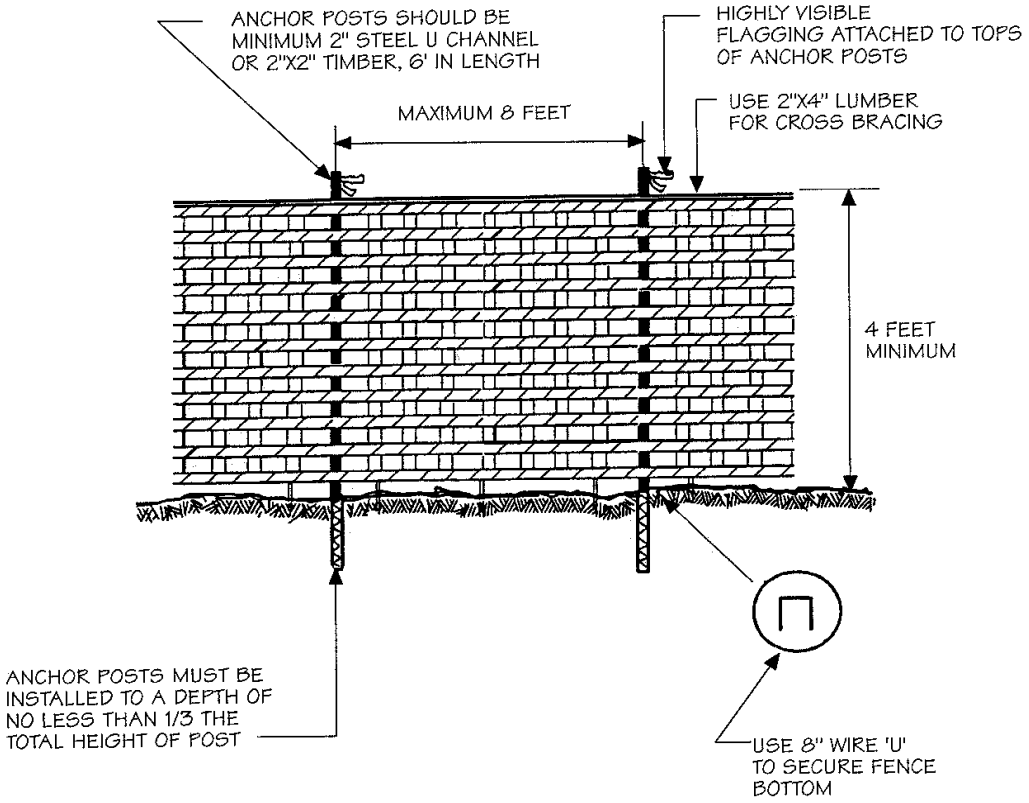


Notes:

1. **Bottom of signs to be higher than top of tree protection fence.**
2. **Signs to be placed approximately 100' feet apart. Conditions on site affecting visibility may warrant placing signs closer or farther apart.**
3. **Attachment of signs to trees is prohibited.**
4. **Signs may be removed from residential lots upon issuance of Use and Occupancy for retention forest only.**
5. **All signage must remain during the maintenance period.**

Source: Adapted from Forest Conservation Manual, 1991

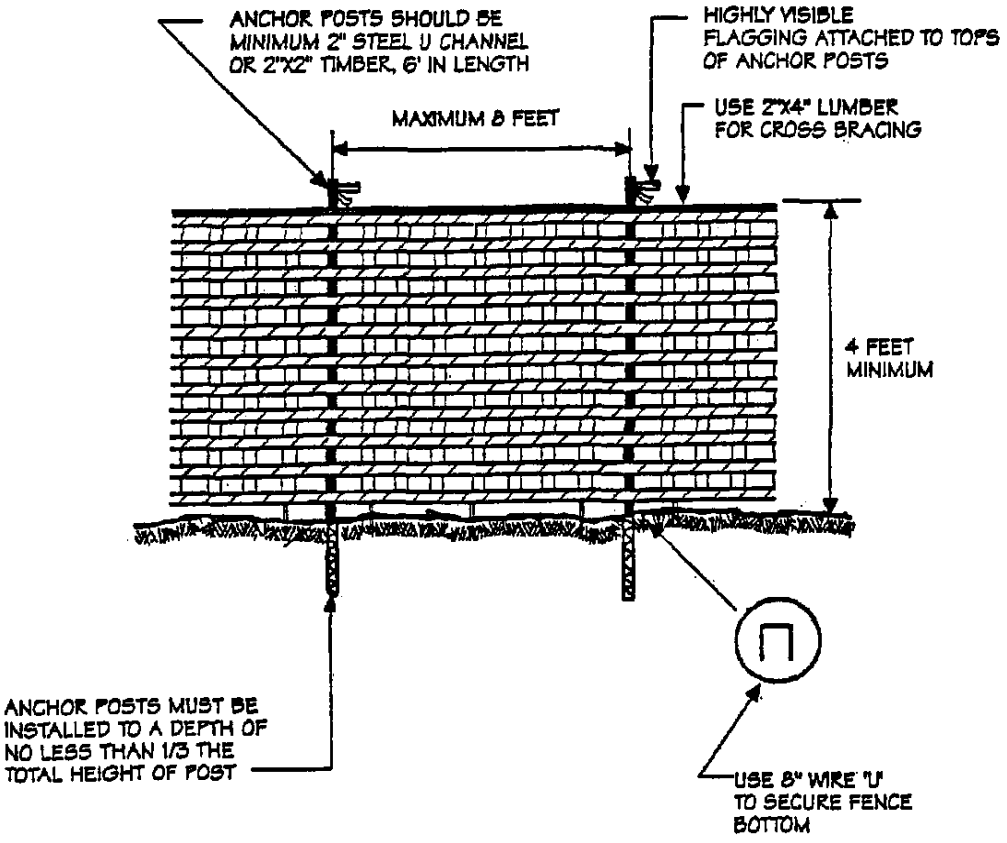
Construction Signs	**Figure D-4**



Notes:
1. Blaze orange or blue plastic mesh fence for forest protection device, only.
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 and flagged prior to installing device.
4. Avoid damage to critical root zone. Do not damage or sever large roots when installing posts.
5. Protection signs are required.
6. Device should be maintained throughout construction.

Source: Adapted from Prince George's County, Maryland: Woodland Conservation Manual and Forest Conservation Manual, 1991

Plastic Mesh Tree Protection Fence | **Figure D-5**

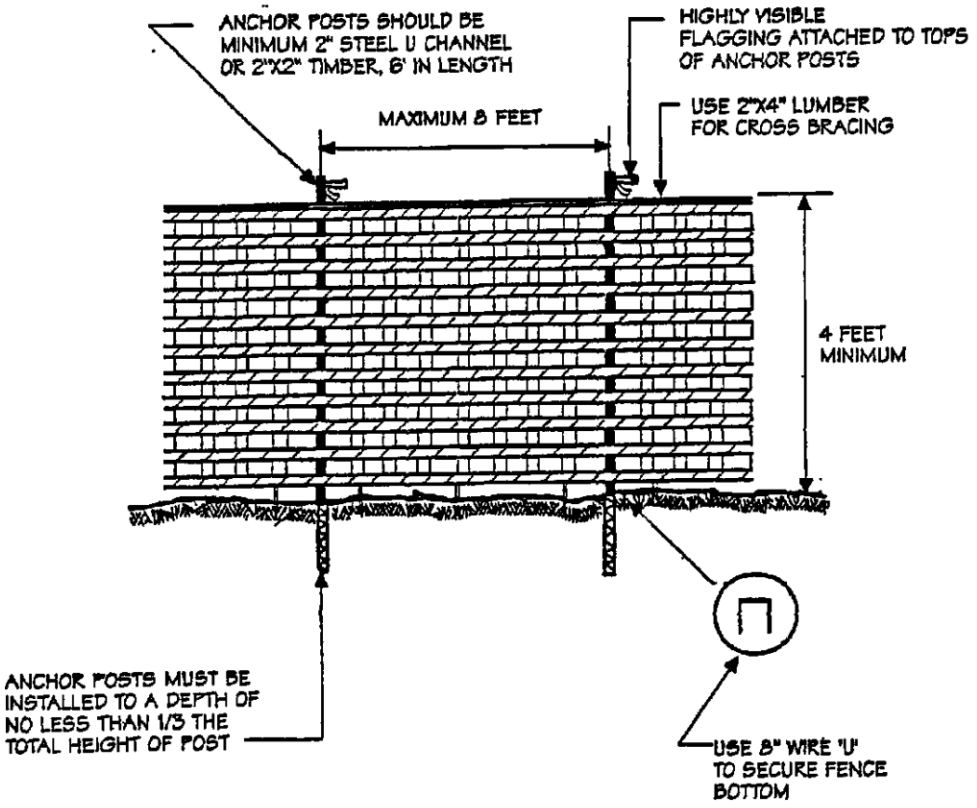


Notes:

1. Blaze orange or blue plastic mesh fence for forest protection device, only.
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 and flagged prior to installing device.
4. Avoid damage to critical root zone. Do not damage or sever large roots when installing posts.
5. Protection signs are required.
6. Device should be maintained throughout construction.

Source: Adapted from Prince George's County, Maryland: Woodland Conservation Manual and Forest Conservation Manual, 1991

Snow Fence	Figure D:7

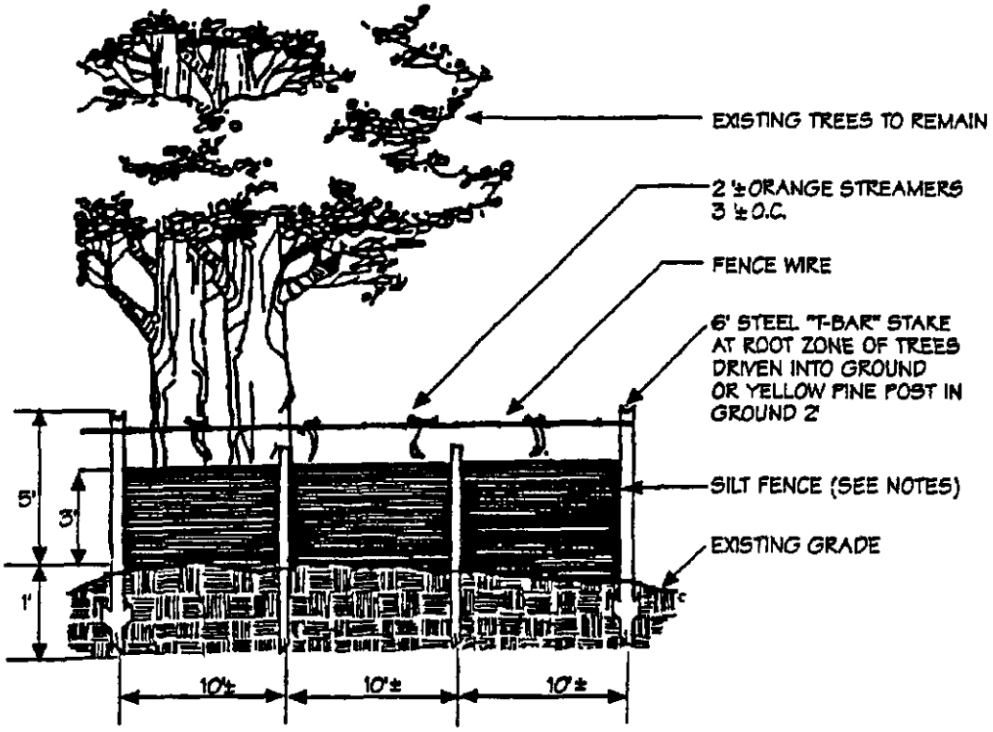


Notes:

1. Blaze orange or blue plastic mesh fence for forest protection device, only.
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 and flagged prior to installing device.
4. Avoid damage to critical root zone. Do not damage or sever large roots when installing posts.
5. Protection signs are required.
6. Device should be maintained throughout construction.

Source: Adapted from Prince George's County, Maryland: Woodland Conservation Manual and Forest Conservation Manual, 1991

Wire Tree Protection Fence	**Figure D:6**

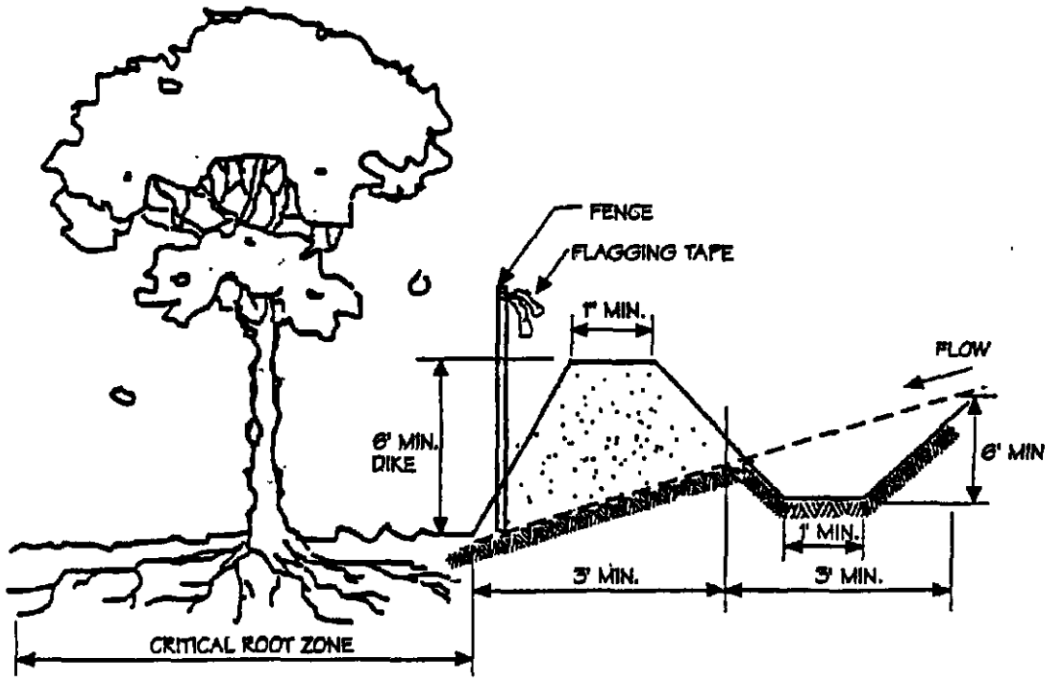


Notes:

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.
8. Locate fence outside the Critical Root Zone.

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

Silt Fence and Tree Protection	Figure D:8

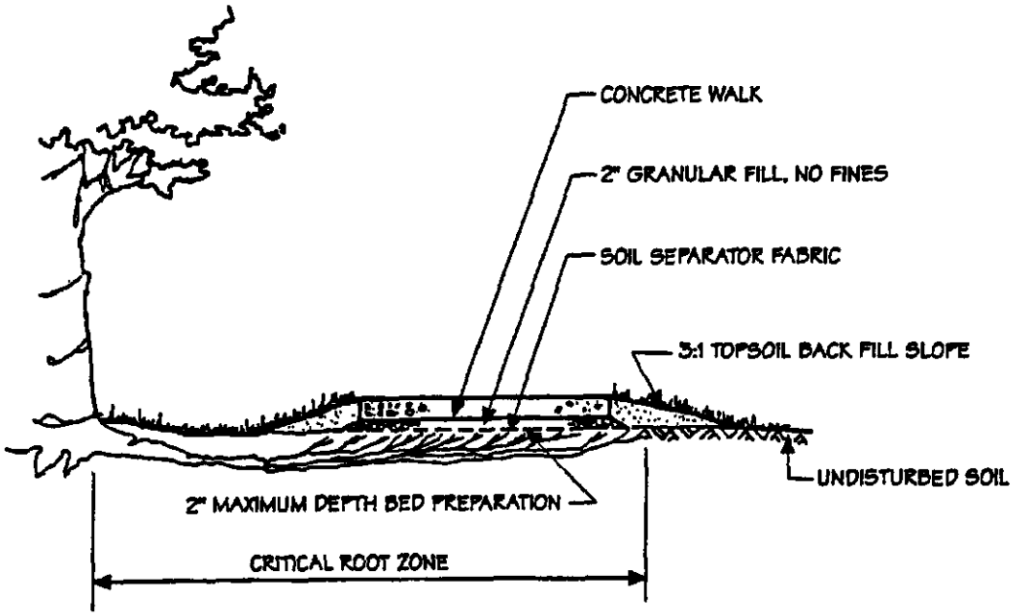


Notes:

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

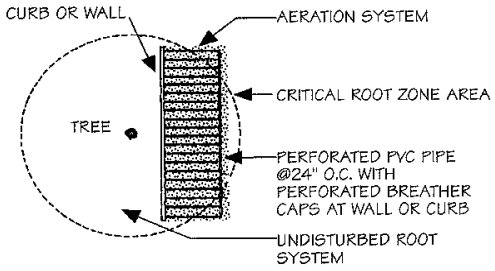
Earth Dike and Swale Combination Device	**Figure D:9**



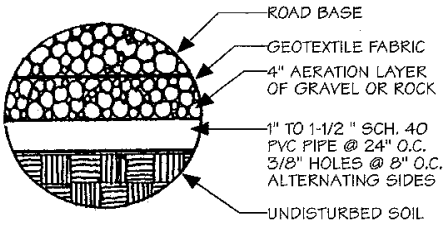
Notes:
1. Bed preparation should not exceed 2 inches
2. Granular fill should contain no fines
3. Minimize width of sidewalk as allowed by code.
4. Take extreme care of existing trees' critical root zone during construction.

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

Sidewalk above Critical Root Zone	**Figure D:10**



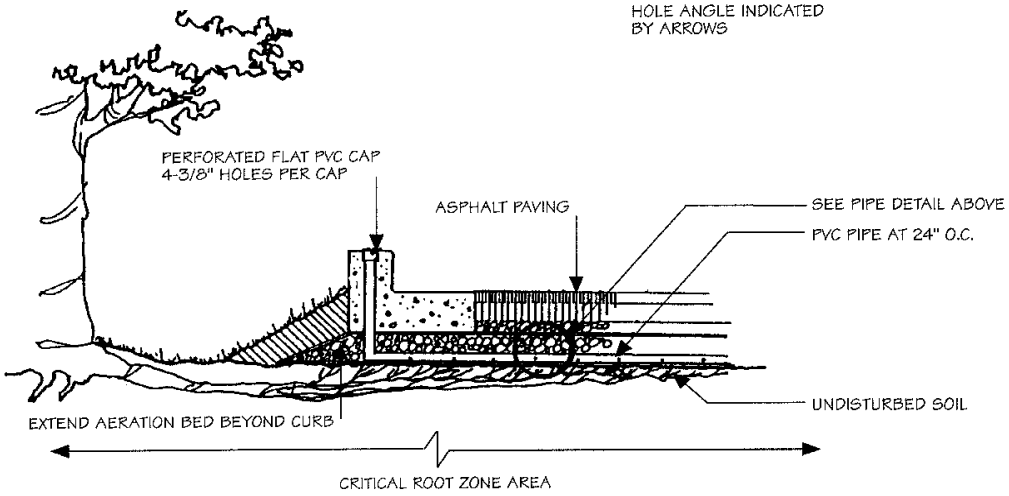
AERATION PLAN



PIPE DETAIL

PIPE SECTION

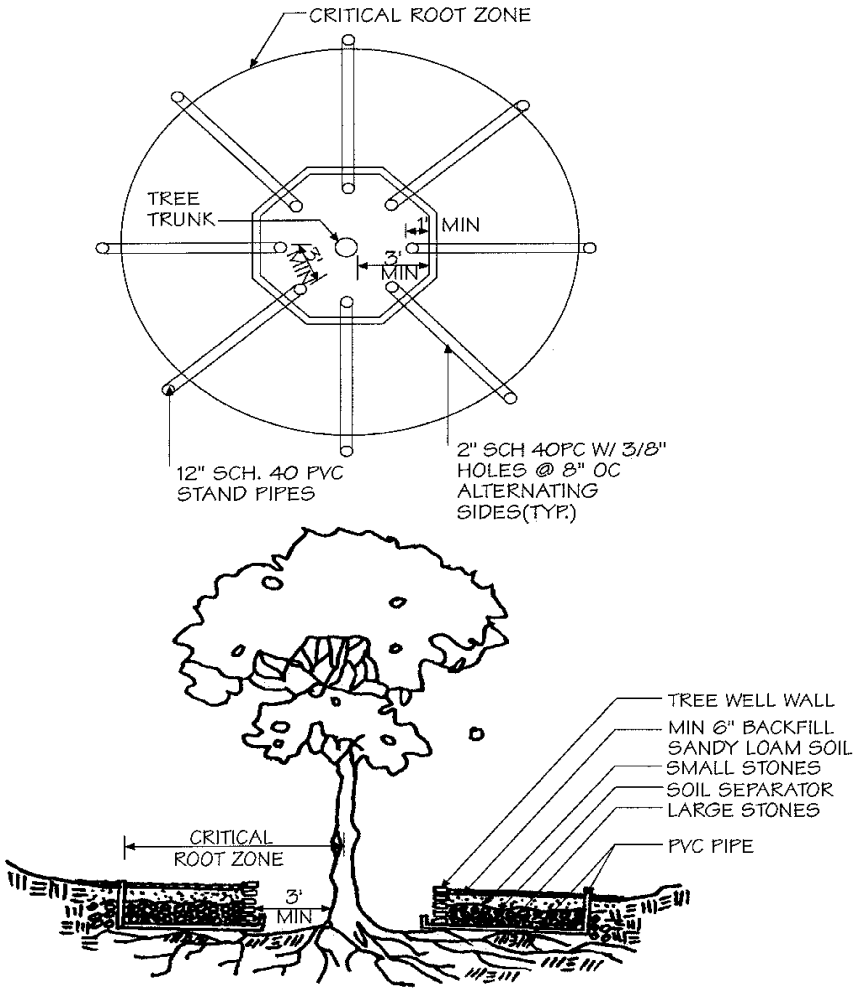
DRILL 3/8" HOLES 8" O.C. ALTERNATING SIDES HOLE ANGLE INDICATED BY ARROWS



Notes:
1. Bed preparation should not exceed 2 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: Adapted from Steve Clark & Associates/ACRT, Inc.

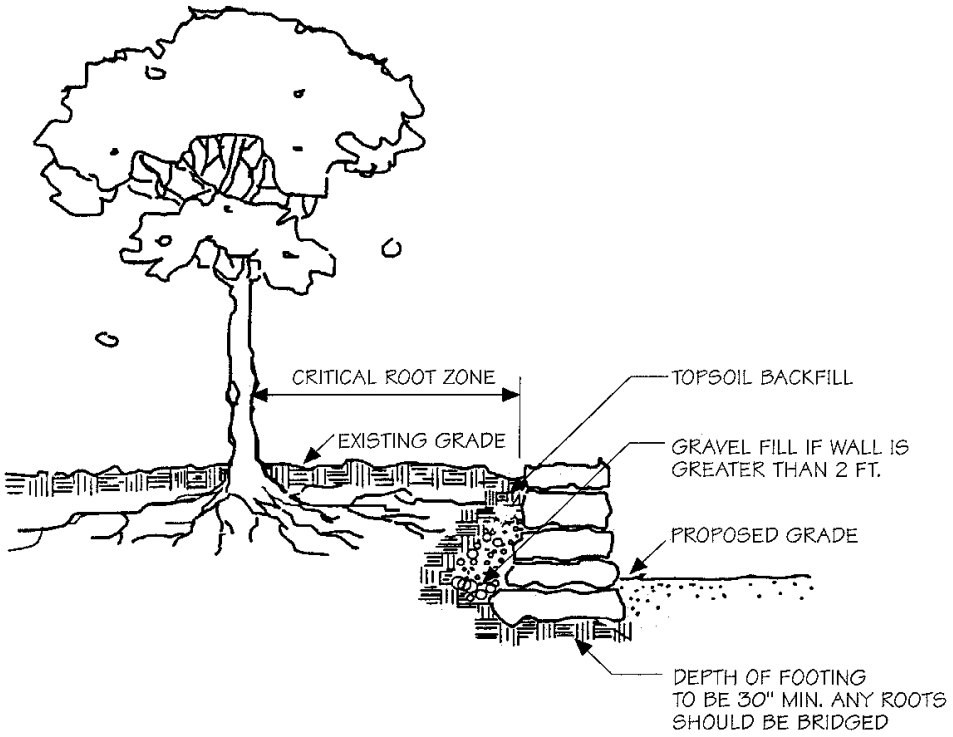
Aeration for Paving above Critical Root Zone	**Figure D:11**



Notes:
1. Well wall should be no closer than 3 feet from tree trunk.
2. Drainage pipe layout should extend beyond the Critical Root Zone.
3. Vertical pipes should 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: UMCP

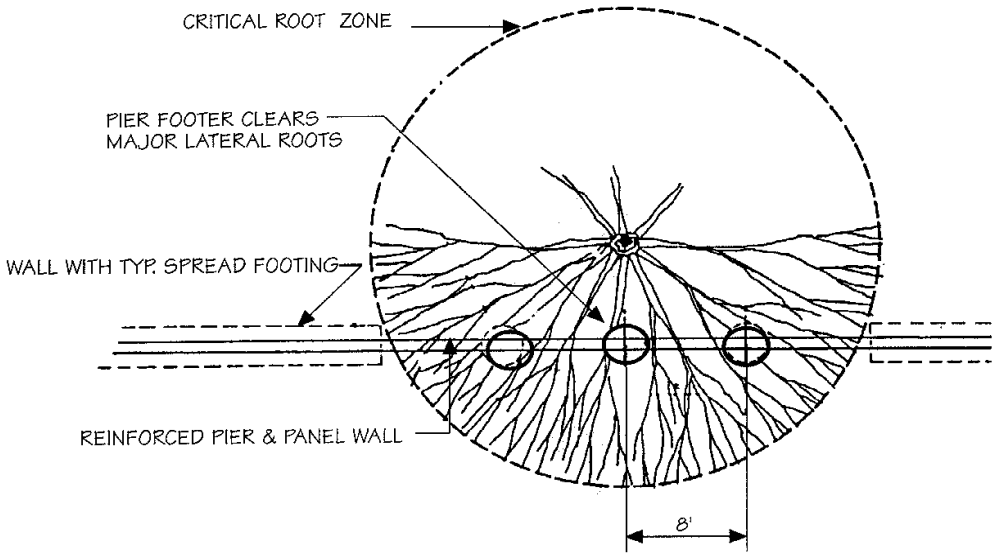
Tree Well and Aeration System	**Figure D:12**



Notes:
1. Wall should be constructed outside the Critical Root Zone.
2. Use extreme care to protect existing roots while constructing retaining wall, including anchoring system, if required.
3. If tree roots must be disturbed, prune roots

Source: Adapted from Fairfax County, Virginia: Vegetation Preservation & Planting, January 1986

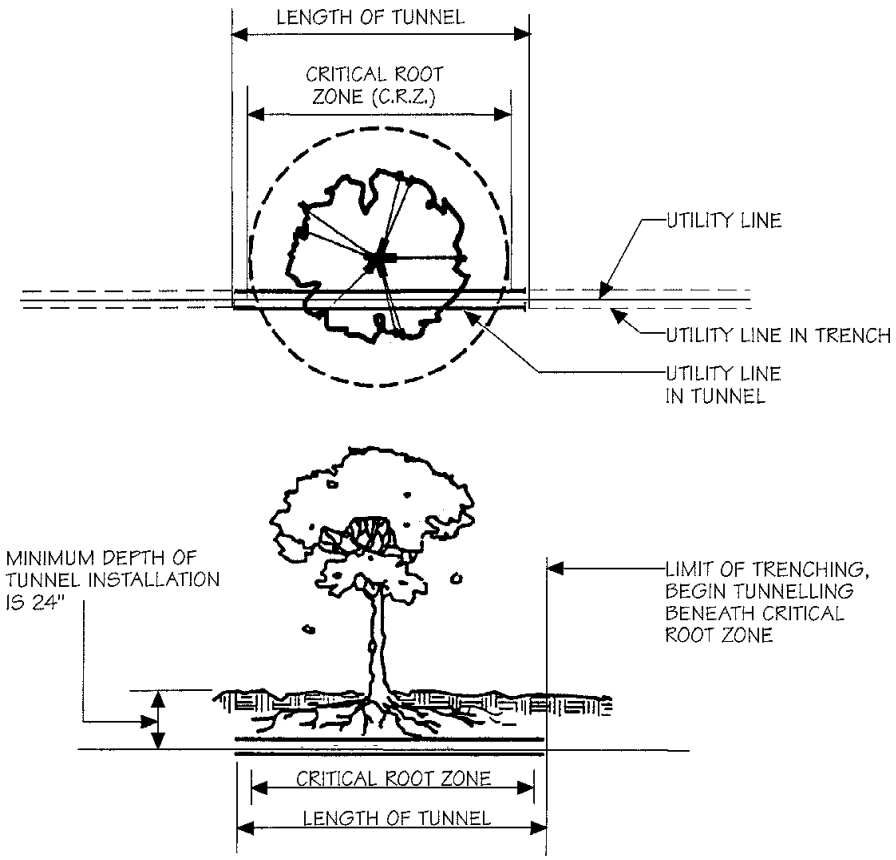
Retaining Walls	**Figure D:13**



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

Reinforced Pier and Panel Wall	**Figure D:14**



Notes:

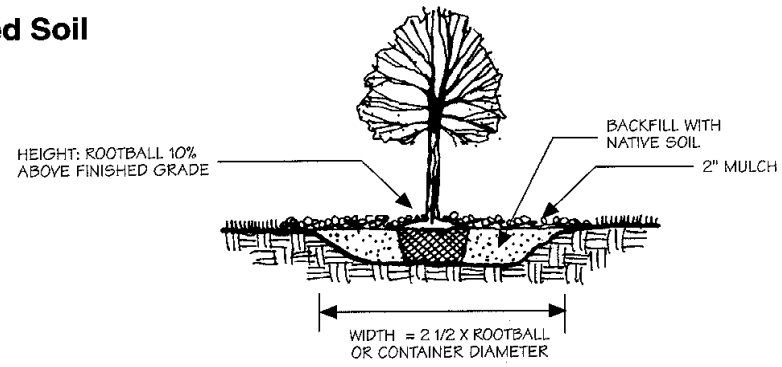
Tunnel should be located under Critical Root Zone at a minimum depth of 24 inches.

Tunnel through the Critical Root Zone, resume trenching of utilities beyond the Critical Root Zone.

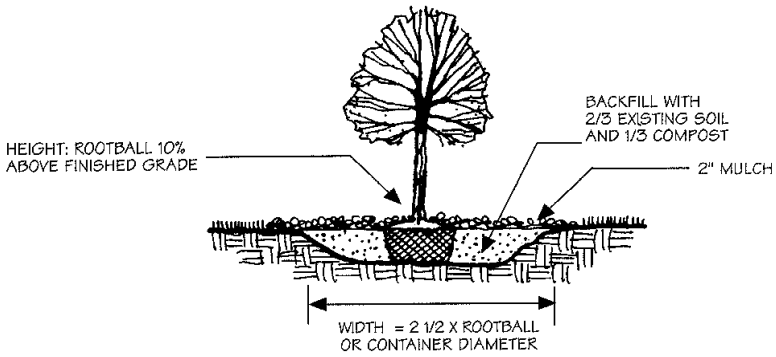
Source: Adapted from Fairfax County, Virginia: Vegetation Preservation and Planting, January 1986

Tunneling	**Figure D:15**

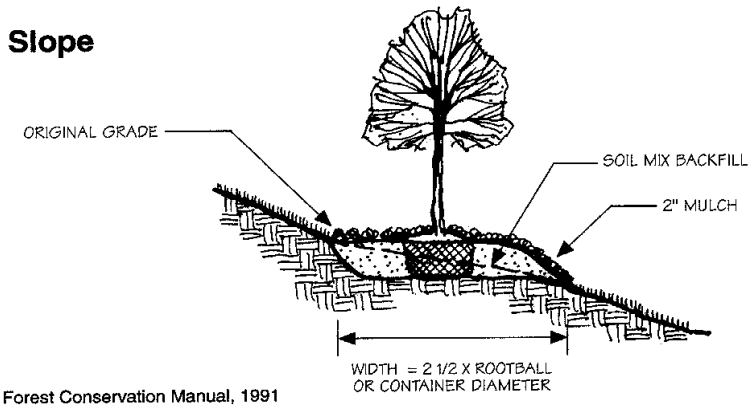
Undisturbed Soil



Disturbed Soil



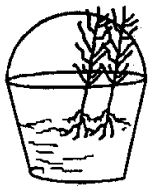
Planting on Slope



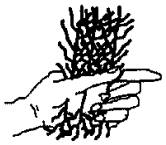
Source:Adapted from Forest Conservation Manual, 1991

Container Grown and B&B Planting Techniques	Figure D:16

Handling Seedlings in the Field



Correct
IN BUCKET WITH SUFFICIENT
WATER TO COVER ROOTS



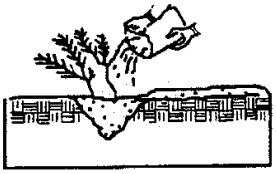
Incorrect
IN HAND:
ROOTS DRY OUT

Note:
1. Bare root seedlings and whip stock should be heeled-in when left unplanted for more than 24 hours.

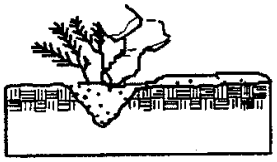
Seedlings and Whips

1. DIG V-SHAPED TRENCH
IN MOIST SHADY PLACE

2. BREAK BUNDLES AND
SPREAD OUT EVENLY



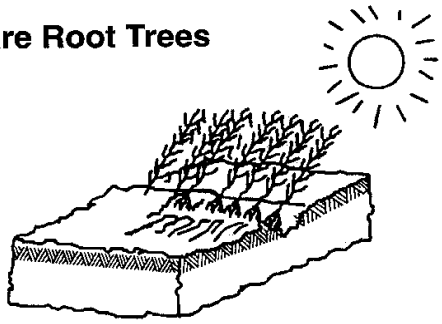
3. FILL IN LOSE SOIL AND
WATER WELL



4. COMPLETE FILLING IN SOIL
AND FIRM WITH FEET

Note:
1. Bare root seedlings and whip stock should be heeled-in when left unplanted for more than 24 hours.

Bare Root Trees



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.

Note:
1. Bare root trees should be banked-in when they must be left unplanted for longer than a few days

Source: Adapted from Forest Conservation Manual, 1991

Handling Bare Root Stock	Figure D:17

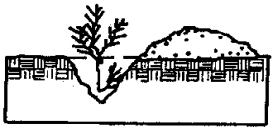
Seedling and Whip Planting

Note:
1. Mulching newly planted seedlings helps the soil retain moisture and protects the seedling from compaction and stem injuries.

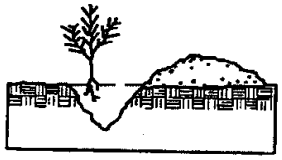
Correct and Incorrect Planting Depth

Correct
AT SAME DEPTH

SEEDLING WAS GROWN
IN NURSERY

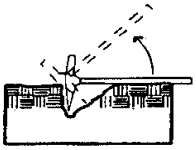


Incorrect
TOO DEEP AND ROOT
BENT

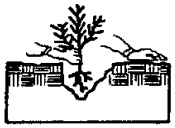


Incorrect
TOO SHALLOW AND ROOTS
EXPOSED

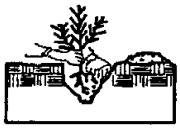
Mattock Planting



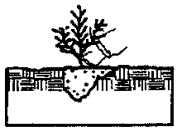
1. Insert mattock; lift handle and pull



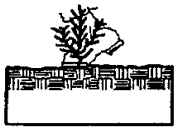
2. Place seedling along straight side at correct depth.



3. Fill in and pack soil to bottom of roots.



5. Firm around seedling with feet.

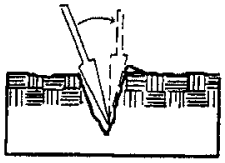


4. Finish filling in soil and firm with heel.

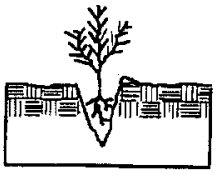
Source: Adapted from Forest Conservation Manual, 1991

Seedling and Whip Planting Techniques	Figure D:18

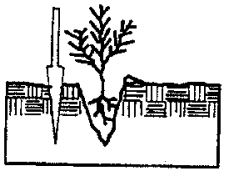
Planting With Dibble Bar



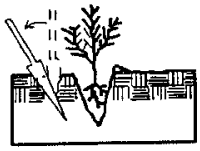
1. INSERT DIBBLE AT ANGLE SHOWN ABOVE AND PUSH FORWARD TO UPRIGHT POSITION



2. REMOVE DIBBLE AND PLACE SEEDLING AT CORRECT DEPTH

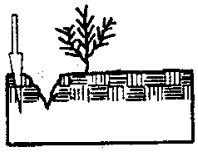


3. INSERT DIBBLE 2 INCHES TOWARD PLANTER FROM SEEDLING

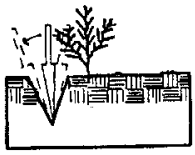


4. PULL HANDLE OF DIBBLE TOWARD PLANTER FIRMING SOIL AT BOTTOM OF ROOTS

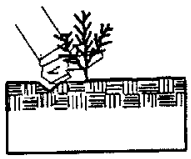
5. PUSH HANDLE OF DIBBLE FORWARD FROM PLANTER FIRMING SOIL AT TOP OF ROOTS



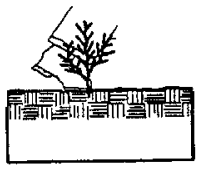
6. INSERT DIBBLE 2 INCHES FROM SEEDLING



7. PULL FORWARD THEN PULL BACKWARD FILLING HOLE



8. FILL LAST HOLE BY STAMPING WITH HEEL

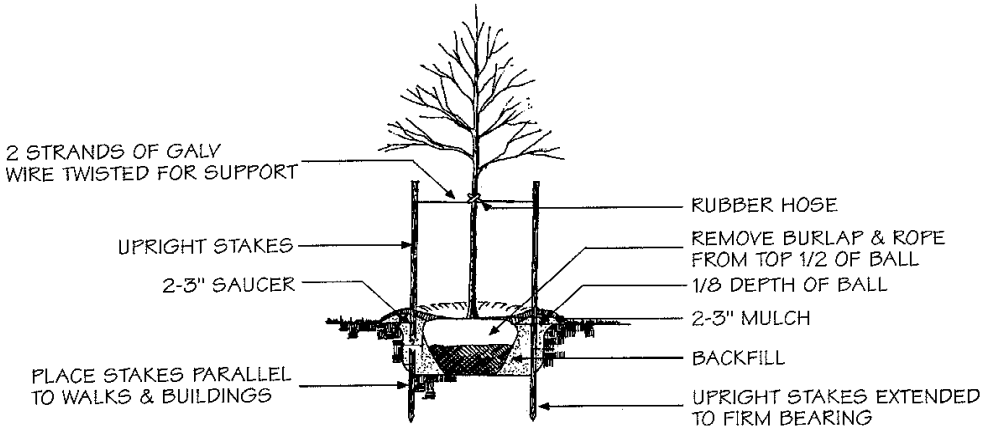


9. FIRM SOIL AROUND SEEDLING WITH FEET

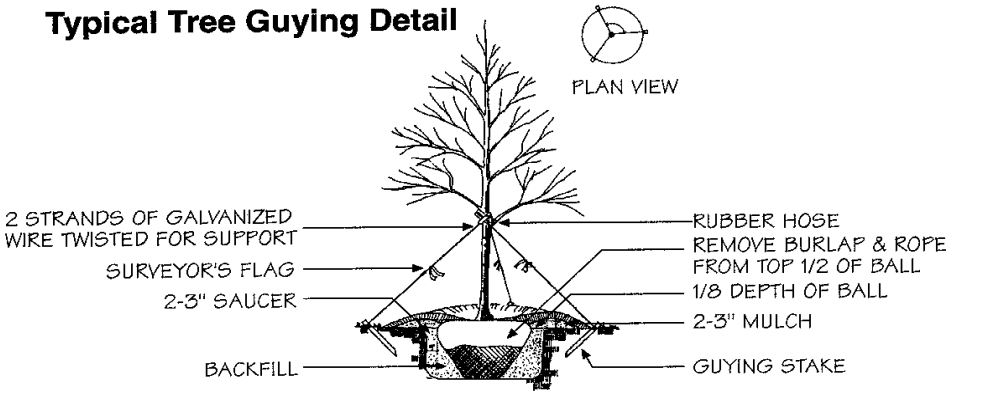
Source: Adapted from Duryea & Dougherty, Forest Regeneration Manual, Kluwer Academic Publishers, Boston, 1991 and Forest Conservation Manual, 1991

Seedling Planting Techniques | **Figure D:19**

Typical Upright Staking Detail



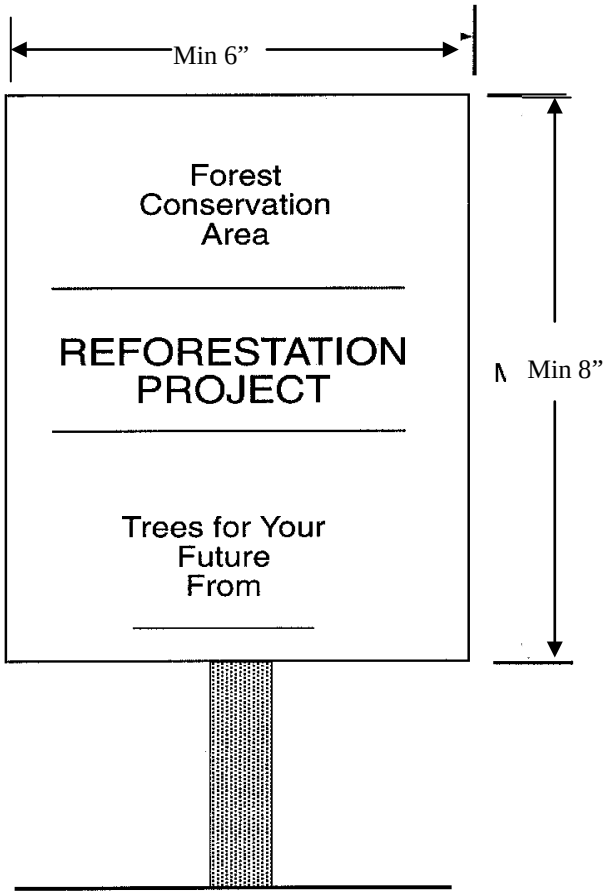
Typical Tree Guying Detail



Tree Size Height	Tree Size Caliper	Stake	#	Wire or Cable	Hose
6-10'	1" to 1-1/2"	5-6' upright	2	14 guage wire	1/2"
10-12'	2" to 2-1/2"	7-8' upright	2	14 guage wire	1/2"
12-14'	2-1/2" to 3"	2" guy	3	12 guage wire	1/2"
14-16'	3-4"	2" guy	3	12 guage wire	3/4"

Source: Adapted from Forest Conservation Manual, 1991

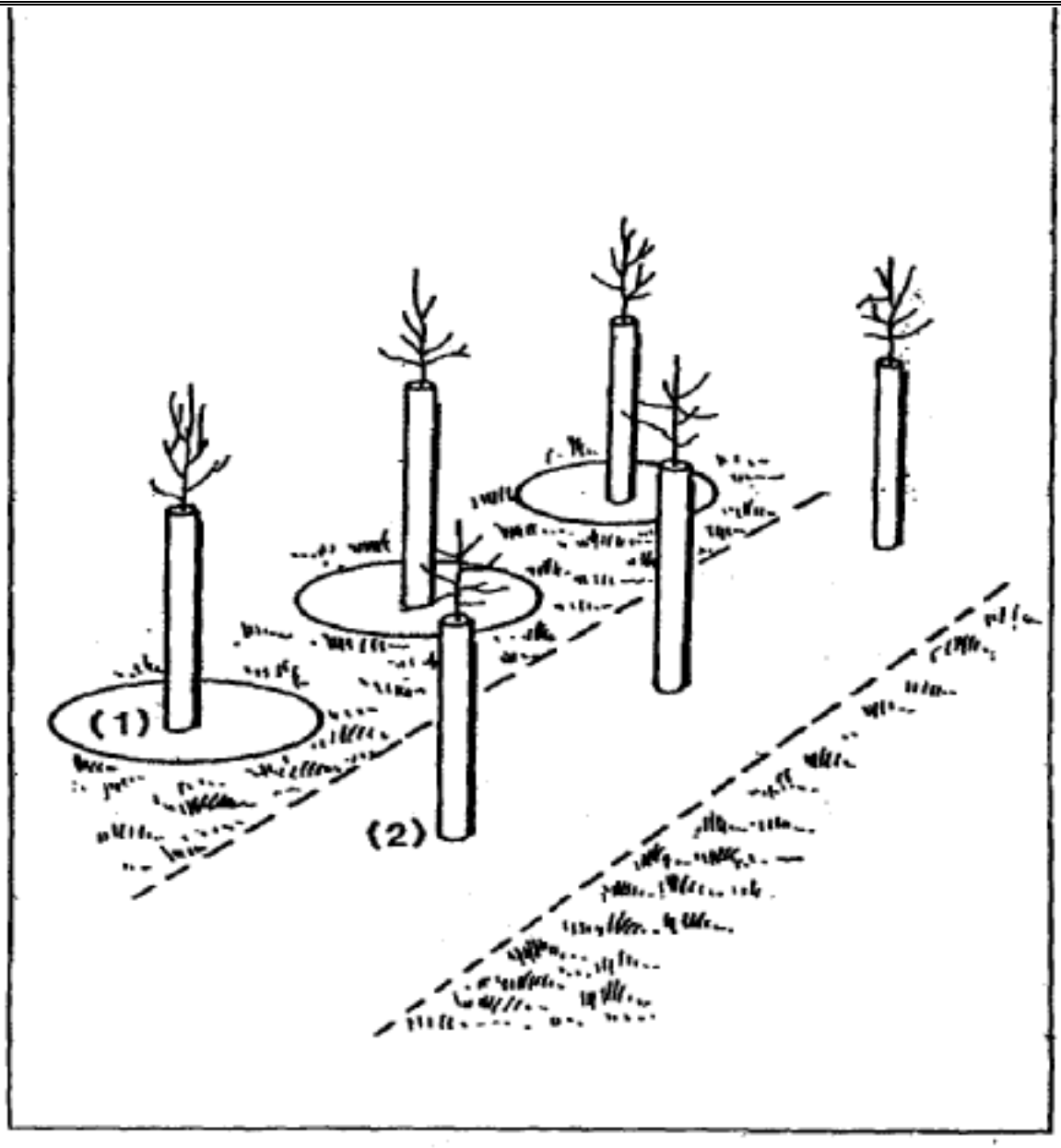
Tree Staking and Guying Specifications | **Figure D:20**



Notes:
1. The signs notify construction workers and future residents of the newly planted material, improving the trees' survival rates.
2. Signs may be adapted by residents for identification of forest retention areas

Source: Adapted from Forest Conservation Manual, 1991

Reforestation and Afforestation Area Signs | **Figure D:21**



Method of Weed Control **Figure D:22**

Methods of Weed Control

1. Spot weeding, keeping 1 m^2 around the base of the tree weed free.
2. Strip weeding, keeping a 1 m wide band down the tree rows weed free. Strip weeding has the advantage that it can be mechanized.

Herbicide management is key to plant success

APPENDIX E

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APPENDIX F

List of Invasive Exotic Plants

The following is a list of exotic or invasive plants that threaten or degrade forests in Maryland:

Common Name	**Scientific Name**
H E R B A C E O U S	
Garlic Mustard[1]	*Alliaria petiolata*[1] (*A. officinalis*)
a grass	*Arthraxon hispidus*
Crown-vetch[2]	*Coronaria varia*[2]
Tall Fescue, K31 Fescue[2]	*Festuca elatior* (*F. arundinacea*)[2]
Sericea Lespedeza[2]	*Lespedeza cuneata*[2]
a grass[1]	*Microstegium vimineum*[1] (*Eulalia viminea*)
Common Reed[1]	*Phragmites australis*[1] (*P. communis*)
Japanese Knotweed[1]	*Polygonum cuspidatum*[1]
Mile-a-minute Vine, Devil's Tearthumb[1]	*Polygonum perfoliatum*[1]
Lesser Celandine[1]	*Ranunculus ficaria*[1]
V I N E S	
Porcelain Berry[1]	*Ampelopsis brevipedunculata*[1]
Oriental Bittersweet[1]	*Celastrus orbiculatus*[1]
Cinnamon Vine[1]	*Dioscorea batatas*[1]
Climbing Euonymus, Wintercreeper	*Euonymus fortunei*
English Ivy[2]	*Hedera helix*[2]
Japanese Honeysuckle[1]	*Lonicera japonica*[1]
Kudzu[2]	*Pueraria lobata*[2]
Periwinkle	*Vinca minor*
Wisteria[2]	*Wisteria floribunda, W. sinensis*[2]
S H R U B S	
Japanese Barberry	*Berberis thunbergii*
Russian Olive	*Elaeagnus angustifolium*
Autumn Olive	*Elaeagnus umbellata*
Winged Euonymus, Winged Wahoo[1]	*Euonymus alatus*[1]
Privet	*Ligustrum* spp.
Bush Honeysuckles[1], including	*Lonicera* spp.[1]
Belle Honeysuckle	*Lonicera x bella*
Amur Honeysuckle	*Lonicera maackii*
Morrow's Honeysuckle	*Lonicera morrowii*
Tartarian Honeysuckle	*Lonicera tatarica*
Bamboo - running varieties[2]	*Phyllostachys* spp., *Pseudosasa japonica*[2]
Common Buckthorn	*Rhamnus cathartica*
European Buckthorn	*Rhamnus frangula*
Multiflora Rose[1]	*Rosa multiflora*[1]
Strawberry-raspberry, Balloonberry	*Rubus illecebrosus*
Wineberry	*Rubus phoenicolasius*
Japanese Spiraea[1]	*Spiraea japonica*[1]
Coralberry	*Symphoricarpos orbiculatus*

T R E E S

Norway Maple[1]	*Acer platanoides*[1]
Tree of Heaven	*Ailanthus altissima*
White Mulberry	*Morus alba*
Empress Tree	*Paulownia tomentosa*
Sweet Cherry, Bird Cherry	*Prunus avium*

1. The most serious threats to natural forests because they are both damaging and strongly invasive.
2. Not as readily established, but once established, very persistent and damaging.

Ranking by Maryland Natural Heritage Program, 21 July 1994.

Forest Conservation Manual Task Force
Jeff Horan, Chair, DNR-Forest Service
Tod Ericson, Secretary, DNR-Forest Service
Paul Amrhein, DNR-Forest Service
Norman Astle, Maryland Farm Bureau
Joe Barley, Baltimore Gas and Electric
John Blake, Maryland Forests Association
Mark Burchick, Environmental Quality Resources, Inc.
Patricia Cornman, Baltimore County DEPRM
Kris Dameron, Queen Anne's County Department of Planning and Zoning
Rupert Friday, Chesapeake Bay Foundation
Scott Gove, Maryland Builders Association
Lorrie Herson-Jones, Metropolitan Washington Council of Governments
Elmina Hilsenrath, University of Maryland, College Park
David Holden, Howard County Planning and Zoning
Roxana Homer, Calvert County Planning and Zoning
Ginger Page Howell, DNR-Forest Service
Kristen Mark Hughes, Maryland Association of Counties
Henry Kay, Maryland Office of Planning
Doug Koop, Cecil County Planning and Zoning
The Honorable George H. Littrell, Jr., House of Delegates
The Honorable George McManus, Town of Denton
Rich Pais, Daft, McCune, Walker, Inc.
Jim Peck, Maryland Municipal League
Walt Powers, Worcester County Forest Conservation Task Force
Frank Richardson, Maryland Farm Bureau
Robert Smith, Maryland House of Delegates, Environmental Matters Committee
Robert Syphard, Town of Bel Air Planning and Community Development
Carol Swan, Maryland Senate, Economic and Environmental Affairs Committee
Martin Tucker, Fox and Associates
Clark Wagner, City of Gaithersburg Planning Department
Leonard Wrable, Mar-Len Forestry, Inc.

Forest Conservation Advisory Group

Appointed Members

Department of Natural Resources
John R. Griffin
Eric C. Schwaab
Leonard M. Wrabel
Erin M. Fitzsimmons

American Planning Association, Maryland Chapter
Brian H. Williams, Harford County
Maryland Builders Association
Michael L. Roepcke
Maryland Association of Counties/Maryland Municipal League
William C. Livingston, Wicomico County
The Honorable Julia W. Gouge, Carroll County
The Honorable Ellen O. Moyer, City of Annapolis
Chesapeake Bay Foundation
Rupert Friday
Maryland Farm Bureau
Donald Hoopes

APPENDIX G

Rare Species of Concern to the Maryland Natural Heritage Program

ANIMALS

Planarians

Phagocata virilis	A planarian
Planaria dactyligera	A planarian
Sphalloplana sp 1	A planarian

Molluscs

Alasmidonta undulata	Triangle floater
Alasmidonta varicosa	Brook floater
Anguispira clarki	Clark's beehive snail
Lampsilis cariosa	Yellow lampmussel

Crustaceans

Ankylocthere tridentata	An entocytherid ostracod
Attheyella spinipes	A harpacticoid copepod
Caecidotea sp 1	An isopod
Caecidotea sp 2	An isopod
Caecidotea sp 3	An isopod
Dactylocythere scotos	An entocytherid ostracod
Diacyclops palustris	A cyclopoid copepod
Eulimnadia francesae	A conchostracan phyllopod
Eulimnadia ventricosa	A conchostracan phyllopod
Stygobromus pizzinii	Pizzini's cave amphipod
Stygobromus sp 5	Crabtree cave amphipod
Stygobromus sp 6	An undescribed amphipod

Spiders

Atypus bicolor	American purse-web spider
Oreonetides sp 1	Snivelys cave spider
Porrhomma cavernicolum	Appalachian cave spider

Insects

Amblyscirtes hegon	Pepper-and-salt-skipper
Apamea apamiformis	A noctuid moth
Apamea plutonia	A noctuid moth
Arrhopalites sp 1	Crabtree cave springtail
Capis curvata	A noctuid moth
Catocala marmorata	Marbled underwing

Catocala pretiosa	Precious underwing
Chlorotettix sp 1	A cicadellid leafhopper
Cicindela lepida	Little white tiger beetle
Cincindela patruela	A tiger beetle
Colias interior	Pink-edged sulphur
Cyclophora nanaria	A geometrid moth
Cyllopsis gemma	Gemmed satyr
Dasychira atrivenosa	A lymantriid moth
Ectoedemia castaneae	American chestnut nepticulid moth
Ectoedemia phleophaga	Phleophagan chestnut nepticulid moth
Elaphria georgei	A noctuid moth
Erynnis persius	Persius duskywing
Euchloe olympia	Olympia marble
Euphyes pilatka	Saw-grass skipper
Hadena ectypa	A noctuid moth
Hemileuca maia ssp 4	Woodland buckmoth
Hesperia attalus	Dotted skipper
Hesperia sassacus	Indian skipper
Hoperius planatus	A hydrophylid beetle
Hydrochara occulta	A hydrophylid beetle
Hydrochus sp 1	Seth forest water scavenger beetle
Isoparce cupressi	Cypress sphinx moth
Laccophilus schwarzi	Schwarz' diving beetle
Limotettix sp 1	Eastern sedge barrens planthopper
Lucanus elephas	Giant stag beetle
Meropleon titan	A noctuid moth
Mitoura hesseli	Hessel's hairstreak
Nicrophorus americanus	American burying beetle
Papaipema duovata	A noctuid moth
Papaipema marginidens	A noctuid moth
Papaipema polymniae	Polymnia stalk borer
Papilio cresphontes	Giant swallowtail
Papilio palamedes	Palamedes swallowtail
Potamanthus walkeri	Walker's tusked sprawler
Satyrium acadica	Acadian hairstreak
Satyrium kingi	King's hairstreak
Schinia parmeliana	A noctuid moth
Scymnus gordoni	A coccinellid beetle
Sperchopsis tessellatus	A hydrophylid beetle
Speyeria diana	Diana
Sphinx franckii	Franck's sphinx
Stylurus notatus	Elusive clubtail dragonfly
Synanthedon castaneae	Chestnut clearwing moth
Tachopteryx thoreyi	Thorey's grayback damselfly
Xestia bollii	A noctuid moth

Fishes

Acantharchus pomotis	Mud sunfish
Acipenser oxyrchynchus	Atlantic sturgeon
Centrarchus macropterus	Flier

Clinostomus elongatus	Redside dace
Enneacanthus chaetodon	Blackbanded sunfish
Fundulus luciae	Spotfin killifish
Noturus flavus	Stonecat
Percina caprodes	Logperch

Amphibians

Plethodon wehrlei	Wehrle's salamander
Pseudacris brachyphona	Mountain chorus frog
Rana virgatipes	Carpenter frog

Reptiles

Apalone spinifera	Eastern spiny softshell
Graptemys geographica	Map turtle
Pituophis melanoleucus	Northern pine snake

Birds (Breeding only)

Accipiter striatus	Sharp-shinned hawk
Aegolius acadicus	Northern saw-whet owl
Ammodramus henslowii	Henslow's sparrow
Asio flammeus	Short-eared owl
Asio otus	Long-eared owl
Botaurus lentiginosus	American bittern
Catharus ustulatus	Swainson's thrush
Circus cyaneus	Northern harrier
Cistothorus platensis	Sedge wren
Dendroica coronata	Yellow-rumped warbler
Egretta caerulea	Little blue heron
Empidonax alnorum	Alder flycatcher
Gallinula chloropus	Common moorhen
Ixobrychus exilis	Least bittern
Junco hyemalis	Dark-eyed junco
Laterallus jamaicensis	Black rail
Limnothlypis swainsonii	Swainson's warbler
Lophodytes cucullatus	Hooded merganser
Podilymbus podiceps	Pied-billed grebe
Porzana carolina	Sora
Regulus satrapa	Golden-crowned kinglet
Sitta canadensis	Red-breasted nuthatch
Sphyrapicus varius	Yellow-bellied sapsucker
Sterna antillarum	Least tern
Sterna sandvicensis	Sandwich tern
Troglodytes troglodytes	Winter wren
Vermivora ruficappilla	Nashville warbler

Mammals

Condylura cristata parva	Southeastern star-nosed mole
Erethizon dorsatum	Porcupine
Mustela nivalis	Least weasel
Myotis leibii	Eastern small-footed bat

Neotoma floridanan magister	Eastern woodrat
Sorex dispar	Long-tailed shrew
Sorex hoyi winnemana	Southern pygmy shrew
Sorex longirostris	Southeastern shrew
Spilogale putorius	Eastern spotted skunk
Sylvilagus transitionalis	New england cottontail
Ursus americanus	Black bear

Plants

Abies Balsamea	Balsam fir
Agalinis decemloba	
Agalinis linifolia	
Agalinis skinneriana	
Alnus maritima	Seaside alder
Alopecurus aequalis	Short-awned foxtail
Alopecurus carolinianus	Carolina foxtail
Ammannia coccinea	
Ammannia latifolia	Koehne's ammannia
Ampelopsis arborea	Pepper-vine
Ampelopsis cordata	
Amsonia tabernaemontana	Blue dogbane
Anemone riparia	Large white anemone
Arabis glabra	Tower mustard
Arabis hirsuta	Hairy rockcress
Aristida curtissii	Curtiss' three-awn
Aristida tuberculosa	Sea-beach three-awn
Aster nemoralis	Bog aster
Aster praealtus	Willow aster
Aster sagittifolius	Arrow-leaved aster
Azolla caroliniana	Mosquito fern
Bacopa monnieri	
Betula populifolia	Gray birch
Blephilia hirsutha	Hairy woodmint
Bouteloua curtipendula	Side-oats grama
Calystegia spithamaea	Low bindweed
Campanula rotundifolia	Harebell
Cardamine pratensis	Cuckooflower
Carex arenaria	Sand sedge
Carex brevior	
Carex cephaloidea	Thin-leaved sedge
Carex echinata	Little prickly sedge
Carex emoryi	Emory's sedge
Carex meadii	Mead's sedge
Carex projecta	Necklace sedge
Carex retrorsa	
Carex richardsonii	Richardson's sedge
Carex rostrata	Beaked sedge
Carex rugosperma	
Carex tonsa	Shaved sedge
Carex trichocarpa	Hairy-fruited sedge

Carex typhina	Cat-tail sedge
Celtis laevigata	Sugarberry
Centrosema virginianum	Spurred butterfly-pea
Chaerophyllum tainturieri	
Chamaesyce vermiculata	Hairy spurge
Chenopodium leptophyllum	Narrow-leaved goosefoot
Cimicifuga americana	American bugbane
Clintonia alleghaniensis	Harned's swamp clintonia
Corydalis aurea	Golden corydalis
Croton capitatus	Hogwort
Croton monanthogynus	Prairie-tea
Cuscuta indecora	
Cyperus houghtonii	
Cyperus refractus	Reflexed cyperus
Cyperus retrofractus	Rough cyperus
Cystopteris tennesseensis	Tennnessee bladder-fern
Desmodium viridiflorum	
Dioscorea hirticaulis	Wild yam
Eleocharis flavescens	Pale spikerush
Eleocharis geniculata	Capitate spikerush
Eleocharis tortilis	Twisted spikerush
Epilobium leptophyllum	Linear-leaved willowherb
Eragrostis hirsuta	
Erianthus alopecuroides	Wooly beardgrass
Erigeron pulchellus	Lucy Braun's robin plantain
Var brauntiae	
Eriocaulon compressum	Flattened pipewort
Eriocaulon decangulare	Ten-angled pipewort
Euphorbia zinniiflora	Flowering spurge
Fimbristylis puberula	Hairy fibristylis
Galax aphylla	Galax
Galium palustre	Marsh bedstraw
Gymnocladus dioicus	Kentucky coffee-tree
Helianthus hirsutus	Hirsute sunflower
Houstonia tenuifolia	Slender-leaved bluets
Juncus articulatus	Jointed rush
Juncus brevicaudatus	Narrow-panicled rush
Juncus polycephalus	
Liatris spicata	Spiked blazing-star
Limonium nashii	Nash's sea lavender
Ludwigia brevipes	Creeping ludwigia
Ludwigia decurrens	
Lycopodium inundatum	Bog clubmoss
Lycopodium sabinifolium	Ground-fir
Manfreda virginica	False aloe
Matteuccia struthiopteris	Ostrich fern
Muhlenbergia glabriflora	
Muhlenbergia glomerata	
Myriophyllum heterophyllum	Broadleaf water-milfoil
Nemophila aphylla	

Nymphaea tuberosa	Tuberous white water lily
Oldenlandia uniflora	Clustered bluets
Panicum aciculare	Bristling panicgrass
Panicum aculeatum	Tall rough panicgrass
Panicum augustifolium	Narrow-leaved panicgrass
Panicum commonsianum	Commons' panicgrass
Panicum laxiflorum	
Panicum leucothrix	Roughis panicgrass
Panicum tuckermanii	Tuckerman's panicgrass
Panicum yadkinense	
Passiflora incarnata	Purple passionflower
Pilea fontana	Coolwort
Poa alsodes	Grove meadow-grass
Poa languida	Weak speargrass
Poa palustris	Fowl bluegrass
Polygonum amphibium	Water smartweed
Polygonum careyi	Carey's knotweed
Polygonum glaucum	Seaside knotweed
Polygonum opelousanum	Opelousas smartweed
Polygonum setaceum	Bristly smartweed
Populus balsamifera	Balsam poplar
Potamogeton illinoensis	Illinois pondweed
Potamogeton natans	Floating pondweed
Potamogeton perfoliatus	Clasping-leaving pondweed
Potamogeton pusillus	Slender pondweed
Potamogeton spirillus	Spiral pondweed
Potentilla arguta	Tall cinquefoil
Prunus pumila	Eastern dwarf cherry
Psoralea psoralioides	
Pycnanthemum virginianum	Virginia mountain-mint
Quercus laurifolia	Laurel-leaved oak
Quercus macrocarpa	Mossy-cup oak
Quercus shumardii	Shumard's red oak
Ranunculus laxicaulis	
Rhododendron calendulaceum	Flame azalea
Rhododendron canescens	
Ribes glandulosum	Skunk currant
Ribes hirtellum	Low wild gooseberry
Rosa setigera	Prairie rose
Rumex hastatulus	Engelmann's dock
Sagittaria longirostra	Long-beaked arrowhead
Salix discolor	Pussy willow
Salix tristis	Dwarf prairie willow
Scirpus cylindricus	Salt-marsh bulrush
Scirpus fluviatilis	River bulrush
Scirpus verecundus	
Scleria reticularis	Reticulated nutrush
Scleria triglomerata	Tall nutrush
Scutellaria galericulata	Common skullcap
Sesuvium maritumum	Sea-purslane

Sibara virginica	Virginia cress
Smilax ecirrhata	Upright smilax
Solidago stricta	Wandlike goldenrod
Spiranthes laciniata	Lace-lip ladys' tresses
Spiranthes praecox	Grass-leaved ladys'tresses
Sporobodlus asper	Long-leaved rushgrass
Stachys clingmanii	Clingman's hedge-nettle
Stachys cordata	Nuttall's hedge-nettle
Stachys hyssopifolia	Hyssop-leaved hedge-nettle
Stachys latidens	
Streptopus amplexifolius	White mandarin
Stylophorum diphyllum	
Symplocos tinctoria	Sweetleaf
Thalictrum dadycrpum	Purple meadowrue
Thalictrum macrostylum	
Thalictrum subrotundum	
Thelypteris phegopteris	Northern beech fern
Tillandsia usneoides	Spanish moss
Tofieldia glutinosa	False asphodel
Triadenum tubulosum	
Trichostema setaceum	Narrow-leaved bluecurls
Triglochin maritumum	Seaside arrow-grass
Utricularia cornuta	Horned bladderwort
Uvularia grandiflora	Large-flowered bellwort
Verbesina virginica	
V ernonia gigantea	Giant ironweed
Viburnum lentago	Nannyberry
Viola appalachiensis	Appalachian blue violet
Viola incognita	Large-leaved white violet
Viola septentrionalis	Northern blue violet
Vitis cinerea	Northern blue violet
Vitis cinerea	Graybark
Vitis rupestris	Sand grape
Wolffia papulifera	
Wolffia punctata	Water-meal
Xyris difformis	Variable yelloweyed-grass
Zephyranthes atamasca	Atamasco lily

CURRENT AND HISTORICAL RARE, THREATENED, AND ENDANGERED SPECIES OF CARROLL COUNTY, MARYLAND

Scientific Name	Common Name	State Status*
Animals		
Ammodramus henslowii	Henslow's sparrow	In Need of Conservation
Regulus satrapa	Golden-crowned kinglet	Rare
Speyeria idalia	Regal fritallary	Endangered
Plants		
Asclepias rubra	Red milkweed	Endangered
Carex buxbaumii	Buxbaum's sedge	Endangered
Carex conjuncta	Soft fox sedge	Endangered Extirpated
Carex conoidea	Field sedge	Endangered
Carex lanuginosa	Woolly sedge	Threatened
Carex meadii	Mead's sedge	Highly Rare
Castilleja coccinea	Indian paintbrush	Endangered
Elatine minima	Small waterwort	Endangered
Euphorbia purpurea	Darlington's spurge	Endangered
Fraxinus profunda	Pumpkin ash	Endangered Extirpated
Geum aleppicum	Yellow avens	Endangered
Krigia dandelion	Potato dandelion	Endangered
Lonicera canadensis	Canada honeysuckle	Endangered
Lythrum alatum	Winged loosestrife	Endangered
Matteuccia struthiopteris	Ostrich fern	Rare
Pycnanthemum vertcillatum	Whorled mountain-mint	Endangered
Sanguisorba canadensis	Canada burnet	Threatened
Scirpus smithii	Smith's clubrush	Endangered Extirpated
Scleria reticularis	Reticulated nutrush	Rare
Sphenopholis pennsylvanica	Swamp-oats	Threatened
Talinum teretifolium	Fameflower	Threatened

*See attached page for an explanation of State Status categories.

Maryland Natural Heritage Program
Department of Natural Resources; Resource Conservation Service
EXPLANATION OF STATE STATUS CATEGORIES

The State Status is determined by the Maryland Department of Natural Resources. The first four categories are those included in the Department's Threatened and Endangered Species list. Legal protection is provided only to species designated under one of these four categories. The remaining five categories are unofficial designations as determined by the Department's Natural Heritage Program.

Endangered Extirpated – a species that was once a viable component of the flora or fauna of the State, but for which no naturally occurring populations are known to exist in the State.

Endangered – a species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy.

Threatened – a species of flora or fauna which appears likely, within the foreseeable future, to become endangered in the State.

In Need of Conservation – an animal species whose population is limited or declining in the State such that it may become threatened in the foreseeable future if current trends or conditions persist.

* * * *

Extirpated – a species that is known historically from the State, but has not been verified for an extended period, usually 40 years, and apparently is extirpated; or any species whose only known populations have been destroyed.

Historical – a species that is known historically from the State, but has not been verified for an extended period, usually 15 years.

Highly Rare – a species which typically has five or fewer current, naturally occurring, viable populations remaining in the State.

Rare – a species which typically has between five and twenty current, naturally occurring, viable populations remaining in the State.

Status Uncertain – an uncommon species considered to be of concern in the State, but with an uncertain status due to inadequate data to determine rarity, question of taxonomic classification, the possibility that reports of Maryland populations are based on misidentified specimens, or the possibility that the species is not native and naturally occurring in the State.

APPENDIX H

MARYLAND SOILS DATA

K factors have been designated as > .35 if on any of the horizons within the soil series exceeds .35.

This list should air the applicant in identification of hydric soils. It should accompany field verification which should be in accordance with the Army Corps of Engineer's guidelines. The soils consist of those very poorly drained and those having a water table within at least 1.5 feet of the surface for a period of time during the growing season. Morphological factors which are observable in the field include comparison of black muck or black to dark brown peat, and gray colors often with brighter colors mottled. Colors can be identified by comparison with a Munsell color chart. Applicants should sample the soil between a depth of ten inches and 1.5 feet.

(Tiner, 1988, MD DNR, USDI Fish and Wildlife Service)

MARYLAND SOILS DATA

Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)	Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)
Abbottstown	+		Barclay	-	
Aldelphia	+		Bayboro	+	+
Albrights	+		Baybobo ponded		+
Aldino	+		Beach land	-	
Allegheny	-		Belmont	+	
Alloway	+		Beltsville	+	
Alluvial land	-		Benevola	+	
Altavista	+	+	Berks	-	
Andover	+	+	Bermudian	+	
Andover, Stony	+		Berryland	-	+
Amaugh			Bertie	+	
Amaugh, Stony		+	Bibb	+	+
Ashby	-		Birdsboro	+	
Ashton	-		Bladen	+	+
Athol	+		Bladen, ponded		+
Atkins	+	+	Borrow pits	-	
Atsion		+	Bourne	-	
Atsion, tide Flooded		+	Bowmansville	+	+
			Braddock	-	
Augusta	+				
			Brandywine	-	
Aura	+				
			Brinkerton	+	+
Axix		+			
			Brinkerton, Stoney		+
Baile	+	+			
Baltimore	-		Brooke	+	
Barbour		+	Buchanan	+	

MARYLAND SOILS DATA

Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)	Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)
Bucks	+		Colluvial land	-	
Butlertown	+		Colts Neck	-	
Calvert	+		Comus	-	
Calvin	-		Conestoga	+	
Captina	+		Congaree	+	
Cardiff	-		Conowingo	+	
Caroline	+		Cookport	+	
Catoctin	-		Corydon	+	
Cavode	+		Croom	+	
Chalfont	+		Croton	+	+
Chandler	-		Cronton, Stony		+
Chavies	-		Cut and Fill land	-	
Chester	-		Dekalb	+	
Chewacla	+		Delanco	+	
Chillum	+		Donlonton	+	
Christiana	+		Downer	-	
Chrome	-		Dragston	+	
Clay pits	+		Duffield	+	
Clayey land	+		Duneland	-	
Clymer	-		Dunmore	+	
Coastal beach	-		Dunning	+	+
Codorus	+		Edgemont	-	
Colbert	+		Edom	-	
Colemantown	+	+	Elioak	-	
Collington	-		Elk	+	

MARYLAND SOILS DATA

Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)	Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)
Elkins	+	+	Hatboro	+	+
Elkton	+		Hazel	-	
Eliber	-		Highfield	-	
Elsinboro	-		Hollinger	+	
Eroded land	+		Holston	-	
Ernest	+		Howell	+	
Etowah	-		Huntington	+	
Evesboro	-		Hyde	+	+
Exum	+		Ipswich		+
Fairfax	+		Iradell		+
Fallsington	+	+	Iuka	+	
Fauquier	+		Jimtown	-	
Fort Mott	-		Johnsburg	+	
Frankstown	+		Johnstown	+	+
Frederick	-		Joppa	-	
Galestown	-		Kalmia	-	
Gilpin	-		Keansburg	-	
Gleneig	+		Kedron	+	
Glenville	+		Kelly	+	
Gravel pits and Quarriers	-		Kenansville	-	
Greenwich	+		Keyport	+	
Gullied land	+		Kingsland		+
Guthrie	+	+	Kinkora	+	+
Guthrie, ponded		+	Klej	-	
Hagerstown	-		Klinesville	-	

MARYLAND SOILS DATA

Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)	Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)
Laidig	-		Magnolia	-	
Lakeland	-		Manor	+	
Lamington	+		Markes		+
Landisburg	+		Marr	+	
Lansdale	+		Matapeake	+	
Lantz	+	+	Matawan	-	
Largent	+		Mattapex	+	
Leadvale	-		Meadow	-	
Leetonia	-		Meckesville	-	
Legore	-		Melvin	+	+
Lehew	-		Melvin, cool		+
Lehigh	+		Melvin, ponded		+
Lenoir	+	+	Mench	-	
Leon	-	+	Mixed alluvial land	-	
Leon; flooded		+	Monmouth	+	
Leonardtown	+	+	Monongahela	+	
Lewisburg	-		Montalto	-	
Lickdale	+	+	Montevallo	+	
Lickdale, stony		+	Morgnec	-	
Lindside	+		Mt. Airy	-	
Linganore	-		Muck	-	
Litz	-		Muirkirk	+	
Loamy and clayey land	+		Murrill	-	
Loysville	+	+	Myersville	-	
Made land	-		Neshaminy	-	

MARYLAND SOILS DATA

Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)	Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)
Nolo	+	+	Relay	-	
Nolo, stony		+	Ridgely	-	
Norfolk	-		Roanoke	+	+
Norton	-		Roanoke		+
Ochlockonee	-		Roanoke, ponded		+
Openquon	+		Robertsville	+	+
Osier	-	+	Rocky land	-	
Osier, flooded		+	Rohrersville	+	
Osier, ponded		+	Rowland	+	
Othello	+	+	Rumford	-	
Pamlico	-		Rutledge	-	+
Peat	-		Rutledge, ponded		+
Penn	-		Sandy, land, steep		+
Philo	+	+	Sand and clayey land	+	
Plummer	-	+	Sassafras	+	
Plummer, ponded			Sequatchie	-	
Pocomoke	-	+	Shelocta	-	
Pocomoke, drained		+	Shrewsburg	+	+
Pocomoke, ponded			Silty and clayey land	+	
Pope	-	+	St. John’s	-	+
Portsmouth	-	+	St. John’s depressional		+
Purdy	+		Steinsburg	-	
Raritan	+		Stony land	-	
Rayne	-				
Readlington	+				

MARYLAND SOILS DATA

Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)	Soil Series	K Value (Erodibility Factor + > .35 - ≤ .35)	Hydric Soils (+ Hydric Soils)
Strip mines and dumps	+		Wharton	+	
Sunnyside	-		Whiteford	-	
Swamp	-		Wickham	-	
Talleydega	+		Wiltshire	+	
Talleyville	-		Woodstown	-	
Teas	-		Worsham	+	+
Thurmont	-				
Tidalmarsh	-				
Trego	+				
Tuxedo	+				
Tyler	+				
Ungers	-				
Urbana	+				
Warners	+	+			
Warners, non-flooded		+			
Watchung	+	+			
Watchung, stony		+			
Waynesboro	-				
Wayside	+				
Wehadkee	-	+			
Westbrook		+			
Weikert	-				
Westmoreland	+				
Westphalia	+				

APPENDIX I

PREFERRED TREE SPECIES LIST

(The following is a list of trees indigenous to Carroll County.)

MESIC SITES	
Acer rubrum	Red Maple
Amelanchier sp.	Shadbush
Catalpa speciosa	Catalpa
Carya ovata	Hickory
Cletis reticulata	Hackberry
Cercis canadensis	Redbud
Fagus grandifolia	American Beech
Fraxinus pennsylvania	Green Ash
Fraxinum americana	White Ash
Juglans nigra	Black Walnut
Juglans cinera	Butternut
Lirodendron tulipifera	Tulip Poplar
Nyssa sylvatica	Black Gum
Prunus pennsylvanica	Black Cherry
Sasaras albidum	Sasafras
Quercus borealis	Northern Red Oak
Quercus palustris	Pin Oak
Quercus velutina	Black Oak
Tilia americana	American Basswood
WET SITES	
Acer rubrum	Red Maple
Alnus servulata	Smooth Alder
Carpinus carolinia	Blue Beech
Platanus occidentalis	Sycamore

Populus deltoides	Eastern Cottonwood
Quercus prinoides	Pin Oak
Salis nigra	Black Willow
DRY SITES	
Betula Lenta	Black Birch
Carya tomentosa	Mockernut Hickory
Carya glabra	Pignut Hickory
Ostrya virginiana	American Hop-Hornbeam
Robinia psuedoacacia	Black Locust
CONIFERS	
Piceaabies	Norway Spruce
Pinus strobus	White Pine
Tsuga Canadensis	Canadian Hemlock

No less than five (5) species may be used in any afforestation or reforestation planting.

PREFERRED NATIVE PLANT SPECIES ADDENDUM

SCIENTIFIC NAME	COMMON NAME
SHRUBS	
Amelanchier sanguinea	Roundleaf Serviceberry-D
Aronia arbutifolia	Red Chokeberry-W
Aronia melanocarpa	Black Chokeberry-M
Aronia prunifolia	Purple Chokeberry-W
Ceanothus americanus	Jerseytea Ceanothus-D
Cephalanthus occidentalis	Common Buttonbush-W
Clethra alnifolia	Summersweet Clethra-W
Cornus amomum	Silky Dogwood-W
Cornus racemosa	Gray Dogwood-M
Cornus stolonifera	Redosier Dogwood-W
Corylus americana	American Filbert-M
Ilex verticillata	Winterberry-W
Kalmia Latifolia	Mountain Laurel-M
Lindera benzoin	Spicebush-M
Myrica pennsylvanica	Northern Bayberry-W
Physocarpus opulifolius	Common Ninebark-M
Rhododendron periclymenoides	Pinxterbloom Azaela-M
Rhododendron viscosum	Swamp Azaela-W
Rhus aromatica	Frangrant Sumac-D
Salix humilis	Prairie Willow-W
Sambucus canadensis	American Elder-M
Vaccinium corymbosum	Highbush Blueberry-M
Vaccubuyn aygystufikuyn	Low Bush Blueberry-M
Vaccinium Stamineum	Common Deerberry-D
Viburnum acerifolium	Mapleleaf Viburnum-M
Viburnum dentatum	Arrowood Viburnum-W
UNDERSTORY	
Cornus florida	Flowering Dogwood-M
Cornus alternifolia	Pagoda Dogwood-M
Chionanthus virginicus	White Fringetree-D
Viburnum lentago	Nanneyberry Viburnum-D
Viburnum prunifolium	Blackhaw Viburnum-D
Rhus copallina	Flameleaf Sumac-D
Rhus glabra	Smooth Sumac-D
Hamamelis virginiana	Common Witchhazel-M
Ilex opaca	American Holly-M Winterberry-W

OVERSTORY

Acer saccharum	Sugar Maple-M
Betula nigra	River Birch-W
Betula lenta	Sweet Birch-W
Pinus virginiana	Virginia Pine-D
Juniperus virginiana	Eastern Red Cedar-D
Quercus alba	White Oak-M
Quercus bicolor	Swamp White Oak-W
Quercus coccinea	Scarlet Oak-D
Quercus marilandica	Blackjack Oak-D
Quercus prinus	Chestnut Oak-D
Quercus muhlenbergi	Chinkapin Oak-D
Quercus stellata	Post Oak-D

Site Classifications are: M-Mesic, W-Wet, D-Dry

APPENDIX J

Maryland State Champion Trees 1990

Carroll County Tree Champions

Species	Circumferences	Height	Spread	Total Points	75% of Champion Points
Ash-Fraxinus Americana – Westminster	13'3"	85'	105'	270.3	202.7
Purple Beech-Fagus Sylvatica - Atropurpea - New Windsor	12'10"	75'	82'	249.5	187.1
Boxwood-Buxus Sempervirens Westminster	2'6"	31'	22'	66.5	49.8
Larch-Larix Decidua-Sykesville	9'3"	86'	46'	208.5	156.3
Locust-Robbina Pseudoacacia-Westminster	12'6"	55'	54'	218.5	163.8
Red Maple – Acer Rubrum Sykesville	10'4"	61'	69'	202.3	151.7
Silver Maple – Acer Saccharinum-Westminster	18'3"	75'	90'	316.5	237.3
Sugar Maple – Acer Saccharum-Keymar	10'11"	100'	64'	247.0	185.2
Black Mulberry – Morus Nigra – Westminster – "State Champion"	20'8"	60'	78'	327.5	245.6
Chestnut Oak – Quercus Palustris – Mount Airy	12'3"	77'	80'	239.0	179.2
Pin Oak – Quercus Palustris – New Windsor	13'5"	75'	57'	250.3	187.7
Scarlet Oak – Quercus Coccinea – Finksburg	14'10"	95'	65'	289.3	216.9
White Oak – Quercus Alba – Westminster	15'9"	80'	107'	295.8	221.8
Norway Spruce – Picea Abies – Finksburg	10'0"	124'	33'	252.3	189.2
Sycamore–Plantanus Occidentalis – New Windsor – "State Champion"	25'5"	144'	89'	471.3	353.4
English Walnut – Juglans Nigra – Westminster	10'11"	50'	55'	194.8	146.1
White Cedar – Chamaecyparis Thyoides – Sykesville	6'6"	63'	37'	150.3	112.7
Weeping Willow– Salix Babylonica – Westminster "State Champion"	17'11"	134'	76'	368.0	276.0

Maryland State Champion Trees
1990

Trees are one of the outstanding features in our landscape. Almost everyone likes trees for one reason or another. Trees vary in size. Some species do not attain a large size as dogwoods or alder, yet their place in the landscape is just as important as an oak or yellow poplar.

In order to ensure fair comparisons for champion trees, certain measuring procedures are used. To qualify as a tree champion, the tree must have a single stem or trunk for at least 4.5 feet above ground level and have a total height of at least 15 feet. In multiple stemmed trees, only the largest stem should be measured.

The required information necessary to nominate or measure a big tree is:

1. Species – scientific name and common name
2. Location – county, town or road
3. Circumference – the girth, in inches, of the trunk at 4.5 feet above ground
4. Height – total perpendicular height of the tree, in feet
5. Crown Spread – the average of two measurements of the crown spread taken at right angles to each other, in feet
6. Condition – the general condition and health of the tree

The formula is: Total Points = Circumference (inches) + Height (feet) + 25% of the Average Crown Spread (feet)

The list is constantly changing. The search for the biggest tree of each species continues. This list will be updated as more champion tree candidates are discovered. For the most up to date list, please call the Maryland Department of Natural Resources, Forestry Division at (301)974-3776.

STATE CHAMPION TREES

Scientific Name	Common	Diameter (inches)
Ables balsamea	Balsam fir	32.2
Ables concolor	White fir	23.2
Ables Fraseri	Fraser fir	22.0
Ables nordmanniana	Nordman fir	35.0
Acer negundo	Boxelder	54.1
Acer ornatum dentatum	Cutleaf maple	4.5
Acer Palmatum	Japanese maple	45.9
Acer palmatum ornatum dentatum	Japanese cutleaf weeping maple	7.0
Acer platanoldes	Norway maple	61.5
Acer psudoplantanus	Sycamore maple	32.5
Acer rubrum	Red maple	58.0
Acer saccharinum	Silver maple	97.1
Acer saccharum	Sugar maple	85.7
Aesculus glabra	Ohio buckeye	54.1
Aesculus hippocastanum	Horse chestnut	55.4
Aesculus octandra	Yellow buckeye	47.8
Ailanthus altissima	Allanthus	45.5
Albizia julibrissin	Mimosa	27.4
Ainus serrulata	Hazel alder	3.2
Amelanchler aborea	Serviceberry	38.5
Aralla spinosa	Hercules club	4.8
Aralla triloba	Paw Paw	8.9
Betula nigra	River birch	36.9
Betula populifolia	Grey birch	32.8
Broussonetia papyrifera	Paper mulberry	22.6
Buxus sempervirens	Boxwood	9.6
Carpinus caroliniana	Musclewood	10.8
Carva cordiformis	Bitternut hickory	50.0
Carya glabra	Pignut hickory	28.3
Carya illinoenis	Peacan	58.6
Carya laciniosa	Shellbark hickory	40.1
Carya ovalis	Red hickory	29.3
Carya ovata	Shagbark hickory	56.4
Carya pallida	Pale-leaved hickory	29.9
Castanea crenata	Japanese chestnut	43.0
Castamea demtata	American chestnut	18.2
Castanea mollissima	Chinese chestnut	57.0
Catalpa bignonioides	Catalpa	65.6
Catalpa speciosa	Northern catalpa	62.4
Cedrus atlantica	Blue atlas cedar	36.6
Cedrus deodara	Deodar cedar	32.2
Cedrus libani	Lebanon cedar	43.3
Celtis occidentalis	Hackberry	61.1
Chamaceyparis lawsoniana	Port-orford cedar	14.3
Chamaceyparis thyoides	Atlantic white cedar	33.1
Chionanthus virginicus	Fringe-tree	7.5
Cladrastis lutea	Yellow wood	42.7

Scientific Name	Common Name	Diameter (inches)
Cornus florida	Flowering dogwood	32.2
Cornus kousa	Kousa dogwood	8.0
Cotinus americanus	Smoke tree	5.4
Cryptomeria japonica	Cryptomeria	15.0
Cryptomeria japonica lobbii	Cryptomeria	22.9
Diospyros virginiana	Persimmon	21.0
Fagus grandifolia	American beech	67.5
Fagus sylvatica	Copper beech	73.2
Fagus sylvatica atropunicea	Purple beech	49.0
Fagus sylvatica heterophylia	Cutleaf beech	38.2
Fagus sylvatica pendula	Weeping beech	54.1
Fagus sylvatica purpurea	Purple beech	43.3
Fraxinus americana	White ash	65.3
Fraxinus exceisior	European ash	55.1
Fraxinus pennsylvanica	Green ash	36.0
Ginkgo biloba	Ginko	65.9
Gleditsla triacanthos	Honey locust	45.9
Gymnocladus dioicus	Kentucky coffeetree	45.3
Hibiscus syriacus	Althea	1.9
Hovenka dulcis	Japanese raisin tree	15.9
Ibex opaca	American holly	38.5
Jugians cinerea	Butternut	34.7
Juglans nigra	Black walnut	79.9
Juglans regia	English walnut	41.7
Juniperus virginiana	Eastern red cedar	49.4
Kalmia latifolia	Mountain laurel	2.9
Lagerstroemia indica	Crepemyrtle	9.2
Larix decidua	European larch	33.1
Larix laricinia	Eastern Larch	43.3
Libocedrus decurrens	Incense cedar	52.2
Lindera benzoin	Spicebush	34.4
Liquidambar styraciflua	Sweetgum	67.2
Liriodendron tulipifera	Yellow poplar	95.5
Maclura pomifera	Osage orange	67.8
Magnolia acuminata	Cucumber magnolia	79.6
Magnolia fraseri	Fraser magnolia	22.6
Magnolia grandiflora	Southernmagnolia	36.3
Magnolia macrophylla	Big Leaved magnolia	29.0
Magnolia soulangeana	Saucer magnolia	29.9
Magnolia virginiana	Sweetbay magnolia	5.1
Malus angustifolia	Crabapple	30.6
Metasequola glyptostroboides	Dawn redwood	29.9
Morus alba	White mulberry	44.9
Morus nigra	Black mulberry	79.0
Morus rubra	Red mulberry	47.8
Nyssa sylvatica	Black gum	103.2
Paulownia tomentosa	Paulownia	55.7
Picea abies	Norway spruce	53.2
Picea pungens	Blue spruce	24.5

Scientific Name	Common Name	Diameter (inches)
Picea rubens	Red spruce	34.7
Pinus echinata	Shortleaf pine	21.7
Pinus griffithii wallichiana	Himalayan white pine	40.8
Pinus nigra	Austrian pine	41.4
Pinus palustris	Longleaf pine	17.8
Pinus rigida	Pitch pine	27.1
Pinus strobus	White pine	42.7
Pinus taeda	Loblolly pine	51.0
Pinus virginiana	Virginia pine	30.3
Platanus occidentallis	Sycamore	97.1
Populus alba	White poplar	37.3
Populus deltoides	Eastern cottonwood	71.3
Populus grandidentata	Bigtooth aspen	22.6
Prunus avium	Sweet cherry	31.5
Prunus redoensis	Japanese yoshino cherry	45.9
Prunus serotina	Black cherry	86.0
Prunus sub-hirtella	Weeping cherry	19.1
Pterocarya fraxinifolia	Caucasian wing nut	36.6
Pyrus calleryana	Bradford pear	17.8
Pyrus communis	Pear	43.6
Pyrus malus	Common apple	27.1
Quercus acutissima	Sawtooth oak	24.5
Quercus alba	White oak	119.1
Quercus bicolor	Swamp white oak	61.8
Quercus coccinea	Scarlet oak	61.5
Quercus faicata	Southern red oak	105.4
Quercus falcatt v pagodafolia	Cherrybark oak	45.9
Quercus laevis	Turkey oak	60.8
Quercus lyrata	Overcup oak	86.9
Quercus macrocarpa	Burr oak	58.9
Quercus marilandica	Blackjack oak	31.8
Quercus michauxii	Swamp chestnut oak	85.0
Quercus muehienbergii	Chinquapin oak	51.6
Quercus nigra	Water oak	43.0
Quercus palustris	Pin oak	65.3
Quercus phillos	Willow oak	88.9
Quercus prinus	Chestnut oak	79.3
Quercus rubra	Northernred oak	70.4
Quercus stellata	Post oak	47.1
Quercus velutina	Black oak	66.9
Rhus vernix	Poison sumac	7.3
Robinia pseudoacacia	Black locust	70.1
Salix babylonica	Weeping willow	68.5
Sassafras albidum	Sassafras	50.3
Taxodium distichum	Baidcypress	65.9
Taxus baccata	English yew	58.3
Taxus baccata stricta	Irish yew	49.0
Thuja occidentalis	Arborvitae	24.2
Tilia americana	American basswood	59.6

Scientific Name	Common Name	Diameter (inches)
Tilia cordata	Littleleaf linden	58.3
Tilia europaea	European linden	47.1
Tilia heterophylia	White basswood	56.1
Tilia platphyllos	Big leaf linden	53.2
Tsuga canadensis	Eastern hemlock	46.8
Tsuga caroliniana	Carolina hemlock	13.4
Ulmus americana	American elm	76.4
Ulmus campestris	English elm	68.2
Ulmus carpinifolia pendula	Smooth leaved elm	44.3
Ulmus parvifolia	Chinese elm	42.0
Ulmus rubra	Slippery elm	32.2
Viburnum prunifolium	Black haw	6.7

APPENDIX K

APPROVAL PROCESS

A. Subdivision Concept and Preliminary Plan

A Concept Plan to include a note indicating that the site will comply with all requirements of the Landscape Ordinance shall be submitted for review by the Planning Commission or appointed authority. The Preliminary Plan shall be submitted consisting of an outline drawing of the subdivision, all existing plant materials shown either individually or by tree canopy coverage line. The Planning Commission or designated authority, in accordance with this manual, shall approve or disapprove the Landscape Plan or may approve the plan with conditions.

B. Site Plan

A landscape plan including plant type, size and location and any proposed fencing and berms shall be submitted for review by Carroll County as part of the Site Plan Submittal. All existing plant materials shall be shown on the plan either individually or by tree canopy coverage line. The Planning or authorized representative, in accordance with this manual, shall approve or disapprove the landscape plan or may approve the plan with conditions.

C. Final Landscape Plan

If changes are made to the initial submission, a final landscape plan incorporating all changes or additions ordered by the Planning Commission or staff reviewer must be approved by the Planning Commission or authorized representative.

D. Performance Guarantee

Cost estimate of Landscaping shall be included in the PWA.

1. If all screening is not completed within one (1) year after the date of occupancy, or if the screening shall not meet the requirements set forth in the plan, the cash deposit shall be forfeited, or if a bond or letter of credit has been posted, payment in full to Carroll County, Maryland shall be ordered. The funds, so received, shall be used by the county for defraying the cost of providing landscaping in compliance with the approved plans.

2. If the foregoing costs exceed the amount of the deposit or bond, the excess shall constitute a lien on the property, and the owner of the property shall be bound under a continuing obligation for payment of any and all excess costs and expenses of any nature incurred by the County; unused portions of monies forfeited under bond shall be returned.

APPENDIX L

Native Plants of Maryland

WHAT ARE SOIL CONDITIONS FOR NATIVE PLANTS?

Many of the native plants listed will grow in the wide range of soil types that exist in Maryland. However, if your site has one of the following conditions, it would be best to get advice on soil preparation from a local nursery or the University of Maryland's Home and Garden Information Center (1-800-342-2507):

- Very sandy
- Heavy clay
- Compacted soil
- Soil pH below 5.5 or above 6.8

WHERE TO FIND NATIVE PLANTS?

Most nurseries carry some native plants. Because of the demand for native species, several local nurseries have increased their selection. A partial list of known native plant sources is available with this guide.

Please do not remove native plants from the wild. It can alter the natural habitat and deplete native populations. Most wild-collected plants do not survive transplanting. Growth conditions for some natural areas are difficult to reproduce in the home landscape. For these reasons, make sure that the native plants you buy are nursery-grown.

WHAT ARE INVASIVE NON-NATIVE PLANTS?

Certain non-native ornamentals have been taking over natural areas due to their aggressive characteristics. In the next column is a list of plants that should be carefully controlled or even avoided in your landscape.

The beauty of native plants and their natural resistance to insect and disease makes them an indispensable asset to your garden. Native plants help to create landscapes that possess the charm and character of our local natural history. Plant a wide variety of these species in your landscape to attract a diversity of beneficial insects. Traditional landscapes can be amended to include native species. By using these beautiful plants, you will be contributing to the conservation of our nation's species.

Chapter 5 INVASIVE NON-NATIVE PLANTS

TREES

Norway Maple	*Acer platanoides*
Russian Olive	*Eleagnus angustifolium*
Autimn Olive	*Eleagnus umbellata*
White Mulberry	*Morus alba*
Princess Tree	*Paulownia tomentosa*

VINES

Porcelain Berry	*Anoekiosus brevipedunculata*
Oriental Bittersweet	*Celastrus orbiculatus*
English Ivy	*Hedera helix*
Japanese Honeysuckle	*Lonicera japonica*
Mile-a-minute Vine	*Polygonum perfoliatum*
Kudza	*Pueraria lobata*
Vinca, Periwinkle	*Vinca minor*
Japanese Wisteria	*Wisteria floribunda*

SHRUBS/SMALL TREES

Japanese Barberry	*Berberis thunbergii*
Winged Euonymous	*Euonymus alatus*
Blunt-leaved Privet	*Ligustrum spp.*
Japanese Honeysuckle	*Lonicera japonica*
Japanese Spiraea	*Spiraea japonica*

HERBACEOUS PLANTS

Purple Loosestrife	*Lythrum salicaria*
Lesser Celandine, Buttercup	*Ranunculus ficaria*

GRASSES

Pampas Grass	*Cortaderia selloana*
Japanese knotweed	*Polygonum japonicum*
Japanese Silver Grass	*Miscanthus sinensis*

Scientific Name	Region	Common Name(s)	Light FS	Light PS	Light SH	Moisture W	Moisture M	Moisture D	Height	Bloom Period	Flower Color	Fall Color	Notes
Groundcover *(Low-growing plant that spreads over the soil surface, helping to suppress weeds and prevent erosion)*													
Asarum canadense	C/P/M	Wild Ginger		O	●		∵			Apr-May	Purple	Evergreen	
Chrysogonum virginianum	C/P	Green-and-gold		O			∵	▲		Mar-Jun	Gold		
Hepatica americana	C/P/M	Round-lobed hepatica, Liverleaf		O	●		∵	▲		Mar-Jun	White to lavender		
Mitchella repens	C/P/M	Partridgeberry	O	O	●		∵			Jul-Sep	White	Evergreen	Berries food for upland birds
Sedum ternatum	P	Mountain Stonecrop		O	●		∵			April	Greenish-white	Evergreen	
Uvularia sessilifolia	C/P/M	Straw lily	O	O	●		∵			May-Jun	Yellow		
Vine *(Woody or herbaceous plant that can grow long and climb vertical surfaces using tendrils or holdfasts)*													
Campsis radicans	C	Trumpet Vine, Trumpet Creeper	O					▲		Jul-Sep	Orange		Attracts hummingbirds; erosion control
Clematis virginiana	C/P/M	Virgins Bower	O					▲		Jul-Sep	White		Showy flowers
Lonicera sempervirens	C	Trumpet Honeysuckle, Coral Honeysuckle	O					▲		Apr-Jul	Coral		Attracts hummingbirds and butterflies
Parthenocissus quinquefolia	C/P/M	Virginia Creeper	O	O	●	💧	∵				White/ purple	Crimson	Fast grower
Fern or Fern Ally *(Plant that has fronds, not leaves, and reproduces with spores, not seeds)*													
Adiantum pedatum	C/P/M	Northern Maidenhair Fern		O			∵		1-2'				Delicate texture
Asplenium platyneuron	C/P/M	Ebony Spleenwort		O	●		∵		1-1.5'				Small; can tolerate more sun
Athyrium asplenioides (A. filix-femina)	C/P/M	Southern Lady Fern		O		💧	∵		1.5-3'				Aggressive; easy to grow
Dryopteris marginalis	C/P/M	Marginal Shield Fern		O	●		∵		1.5'			Evergreen	Dark, leathery foliage
Onoclea sensibilis	C/P/M	Sensitive Fern		O	●	💧	∵		1-2'				Groundcover in wet areas
Osmunda cinnamomea	C/P/M	Cinnamon Fern	O	O	●	💧	∵		2-3'				Tolerates full sun if kept moist
Osmunda claytonia	M	Interrupted Fern		O		💧	∵		2-3'				
Osmunda regalis	C/P/M	Royal Fern	O	O	●	💧	∵		2-3'				Tolerates full sun if kept moist
Polypodium virginianum	P/M	Common Polypody		O	●		∵		2'				On Rocky slopes & bases of trees
Polystich[illegible] acrostichoides	C/P/M	Christmas Fern		O	●		∵		1.5-2'			Evergreen	Narrow, upright

ScientificName	Region	Common Name(s)	Light: FS	Light: PS	Light: SH	Moisture: W	Moisture: M	Moisture: D	Height	Bloom Period	Flower Color	Fall Color	Notes
Grass or Grass-like *(Non-woody plants that grow from the base, not the tip, of the leaves)*													
Andropogon gerardii	C	Big Bluestem	O	●		●	∵	▲	5'	Jun-Sep			Clump-forming; attractive foliage
Andropogon virginicus	C/P/M	Broomsedge	O	●				▲	2'	Aug-Nov			Seeds provide food for birds
Carex stricta	C/P/M	Tussock Sedge	O	●		●	∵		1-3'	May-Aug			Easy to grow; tolerates shade and moist conditions
Chasmanthium latifolium	C	Sea Oats, Wild Oats		●			∵		2-3'	Jul-Sep			
Juncus effusus	C/P/M	Soft Rush	O			●	∵		2-3'	Jun-Sep			Provides bird cover in aquatic areas
Muhlenbergia sobolifera	P/M	Branched Muhly	O	●			∵	▲	3'	July-Oct.			
Panicum virgatum	C	Switchgrass	O			●	∵		3-6'	Jul-Oct			Tolerates brackish to salt water; seeds provide food for songbirds
Schizachyrium scoparium	C	Little Bluestem	O	●				▲	4'	Aug-Oct			Clump-forming; tolerates poor soil
Scirpus cyperinus	C/P/M	Woolgrass	O			●	∵		3-4'	Aug-Sep			Seeds provide food for ducks and other marsh birds
Sorghastrum nutans	C/P/M	Indiangrass	O	●				▲	5-7'	Aug-Sep			Beautiful seed heads; provides food for birds
Spartina alterniflora	C	Salt Marsh Cordgrass, Smoth Cordgrass	O			●	∵		2-5'	Jul-Sep			Tolerates salt and brackish water
Spartina patens	C	Salt Meadow Hay	O			●	∵		1-3'	Jul-Sep			Common in coastal salt marshes
Zizania aquatica	C	Wild Rice	O			●	∵		6-10'	Jul-Sep			Food for overwintering waterfowl
Herbaceous (Plants that die back at the end of a growing season)													
Acorus calamus	C/P/M	Sweet Flag	O	●		●	∵		2-3'	May-Jul			Foliage fragrant; resembles Iris
Angelica venerosa	P/M	Hairy Angelica	O					▲	3-5'	Jul-Sep	White or greenish		
Aquilegia canadensis	C/P/M	Wild Columbine, Eastern Columbine		●	●	●	∵	▲	2'	Apr-May	Red-yellow		Attracts hummingbirds
Arisaema triphyllum	C/P/M	Jack-in-the-pulpit		●	●	●	∵		1'	Apr-Jun	Striped		Caustic to most animals
Asclepias incarnata	C/P/M	Swamp Milkweed	O	●			∵		4'	May-Jun	Pink or White		Attracts butterflies
Asclepias tuberosa	C/P/M	Butterflyweed	O	●			∵	▲	3'	May-Jun	Orange		Flowers a source of nectar for butterflies
Aster novae-angliae	C/P/M	New England Aster	O	●			∵	▲	2'	Sep-Oct	Violet		Flowers visited by butterflies;

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Scientific Name	Region	Common Name(s)	Light FS	Light PS	Light SH	Moisture W	Moisture M	Moisture D	Height	Bloom Period	Flower Color	Fall Color	Notes
													seed heads attract birds
Herbaceous (cont'd.)													
Baptisia australis	C	Blue False Indigo	○				∵		4'	May-Jun	Blue		Will tolerate poor and clay soil
Baptisia tinctoria	C/P/M	Wild Indigo	○					▲	3'	Jun-Sep	Yellow		Tolerant of poor soil
Boltonia asteroides	C	Boltonia	○				∵	▲	3'	Jul-Sep	White		Flowers nectar source for butterflies
Caltha palustris	C/P/M	Marsh Marigold	○	○		●			1-2'	Apr-Jun	Bright yellow		Forms clumps
Campanula americana	P/M	Tall Bellflower		○	●			▲	1-2'	Jun-Sep	Blue		
Chelone glabra	C/P/M	Turtlehead		○		●	∵		3'	Aug-Oct	White		Attracts hummingbirds
Cimicifuga racemosa	C/P/M	Snakeroot, Fairy Candles			●		∵		5'	Jun-Jul	White		Excellent woodland plant
Claytonia virginia	P/M	Spring Beauty			●		∵		.5"	Mar-May	Pink-white		
Coreopsis rosea	C	Pink Coreopsis, Pink Tickweed	○	○			∵	▲	1.5'	Jul-Sep	Pink		Seed eaten by songbirds
Coreopsis verticillata	C/P	Tickseed	○	○				▲	2'	Jun-Jul	Yellow		Tolerant of poor soil
Dicentra eximia	P/M	Wild Bleeding Heart			●		∵		1.5'	Apr-Sep	Pink		Native to mountain regions; prefers rich, moist soil
Dicentra canadensis	C/P/M	Bleeding Heart			●		∵		1'	April-May	Greenish white		
Eupatorium fistulosum	C/P/M	Joe-Pye Weed	○				∵	▲	5'	Jul-Sep	Pink		Flowers visited by butterflies
Geranium maculatum	C/P/M	Wild Geranium		○	●		∵		2'	Apr-Jul	Lavender		Long bloom time
Helianthus angustifolius	C	Swamp Sunflower	○			●	∵		5'	Aug-Oct	Yellow		Flowers visited by butterflies; seed heads eaten by birds
Heuchera americana	C/P/M	Coralbells		○	●		∵	▲	1.5'	April - June	Pale green/Purple		Long blooming, semi evergreen
Hibiscus moscheutos	C	Rose Mallow	○	○		●	∵		3-6'	Jul-Sep	Cream		
Hypericum performatum	C/P/M	St. John's Wort	○			●	∵		2'	Jun-Sep	Orange/yellow		
Iris versicolor	C/P/M	Blue Flag	○	○		●	∵		3'	May-Jun	Blue		Moisture tolerant
Liatris spicata	C	Gayfeather	○			●	∵		3'	Aug-Oct	Purple		Flowers visited by butterflies
Lobelia cardinalis	C/P/M	Cardinal Flower	○	○		●	∵		3'	Jul-Sep	Red		Flowers a source of nectar to hummingbirds and butterflies
Lobelia siphilitica	C	Great Blue Lobelia	○	○	●	●	∵		3'	Aug-Oct	Blue		Attracts hummingbirds

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Scientific Name	Region	Common Name(s)	Light FS	Light PS	Light SH	Moisture W	Moisture M	Moisture D	Height	Bloom Period	Flower Color	Fall Color	Notes
Herbaceous (cont'd.)													
Mertensia virginica	C/P/M	Virginia Bluebells		○	●		∴		1'	Mar-Apr	Pink turning blue		Plant will become dormant in heat of summer
Monarda didyma	C/P	Beebalm	○	○			∴		3'	Jul-Sep	Red		Flowers visited by hummingbirds and butterflies
Monarda fistulosa	C/P/M	Wild Bergamot	○	○			∴	▲	4'	Jul-Aug	Pink to purple		Attracts hummingbirds and butterflies
Myosotis laxa	C/P	Smaller Forget me Not		○					.5"	May-July	Blue		
Penstemon digitalis	C/P/M	Beardtongue	○	○			∴	▲	2'	Jun-Jul	White		Tolerates poor drainage
Phlox divaricata	C/P/M	Blue Phlox, Woodland Phlox		○	●		∴		1.5'	Apr-May	Blue		Becomes dormant in heat of summer; after flowering; interplant with aster or goldenrod
Phlox stolonifera	P/M	Creeping Phlox		○			∴		1'	Apr-Jun	Blue		
Physostegia virginiana	C	Obedient Plant, False Dragonhead	○				∴	▲	3'	Aug-Sep	Pink		Spreads easily; can be invasive
Podophyllum peltatum	C/P/M	May-apple		○	●		∴		1'	Apr-May	White		Shiny, green, umbrella-like leaves
Pontederia cordata	C	Pickerelweed	○	○		💧			3'	Jun-Nov	Lavender		Food for waterfowl
Rudbeckia fulgida	C/P/M	Early Coneflower	○	○			∴		1.5'	Jul-Oct	Yellow		R. fulgida var. sullivantii 'Goldsturm' is attractive cultivar
Rudbeckia hirta	C/P/M	Black-eyed Susan	○	○			∴	▲	2'	Jun-Oct	Gold		Seed heads eaten by birds
Solidago bicolor	C/P/M	Silver Rod Goldenrod	○					▲	.5-3'		White		
Solidago rugosa	C/P/M	Wrinkle Leaf Goldenrod	○			💧	∴		1-6'	Aug-Oct	Yellow		Flowers visited by butterflies; seeds eaten by birds
Solidago sempervirens	C	Seaside Goldenrod	○	○			∴		6'	Aug-Oct	Yellow	Evergreen	Salt-tolerant
Spigelia marilandica	C/P	Indian Pink		○	●		∴		2'	May-Jun	Red with yellow		Flowers attract hummingbirds
Tiarella cordifolia	C/P/M	Foamflower	○	○	●		∴		1'	Apr-Jun			Long-blooming
Tradescantia virginiana	C/P/M	Spiderwort	○	○			∴	▲	2'	Apr-Jul	Blue, purple-blue		
Trillium erectum	P/M	Wake Robin			●	💧			1'	Apr-Jun	Purple		
Verbena hastata	C/P/M	Blue Vervain			●	💧				Jun-Oct	Blue/violet/ pink		
Vernonia noveboracensis	C/P/M	New York Ironweed	○				∴		4'	Aug-Oct	Purple		Attracts butterflies
Veronica officinalis	C/P/M	Speedwell	○	○			∴	▲	2'	May-Jun	Purple		Prefers well-drained soil

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Scientific Name	Region	Common Name(s)	Light FS	Light PS	Light SH	Moisture W	Moisture M	Moisture D	Height	Bloom Period	Flower Color	Fall Color	Notes
Low Shrub (Shrub that generally grows less than five feet tall)													
Amelanchier obovalis	C	Obovate Serviceberry	O	O			∴	▲	1-5'	Mar-Apr	White/ pink		Well-drained soil; purple-black fruit in May-June
Aronia melanocarpa	C/M	Black Chokeberry	O	O		●	∴	▲	5'	Apr-Jun	White or pink-tinged	Dark purple-red	Tolerates wet to dry soil; pretty color; good for wildlife; blackberry fruit August to October
Comptonia peregrina	C	Sweet Fern	O	O			∴		3'	Apr-May	Yellow-green		Well-drained soil; fruit, 4-5 mm nuts in August; leaves aromatic on hot days or when crushed
Euonymus americanus	C/P/M	Strawberry Bush		O			∴		1.5-6'	May-Jun	Green		Crimson fruit, scarlet seeds, good for wildlife
Gaylussacia baccata	C/P/M	Black Huckleberry		O	●		∴	▲	1.5'	May-Jun	White to pink		Important for wildlife
Gaylussacia frondosa	C	Dangleberry	O	O		●	∴	▲	2-4'	Apr-Jun	Greenish to purple		Well-drained soil; dark blue fruit; important for wildlife; wet soils in spring, dry in summer
Lyonia mariana	C	Stagger-bush		O	●		∴		.5-6.5'	May-Jun	White, pale pink	Red	Well-drained soil; leathery leaves
Prunus maritima	C	Beach Plum	O	O			∴		1-8'	Apr-May	White		Well-drained soil; fruit period Sep to Oct; extremely salt-tolerant
Rhododendron atlanticum	C	Dwarf Azalea, Coast Azalea		O			∴		5-1.5'	Apr-May	White, purple-tinged		Well-drained soil; very fragrant flower
Rubus cuneifolius	C	Sand Blackberry	O				∴		1-3'	May-Jun			Well-drained soil; Black fruits in Jul-Aug
Spiraea alba	C/P/M	Narrow-leaved Meadow-sweet	O				∴		5'	Jun-Sep	White		Well-drained soil; fruits mature by September but persist into winter
Spiraea latifolia	C/P/M	American Meadow-sweet	O				∴		5'	Jun-Sep	White or pinkish		Well-drained soil; fruits mature in fall but persist through winter
Vaccinium angustifolium	M	Late Lowbush Blueberry	O	O			∴	▲	.25-1'	May-Jun	White or pink-tinged	Red	Grows in poor soil conditions; blue fruit in July; good for wildlife
Vaccinium vacillans	C/P/M	Early Lowbush Blueberry	O	O			∴		.5-1.5'	Apr-May	Greenish-white, reddish		Well-drained soil; dark blue fruit opens in July and early August; leathery leaf; good for wildlife
Viburnum acerifolium	C/P/M	Maple-leaved Arrowwood	O	O			∴	▲	3-6.5'	Apr-May	Creamy-white, pinkish	Orange, red and purple	Well-drained soil; purplish-black fruit persisting well into winter; good for wildlife
Medium Shrub (Shrub that generally grows between 5 and 15 feet tall)													
Aronia arbutifolia	C/P/M	Red Chokeberry	O			●	∴	▲	1.5-13'	Mar-May	White, purple-tinged		Tolerates wet to dry soil; fruit, bark and foliage important for wildlife
Baccharis halimifolia	C	High-tide Bush, Sea Myrtle, Groundsel Tree	O			●	∴		10'	Aug-Sep	White		Thistle-like silky white fruit in late autumn; only found along the Bay, rivers, and higher parts of salt marshes
Cephalanthus occidentalis	C	Button Bush	O			●	∴		10'	Jul-Aug	Creamy white		Very fragrant flower; excellent

ScientificName	Region	Common Name(s)	Light FS	Light PS	Light SH	Moisture W	Moisture M	Moisture D	Height	Bloom Period	Flower Color	Fall Color	Notes
													source of nectar; small fruit head/seed
Medium Shrubs (Cont'd.)													
Clethra alnifolia	C	Sweet Pepperbush, Summersweet		○	●	●	∴		10'	Jul-Sep	White/pink	Yellow	Very fragrant flower; hairy, spherical fruit
Cornus amomum	C/P	Silky Dogwood,	○	○			∴		3-10'	May-Jun	White	Orange, red or purple	Important for wildlife; a much-used Red Willow, Silky Cornel ornamental; reddish twigs in winter
Hamamelis virginiana	C/P/M	Witch hazel	○	○			∴	▲	3-15'	Sep-Nov	Yellow	Yellow	Well-drained soil; seeds, fruits and foliage important for wildlife; beautiful autumn color and cold-resistant; fragrant, spider-shaped flower
Ilex glabra	C	Inkberry	○	○			∴		3-10'	May-Jun	White to cream	Evergreen	Excellent source of nectar; highly aromatic; good ornamental; important for wildlife
Ilex laevigata	C	Winterberry	○	○			∴		10'	May-Jul	White to cream		Well-drained soil; bright, orange-red fruit; important for wildlife; deciduous holly
Ilex verticillata	C/M	Winterberry Holly, Black Alder	○	○		●	∴		16'	Jun-Jul			Western Maryland native; red fruit persistent through the winter; important for wildlife
Itea virginica	C	Tassel-white, Virginia Sweetspire	○	○		●	∴		3-10'	May-Jun	White	Red to purple	Well-drained soil; holly-like leaves; attractive fall color
Leucothoe racemosa	C	Fetterbush		○	●		∴		13'	May-Jun	White, pinkish		Cultivated for its glossy, dark green leaves
Lindera benzoin	C	Spicebush		○			∴	▲	6.5-16'	Mar-May	Yellow	Yellow	Well-drained soil; leaves are spicy-aromatic when crushed; red
Lyonia ligustrina	C/P/M	Male-berry		○	●		∴		1.5-10'	May-Jul			Well-drained soil
Myrica cerifera	C	Southern Wax Myrtle	○	○			∴	▲	13-16'	Mar-Apr	Yellowish-green	Evergreen	Well-drained soil; gray-white fruit; fragrant wax of berries used in candles; leathery leaves
Myrica pensylvanica Yellowish-green	C	Northern Bayberry		○		●	∴	▲	8'	Apr-May			Bluish-white, hard, waxy berries; aromatic berries, used in making candles; good for poor soil conditions; deciduous to partial evergreen; leathery leaves
Rhododendron canescens	C	Sweet Azalea		○			∴		3-10'	Apr-May	White or pink		Well-drained soil
Rhododendron periclymenoides	C/P/M	Pink Azalea, Pinxterbloom Azalea		○		●	∴		3-10'	Apr-May	Pink to white	Dull yellow	Well-drained soil; an excellent ornamental; formerly *Rhododendron nudiflorum*
Rhododendron viscosum	C	Swamp Azalea	○			●	∴		6.5-10'	May-Aug	White, pink		Intensely fragrant flower
Rhus glabra	C	Sweet Sumac, Smooth sumac	○				∴	▲	1.5-10'	Jun-Jul	Greenish	Red	Red, hairy fruit; rich fall color; good for wildlife

Scientific Name	Region	Common Name(s)	Light FS	Light PS	Light SH	Moisture W	Moisture M	Moisture D	Height	Bloom Period	Flower Color	Fall Color	Notes
Medium Shrubs (Cont'd.)													
Vaccinium corymbosum	C/M	Highbush Blueberry	○	●			∴		13'	April-May	White or pink-tinged		Blue to blue-black fruits; excellent for wildlife; these hybridize rather freely
Vaccinium stamineum	C/P/M	Deerberry	○	●			∴		5-10'	Apr-Jun	Greenish-white		Well-drained soil; good for wildlife
Viburnum dentatum	P/M	Southern Arrowwood	○	●			∴	▲	10'	May-Jun	Creamy white	*Yellow or red*	Well-drained soil
Viburnum nudum	C	Naked Witherod	○	●			∴		6.5-13'	Apr-May	White to cream	*Red to red-dish-purple*	Well-drained soil; thick, glossy green leaf; blue-black fruit; good for wildlife
Viburnum recognitum	C/P/M	Smooth Arrowwood	○	●			∴		10'	May-Jun	White		Dark blue fruit; good for wildlife
Tall Shrub *(Shrub that generally grows taller than 15 feet)*													
Aralia spinosa	C/P/M	Devil's Walking Stick	○	●			∴		39'	Jun-Aug	White		Black fruit (berry); seeds poisonous if chewed by humans; excellent for wildlife; can be invasive
Ilex decidua	C	Possum Haw	○	●			∴	▲	33'	Apr-May	White or cream		Well-drained soil; berries and foliage provide food and shelter for wildlife
Kalmia latifolia	C/P/M	Mountain Laurel		●			∴	▲	10'	May-Jul	Pink/purple; white	*Evergreen*	Well-drained soil; excellent ornamental; foliage exceedingly poisonous if eaten
Rhus copallina	C/P/M	Dwarf or Ginger Sumac	○				∴	▲	20'	Jul-Sep	Greenish	*Bright red*	Well-drained soil; red, hairy fruit; good for wildlife; beautiful fall color
Rhus typhina	C/P/M	Staghorn Sumac	○					▲	20'	June-July	Yellow-green		Fall color; may become invasive; good for wildlife
Viburnum prunifolium	C/P/M	Black Haw	○	●			∴		26'	Apr-May	White	*Reddish purple*	Well-drained soil; bluish-black fruit persists through winter; good for wildlife
Understory Tree *(Tree that generally grows 15 to 49 feet or higher)*													
Alnus serrulata	C/M/P	Smooth Alder	○				∴		12-20'	Mar-Apr		*Yellow, red*	Intolerant of dry soil
Amelanchier canadensis	C	Canadian Serviceberry, Shadbush, Shadblow, Serviceberry		●	●		∴		35-50'	Apr-May	White	*Orange to red*	Beautiful autumn color; blue-black fruit in fall; fruit valued by wildlife
Asimina triloba	C/P	Paw Paw	○				∴		39'	Mar-Apr	Yellow - red	*Yellow/ Copper/red*	Brown spotted fruit; flowers open greenish-yellow, becoming deep red
Carpinus caroliniana	C/P/M	American Hornbeam, Blue Beech, Musclewood, Ironwood		●	●		∴	▲	35-50'	Apr - May		*Orange, red*	Slow-growing; dense branching
Castanea pumila	C/P/M	Chinquapin, Allegany Chinkapin, Eastern Chinquapin		●				▲	12-20'	Jun			Chestnut family, but not as susceptible to blight; seed sweet
Cercis canadensis	C/P/M	Eastern Redbud		●	●		∴	▲	20-35'	Apr-May	Pink to lavender		Lovely spring color.
Chionanthus virginicus	C/P	White Fringetree	○	●	●		∴	▲	20-35'	May-Jun	White	*Yellow*	Slow growth rate; songbirds eat fruit; Flowers drooping, profuse

Scientific Name	Region	Common Name(s)	Light FS	Light PS	Light SH	Moisture W	Moisture M	Moisture D	Height	Bloom Period	Flower Color	Fall Color	Notes
Understory Trees (Cont'd.)													
Cornus florida	C/P/M	Flowering Dogwood		○	●		∴	▲	35-50'	Apr-May	White	Scarlet red	Bright red berries eaten quickly by songbirds; tree may be susceptible to anthracnose fungus
Crataegus crus-galli	C/M	Cockspur Hawthorn	○	○			∴	▲	20-35'	May-Jun	White	Orange to red	
Crataegus viridis	C/P	Southern Thorn		○	●	💧	∴		32-39'	Apr	White		Fruits bright red/orange, October and persisting into winter
Ilex opaca	C/P	American Holly	○	○			∴		65'	May-Jun	White or cream	Evergreen	Well-drained soil; bright red fruit on female plants; leathery leaves; good ornamental; harvested for Christmas decorations; good for wildlife
Juniperus virginiana	C	Eastern Red Cedar	○				∴	▲	50'	Mar-Apr		Evergreen	Well-drained soil; male bears yellow cone; female bears brown-violet fruit; good for wildlife; cedar odor thought to be moth repellent; much-used ornamental
Magnolia virginiana	C	Sweetbay Magnolia	○	○			∴		3'	May-Jul	White to cream	Evergreen	Well-drained soil; strong lemon and rose-scented flowers
Prunus virginiana	C/P/M	Choke Cherry	○				∴		to 25'	May-Jun	White	Dark red-purple	Well-drained soil; red to purple fruit August to September; medium-green leaves (spring)
Pyrus coronaria	C/P/M	Wild Crabapple	○				∴		20-26'	Apr-May	Pink		Well-drained soil; glossy dark-green leaves; yellowish-green fruit; good for wildlife
Sassafras albidum	C/P/M	Sassafras	○	○			∴		35-50'	Apr-May		Yellow	Well-drained soil; aromatic, dark green
Tall Tree (*Canopy tree that can grow 50 feet or higher*)													
Acer negundo	C/P/M	Box elder, Ash Leaf Maple, Manitoba	○	○		💧	∴		0-60'			Yellow, red	Fast growth; short-lived; invasive; weak wood
Acer rubrum	C/P/M	Red Maple Scarlet Maple, Swamp Maple, Soft Maple	○	○		💧	∴		0-60'			Red, orange yellow	Medium to fast growth; aggressive; good shade tree; red flower, fruit and leaf stalks; weak wood; beautiful fall color
Acer saccharinum	C/P/M	Silver Maple, Soft Maple, White Maple, River Maple	○	○		💧	∴		50-80'			Yellow	Fast growth; brittle branches; long, curving branches; popular shade tree
Betula nigra	C/P	River Birch, Red Birch, Black Birch	○	○		💧	∴		30-50'			Yellow	Fast growth; peeling bark; hard wood
Carya cordiformis	C/P/M	Bitternut Hickory, Swamp Hickory, Pignut, Bitternut	○			💧	∴		60-80'			Yellow	Slow growth; tall trunk; strong wood; broad crown; inedible nut
Carya glabra	C/P/M	Pignut Hickory, Sweet Pignut Hickory, Smooth Bark Hickory	○	○		💧	∴	▲	60-80'			Yellow	Slow growth; strong wood; inedible seed

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Scientific Name	Region	Common Name(s)	Light FS	Light PS	Light SH	Moisture W	Moisture M	Moisture D	Height	Bloom Period	Flower Color	Fall Color	Notes
Tall Trees (Cont'd.)													
Carya ovata	C/P/M	Shagbark Hickory, Scalybark Hickory, Shellbark Hickory	○				∴		70-100'			Brown	Shaggy, rough bark; strong wood, edible nut
Carya pallida	C	Sandbark Hickory, Pale Hickory	○					▲	60-90'			Yellow/ brown	Slow growth; edible seed; strong wood; uncommon; sandy soil
Carya tomentosa	C/P/M	Mockernut Hickory, White Hickory, Mockernut, Whiteheart	○				∴	▲	60-80'			Yellow	Slow growth; strong wood; long-lived; edible nut
Castanea dentata	C/P/M	American Chestnut, Chestnut	○	●			∴	▲	100'			Yellow	Large massive trunk; edible nuts; prized wood; devastated by chestnut blight; more resistant cultivars available
Celtis occidentalis	C/P/M	Hackberry, Sugarberry, Nettletree	○	●		💧	∴		40-60'			Yellow	Medium to fast growth; adaptable to various conditions
Diospyros virginiana	C/P	Common Persimmon	○	●			∴	▲	50-75'		Greenish-yellow		Very high wildlife value; Fruit edible after frost; golden-yellow to orange fruit
Fagus grandifolia	C/P/M	American Beech	○	●			∴		50-100'		∴	Yellow/ brown	Slow-growing; strong wood; silvery-gray smooth bark; beech nuts
Fraxinus americana	C/P/M	White Ash	○	●			∴		80'			Yellow, maroon	Medium to fast growth; strong wood
Fraxinus pennsylvanica	C/P/M	Red Ash		●		💧	∴		50-60'			Yellow	Fast growth; good shade tree
Juglans nigra	C/P/M	Red Ash, Swamp Ash Black Walnut, American Walnut, Eastern Black Walnut	○				∴		70-90'			Yellow	Medium growth; valuable lumber; edible nuts; do not plant near fruit trees or garden due to toxins given off by roots
Liquidambar styraciflua	C	Sweet Gum, Red Gum, Sap Gum	○	●		💧	∴		60-80'			Yellow, red	Medium to fast growth; widely adapted
Liriodendron tulipifera	C/P/M	Tulip Poplar, Yellow Poplar, Tulip Tree	○	●			∴		70-120'			Yellow	Fast growth; large flower, large leaves
Morus rubra	C/P/M	Red Mulberry, Moral	○				∴		60'			Yellow	Medium to fast growth; short trunk; edible berries; avoid white mulberry, which is on invasive list
Nyssa sylvatica	C/P/M	Black Gum, Black Tupelo, Pepperidge, Sourgum, Swamp Tupelo	○	●		💧	∴	▲	30-60'			Red	Slow growth; glossy leaves, handsome shade tree
Pinus echinata	C/P/M	Shortleaf Pine, Shortstraw Pine, Southern Yellow Pine	○				∴	▲	100'			Evergreen	Open crown; needles 3-4 1/2"; moderately hard wood; abundant drop of needles

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ScientificName	Region	Common Name(s)	Light FS	Light PS	Light SH	Moisture W	Moisture M	Moisture D	Height	Bloom Period	Flower Color	Fall Color	Notes
Tall Trees (Cont'd.)													
Pinus rigida	C/P/M	**Pitch Pine**	O				∴	▲	50-60'			Evergreen	Moderate to fast growth; needles 3-5"; sometimes tufts of needles on the trunk; hard wood; can tolerate dry, rocky soils
Pinus serotina	C	**Pond Pine, Marsh Pine, Pocosin Pine**	O			●			50-60'			Evergreen	Open, irregular crown; stout, crooked branches, usually found near the coast; tolerates flooding
Pinus taeda	C	**Loblolly Pine, Old Field Pine, North Carolina brittle wood Pine, Bull Pine, Rosemary Pine**	O			●	∴		70-90'			Evergreen	Fast growth; long needles; fragrant;
Pinus virginiana	C/P	**Virginia Pine, Scrub Pine, Jersey Pine**	O				∴	▲	50-80'			Evergreen	Medium to fast growth; needles 1-3"; winter-hardy; brittle wood
Platanus occidentalis	C/P/M	**American Sycamore, American Planetree**	O	O		●	∴		75-100'			Yellow	Fast-growing; white and brown peeling bark; large leaves; hard wood
Populus deltoides	C	**Eastern Cottonwood, Carolina Poplar, Southern Cottonwood**	O			●	∴		100'			Yellow	Fast growth; relatively shortlived; soft wood
Populus heterophylla	C	**Swamp Cottonwood, Swamp Poplar, Black Cottonwood, Downy Poplar**	O			●			80'			Yellow	Fast growth, narrow crown, soft wood
Prunus serotina	C/P/M	**Black Cherry, Wild Cherry, Rum Cherry**	O				∴		40-60'			Yellow/ red	Fast growth; white flowers; valuable wood; leaves poisonous to livestock
Quercus alba	C/P/M	**White Oak Stave Oak**					∴		80-100'			Red	Slow to medium growth; strong wood; classic oak with stout branches
Quercus bicolor	C/P	**Swamp White Oak, Swamp Oak**	O	O		●			60-70'			Red/ brown	Slow to medium growth; narrow crown, strong wood
Quercus borealis	C/P/M	**Northern Red Oak, Red Oak, Gray Oak**	O				∴		60-75'			Red	Medium to fast growth' dense foliage; handsome shade tree; rare in coastal plain
Quercus coccinea	C/P/M	**Scarlet Oak, Red Oak, Black Oak**	O				∴		40-60'			Scarlet	Medium growth rate; good shade tree; tolerates poor soil; strong wood
Quercus falcata	C/P	**Southern Red Oak, Spanish Oak, Swamp Red Oak**	O				∴		70-80'			Brown	Medium to slow growth; large open crown; good shade tree; strong wood
Quercus marilandica	C/P	**Black Jack Oak, Jack Oak**		O				▲	50'			Yellow/ brown	Slow growth; open crown; hard wood; sandy or clay soil
Quercus michauxii	C	**Swamp Chestnut Oak, Basket Oak, Cow Oak**	O			●	∴		60-80'			Red/ brown	Medium to fast growth; compact crown; chestnut-like leaves; uncommon on coastal plain
Quercus palustris	C/P	**Pin Oak, Swamp Oak, Spanish Oak**	O				∴		60-80'			Red	Medium growth rate; straight trunk; horizontal branches; slender pin-like twigs; strong wood

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Scientific Name	Region	Common Name(s)	Light FS	Light PS	Light SH	Moistur W	Moistur M	Moistur D	Height	Bloom Period	Flower Color	Fall Color	Notes
Tall Trees (Cont'd.)													
Quercus phellos	C	**Willow Oak, Pin Oak, Peach Oak**	○	●		●	∵		*80-100'*			*Red*	Medium to slow growth; classic oak with stout branches; strong wood
Quercus prinus	C/P/M	**Chestnut Oak, Rock Chestnut Oak, Rock Oak**	○	●			∵		*60-80'*			*Yellow/ orange*	Slow to medium growth; chestnut-like leaves; tolerates sandy or rocky soil
Quercus stellata	C/P/M	**Post Oak, Iron Oak**	○				∵		*50'-70'*			*Brown*	Slow growth; dense crown; hard wood; used as posts, as wood is slow to decay
Quercus velutina	C/P/M	**Black Oak, Yellow Bark Oak, Quercitron Oak**	○				∵	▲	*50-60'*			*Red/ brown*	Medium to fast growth; open spreading crown; good for sandy or clay hillsides
Robinia pseudoacacia	C/P/M	**Black Locust, Locust, Yellow Locust**	○				∵	▲	*40-80'*			*Yellow*	Fast growth; short-lived; durable timber; spreads shoots from underground roots; good honey plants; flowers poisonous if eaten by livestock
Salix nigra	C/P/M	**Black Willow, Swamp Willow**	○	●		●	∵		*40-80'*				Fast growth; dense foliage; may have more than one trunk; soft wood; good shade tree; tolerates flooding
Taxodium distichum	C	**Bald Cypress, Cypress, Swamp Cypress**	○	●		●			*50-70'*				Medium growth rate; tall, straight trunk; feathery, needle-like leaves; rot-resistant lumber; most cut in colonial era; tolerates flooding
Ulmus americana	C/P/M	**American Elm, White Elm, Soft Elm**	○				∵		*100'*			*Bright yellow*	Fast growth; handsome, graceful shade tree; many spreading branches; affected by Dutch Elm disease; newer cultivars less susceptible
Ulmus rubra	P	**Slippery Elm Red Elm, Soft Elm**		●	●		∵	▲	*60'*			*Yellow*	Medium growth rate; large leaves; Spreading branches, hard wood;

CHAPTER 115, FOREST CONSERVATION
FOREST STAND DELINEATION & FOREST CONSERVATION
EXEMPTION REQUEST, NEW FOR SUBMITTAL REQUIREMENT

Effective Date: November 16, 2005

This office continues to experience incorrect or lack of data submittal on the Forest Conservation Data Sheet and Application. The information provided on these forms are required for our data base so that we can submit a mandatory annual report of the progress of the Carroll County Forest Conservation Program to the Department of Natural Resources Forest Service at the State of Maryland

When information is incorrect or missing from the forms, the data being reported to the State is either incorrect or adequate. The County does not have adequate staff to provide or research this information for the engineer/surveyor or developer.

Effective immediately, to assure that we are receiving correct and adequate information, a Real Property Search Report must be submitted with the Forest Stand Delineation & Forest Conservation Exemption request submittal. The Forest Conservation Application will still be required with the Forest Stand Delineation, and the Forest Conservation Data Sheet Plan will still be required with the Forest Conservation Plan submittal. This item will be added to the Forest Stand Delineation Checklist as soon as possible.

The Real Property Search Report can be found on the Maryland Department of Assessments and Taxation website at www.dat.state.md.us under "Real Property Data Search". This report must be submitted to obtain approval of the plan.

Thank you in advance for your cooperation.

If you have any questions in this regard, please do not hesitate to contact this office.

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Vicki Luther, Forest Conservation Specialist
Bureau or Resource Management

Cc: Tom Devilbiss, Chief, Bureau of Resource Management
Clay Black, Chief, Bureau of Development Review
File

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CARROLL COUNTY CODE IMPLEMENTATION POLICY
CHAPTER 150, FOREST CONSERVATION
CONSTRUCTION OF A SINGLE FAMILY DWELLING ON FORESTED, PREVIOUSLY CREATED SINGLE LOTS

Effective Date December 5, 2005
Update January 1, 2018

Policy – This policy applies to single building lots of any size in any zone

1. that have been previously created and recorded; (prior to December 8, 1992)
2. that may not be further subdivided;
3. that are now intended to be used as the site of one single family dwelling only; and
4. are at least 90% covered by existing forest.

Chapter 150 already provides for up to 20,000 square feet of forest removal for single family residential development on such lots without penalty. If circumstances necessitate that additional forest must be removed above the 20,000 square foot threshold to accommodate construction of a single family dwelling on a lot, then the total acreage of forest cleared must be mitigated by the placement of existing forest on that lot into a protective easement at a ratio of 2 acres protected for every 1 acre cleared. The forested land to be placed under protective easement must be approved by the County in advance. Priority areas under Chapter 150 must be given priority when deciding on the location of any mitigation easements.

This action will not be allowed if the forest on the land in question is already under any protective easement from a previous conservation action. Furthermore, it is understood that forest removal will be necessary to accommodate a driveway, well, septic, the single family dwelling, and a curtilage area around the dwelling. The curtilage area is defined as an area up to but not more than 60 feet from the foundation of the dwelling. Any additional forest removal, beyond what was just described, will not be eligible for this Policy but instead will be subject to reforestation mitigation as required in Chapter 150.

Rationale – This policy recognizes that lots created prior to the existence of Chapter 150, which are totally or predominately forested, should be provided a method of complying with the Code without the substantial expense related to reforestation. Consequently, this policy gives applicants the option of addressing forest removal through retention of existing forest rather than planting or banking.

Jonathan Bowman, Forest Conservation Specialist
Bureau of Resource Management

Gale Engles, Bureau Chief
Bureau of Resource Management

Gail Kessler, Deputy County Attorney
County Attorney's Office

CARROLL COUNTY IMPLEMENTATION POLICY
CARROLL COUNTY PROCEDURE
FOR RELEASE OF FOREST CONSERVATION EASEMENT

Effective Date December 8, 2005

Criteria for Release of Easement

Priority 1 Forest **-** Not eligible for Release of Easement.

Priority 2 & 3 - Eligible if one or both of the following conditions exist.

1.) No other location for activity on the lot outside the easement.
2.) Area outside the easement on the lot is not suitable for activity.

If a release is approved the following options for mitigation shall be considered:

1.) On-site planting if lot is greater than 3 acres.
2.) On-site planting:
    a. Stand alone: must be greater than or equal to .23 acres
    b. Addition to existing forest: must be greater than or equal to .1 acres
3.) Off-site planting: priority 1 or sensitive areas only.
4.) Banking

Procedure for Release of Forest Conservation Easement

1. Request release of easement in writing, include a copy of the plan showing the proposed changes and a cover letter justifying the change in planting area.

2. County determines the eligibility of release request.

3. An Official amended Forest Conservation Plan and record plat (prepared and signed by a qualified professional) must be submitted to Landscape and Forest Conservation for approval. A metes and bounds description with a plat plan can be submitted when a record plat is not applicable.

4. When the Forest Conservation Plan and Plat are approved, a Public Works Agreement will be required to collect fees for deed preparation (contact Development Review for instructions of PWA submittal).

5. The County Attorney's Office will prepare the legal documents for the owner's signature.

6. A new deed of Forest Conservation Easement will be recorded in the Land Records of Carroll County.

7. Need to sign Release of Easement owner affidavit.

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Bureau of Resource Management

Cc: Tom Devilbiss, Chief, Bureau or Resource Management

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CARROLL COUNTY CODE IMPLEMENTATION POLICY
CHAPTER 115, COUNTY FOREST CONSERVATION ORDINANCE
POLICY FOR SECTION 115-2(A)(2)(C)

Effective Date April 4, 2006

Policy - This policy is to clarify interpretation of the above reference section of the Carroll County Forest Conservation Ordinance, Chapter 115.

When a site is developed and there is a remaining portion that is not part of the subdivision, as determined by the Bureau of development Review, cumulative disturbance for regulated activity that occurs on the remaining portion of the property will begin at zero if no previous disturbance under the Forest Conservation Ordinance, Chapter 115 has occurred and ownership changes. Any lots that are part of the subdivision that must address the Forest Conservation Ordinance will not begin at zero when ownership changes.

This section of the Ordinance is not to be interpreted to mean that any parcel under new ownership will begin disturbance at zero. It does not imply that a person can disturb 40,000 square feet on a site, and when it is sold to a new owner, the disturbance begins at zero.

Example:

A developer subdivides a site into four lots and there is a remaining portion that is not part of the subdivision. The four lots must address the Forest Conservation Ordinance, but the remaining portion does not because it is not part of the subdivision. The remaining portion is sold as an independent parcel to a new owner. The remaining portion would then begin at zero disturbance.

If additional lots are available on any remainder or remaining portion disturbance would be cumulative regardless of new ownership.

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