Baltimore County

Forest Conservation

Technical Manual

A Statement of Policy

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Department of Environmental Protection and Resource Management

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I. INTRODUCTION

A. Baltimore County Forest Conservation Program Policy

For purposes of the local implementation of the Maryland Forest Conservation Act of 1991, it is the policy of Baltimore County to safeguard the environmental quality of forest and woodland resources to provide air and water quality protection and aesthetic benefits for the citizens of Baltimore County, and to maintain and enhance a mosaic of diverse habitats for a range of forest-dependent native plant and animal species. It is the County's policy to promote retention of important forest and woodland resources through regulation of land development and commercial forest utilization in order to address the environmental functions of forest resources, and to require reforestation and afforestation where disturbance of forests is permitted. It is the policy of Baltimore County to implement the Forest Conservation Program through Title 14, Article X of the Baltimore County Code in support of the County's responsibilities and commitments under the Federal Clean Air Act, the Federal Clean Water Act, the 1984 and 1990 Reservoir Watershed Management Agreements, the 1989-2000 Master Plan, and the 1987 Chesapeake Bay Agreement.

B. Forest Resources of Baltimore County

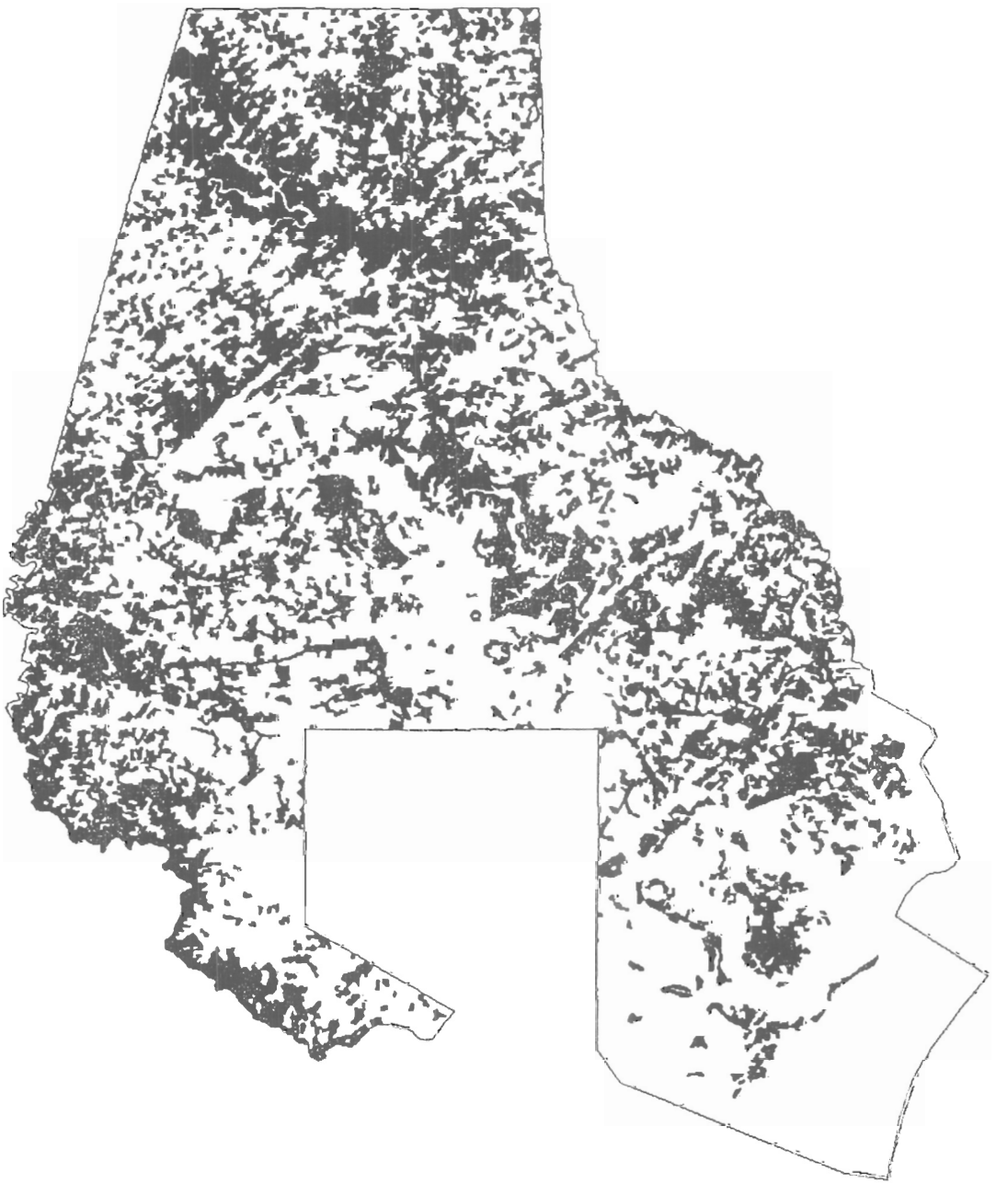
Forests and woodlands represent a significant land cover in Baltimore County. In 1990, the County had 139,247 acres (36%) in forests or some form of tree cover. Furthermore, even though forests compete with agriculture and urbanization as a major land cover, Baltimore County's forest resource is large when compared to most other counties in Maryland. An analysis of 1985 land cover data by the Maryland Office of Planning indicates that Baltimore County has more land in forests than 18 of the State's 24 local jurisdictions. Even accounting for its large size, Baltimore County has a greater percentage of land in forests than nine other counties and is within 2.5% of the forest composition of an additional five counties. Baltimore County retains a greater absolute and proportional amount of forest cover than Carroll, Montgomery, Frederick, Caroline, Kent, Queen Anne's, Talbot, Dorchester, or Wicomico counties. While the State's analysis shows that Baltimore County led the State in loss of forest cover from 1973 to 1985, the County still has a greater forest resource than Kent, Queen Anne's, and Caroline counties combined, which have a total land area 63% larger than Baltimore County.

The map on page 3 shows the geographical distribution of forests and woodlands within Baltimore County based on interpretation of 1990 aerial photography. Tree cover within the urbanized and development zoned areas is less than the rural portion of the County, and makes up only 17% of the County's total forest cover. The most notable characteristic of the geographical pattern of the County's forest is its fragmentation. Due to both agriculture and urbanization, the County's forests have been broken into smaller and smaller parcels, which has had significant impact on wildlife habitat and other functions of forest systems. The largest blocks of forest are located along the Gunpowder and Patapsco rivers, much of which is in public ownership.

In terms of absolute acreage, the amount of forests and woodlands has changed with the major conversions of land from forest to agriculture and from agricultural to urbanization. Due to the prominence of agriculture during the first part of the 20th century, there was less forest in Baltimore County than there is now. In 1929, the State Forester reported that the County contained 99,041 acres of forest growth, or 28% of the total land area. At that time, 196,000 acres in "improved farmland" was reported, or more than 50% of the County land area, compared to 124,573 acres in agriculture (32%) in 1985. As acreage in agricultural production began to decline, some agricultural land reverted to forest. This trend of increased forest land began to reverse after World War II due to the urbanization of the County. Available data on the loss of forests in Baltimore County due to urbanization are detailed in the following section of this report.

The impact of historic land conversion is important for the quality of the forest resource as well as quantity. Overall, the quality of the County's forests is not high. Much of the forests are young due to recent land use conversions and from logging. As with most of the State of Maryland, there are no virgin forest stands within Baltimore County. It is estimated that less than 3% of the County's forest would be considered mature. Generally, the more mature forests are located on publicly owned land such as the Gunpowder State Park or the three drinking water reservoir

FOREST AND TREE COVER IN BALTIMORE COUNTY



SOURCE: STATE OFFICE OF PLANNING, 1990 LAND USE MAP

properties. Wildlife corridors are another concern when looking at the geographical distribution of the County's forest. Due to fragmentation, large tracts of contiguous forest are sparse. The most prominent corridors occur along the Patapsco and Gunpowder rivers. However, through reforestation there is potential for linking other large tracts to form a functional network of wildlife corridors.

Due primarily to urbanization in Baltimore County, considerable forest has been lost over the last 17 years. Trends in forest acreage for the period from 1973 to 1985 are presented below, based on analysis of aerial photographs by the Maryland Office of Planning.

TABLE 1

Baltimore County Forest Acreage and Change - 1973 to 1990

Year	Total Forest Acreage	Percentage of County	Net Change	Percent Change	Acreage Lost/Year
1973	151,603	39.5			
1981	145,810	38.0	-5,793		
1985	144,985	37.8	-825		
1990	139,247	36.2	-5,738		
Total (1973-1990):			-12,356	-8.2	727

As reported by the Maryland Office of Planning, between 1973 and 1985, Baltimore County lost more forest acreage than any other county in Maryland. Total forest cover declined during the 17 year period from 1973 to 1990 by 8.2%. Even with this loss, the County's 1990 forest cover is 40.6% (40,206 acres) greater than that reported for 1929.

The vulnerability of the remaining forest cover in Baltimore County is of concern for the maintenance of water and air quality and wildlife habitat functions. About 24% of the remaining forest cover is "semi-protected" from future development by being located on publicly owned land. There are 45,335 acres of park land in the County, of which 72.3% (32,777 acres) is forested. Much of this acreage is contained within the Resource Conservation zones established in 1975, which cover a significant area of the County (approximately 250,600 acres, or 65%) and permit only relatively low density development. Currently, 66.7% of the existing forest cover is located in RC2, RC3, RC4, RC20 and RC50 zones, and a total of 82.6% is located in all Resource Conservation zones. There are 20,087 acres of vacant urban-zoned land in the County with the potential to be developed. This land is 35.3% forested (7,084 acres), representing a potential loss of an additional 5% of the County's forest cover.

In addition to protective Resource Conservation zoning and public ownership, protection of important riparian forests has been addressed through the enactment of regulations in 1991 which require retention of forested stream buffers. A proposal to further protect the forest resources of the RC4 (Watershed Protection) zone by clustering development and creating conservancy areas for 70% of the land area was approved by the County

Council in 1992. Regulations to reduce the impact of new development have been augmented by a commitment to restore degraded resources in priority watersheds. In 1992 the County Council approved a FY 93-98 Capital Improvement project for urban forestry in the amount of $275,000. These funds will provide for the funding of community greening projects, reforestation of riparian buffers, and the protection of critical forest-dependent habitats. Details of these efforts are included in the "Additional Program Elements" section.

C. Purpose and Goal of the Forest Conservation Act

The intent of the Baltimore County Forest Conservation Act is to safeguard the environmental quality of the County's forest resources base in order to provide air and water quality protection and aesthetic benefits for the citizens of Baltimore County, and to maintain a mosaic of diverse forest habitats for a range of forest-dependent native plant and animal species. Forests, important agents in air and water quality protection, typify the natural vegetation cover for Baltimore County. Scattered patches of mature forest mark sites that have remained relatively undisturbed for long periods of time. More commonly, younger forests represent the natural reclamation of sites once cleared for other land uses but subsequently abandoned.

Forests of different sizes, shapes, ages and structure confer both general and specific benefits on the surrounding environment. Throughout the County, forests play important roles in maintaining environmental quality. They cleanse the air of particulate matter and pollutant gases while producing life-supporting oxygen. They help to retard stormwater runoff that can lead to soil erosion and sedimentation in rivers, streams and reservoirs, and act as focal points for groundwater recharge. Trees serve as major conduits for the exchange of water between the earth and the atmosphere, creating microclimates favorable for other life forms.

Depending upon their location and structural composition, forests have a variety of additional functional uses. Trees in the urban forest complex shelter residential areas from the heat and tension of activity centers, and typically provide habitat for many of the most cosmopolitan wildlife species. Rural forests provide food, shelter and nesting sites usually required by wildlife species that are sensitive to human disturbances. However, the continuum from small urban to expansive rural forests supports many other species that can take advantage of different habitats for different parts of their life cycles.

Forest buffers on rivers, streams and reservoirs act as barriers to water degradation from terrestrial pollutants, improving water quality for the County and aquatic habitats for water-dependent species. Mature forests provide the structure and complexity required by many native plant species, and are oftentimes the only remaining locations for the County's threatened and endangered forest-dependent plant species.

Some forests and woodlots are harvested periodically for timber, firewood and other forest products. Depending upon the method employed, these disturbances may displace native plant and animal species while attracting exotic species that are adapted to the disturbed environment. Agricultural and development land uses create permanent openings that fragment forests and change surface and groundwater flows. Artifically maintained landscapes as well as the activities of residents and their pets change the characteristics of habitat available for wildlife. It is the sum of all these land use activities rather than any one specific use that places increasing stresses upon the forest resource to provide the multiple benefits that were outlined earlier.

Baltimore County's 385,096 land acres support 34% tree cover (OPZ) which includes all land use categories. Non-urban forest cover occurs on

59,885 acres or 15.6% of the County's private and publicly-owned, non-dedicated land. Parks and reservoir lands, not all of which are forested, account for 45,335 acres or 11.8% of the County's land use distribution. Institutional and residential uses contribute the remaining tree cover (Baltimore County Office of Planning and Zoning, 1991). Within the 60,000 acres of non-urban forest cover, only about 10% of this category occurs as large blocks of relatively unfragmented forest.

The thoughtful conservation of the County's forest resource base can maintain or improve the quality of Baltimore County's environment. Forest conservation can also satisfy the aesthetic, recreational and educational needs of residents and visitors alike by providing opportunities for enjoying wildlife and scientific studies close to home.

For all these reasons, future development in Baltimore County needs to be coupled with preliminary assessments of existing forest sites to determine their specific functional values. Forest Stand Delineations and Forest Conservation Plans are important tools for retaining the most environmentally valuable functions of the forests on sites planned for development and agriculture.

For the many benefits that forests confer on the County's inhabitants, Baltimore County has set a goal to protect the best examples of mature forests, to regulate development activities and agriculture in contiguous, maturing forest tracts, to encourage the establishment of a forest corridor network along watercourses and prominent ridges for the health and welfare of the County's human inhabitants, and to provide adequate habitat for forest-dependent plant and wildlife species.

D. Application of the Forest Conservation Act

All persons conducting regulated activities for private or public projects on units of land of 40,000 square feet (approximately one acre) or greater must have a Forest Stand Delineation (FSD) and a Forest Conservation Plan (FCP) completed by a licensed forester, licensed landscape architect or other qualified professional as specified in COMAR .08.19.06.01.

Regulated activities include any of the following activities not exempt under the Baltimore County Forest Conservation Act:

1. Subdivision;

2. Development, including construction;

3. Clearing, grubbing and grading;

4. An activity that requires an erosion and sediment control approval;

5. Certain project plans of County agencies;

6. Certain public utility projects;

7. Certain commercial logging and timber harvesting operations.

Exemptions are provided in Section 14-402 of the Forest Conservation Act:

"1. Highway construction activities under Natural Resources Article, Sec. 5-103, Annotated Code of Maryland.

2. Areas governed by the Chesapeake Bay Critical Area Protection Law, Natural Resources Article, Sec. 8-1801 through Sec. 8-1816, Annotated Code of Maryland.

3. Commercial logging and timber harvesting operations, including harvesting conducted subject to the forest conservation and management program under Tax-Property Article, Sec. 8-211, Annotated Code of Maryland, that are completed after July 1, 1991:

   a) On property located within the Urban Rural Demarcation Line and in accordance with a current Forest Conservation and Management Agreement or a Forest Management Plan, either of which was accepted by the Maryland Department of Natural Resources prior to July 1, 1992, and which:

      1) Has not been the subject of application for a grading or building permit for development within 5 years after the logging or harvesting operation, and

      2) Is the subject of a declaration of intent as provided for in Section 14-403 of this article, approved by the Department; or

b) On property located beyond the Urban Rural Demarcation Line and in accordance with a current Forest Conservation and Management Agreement, Forest Management Plan or Forest Stewardship Resource Conservation Plan, any of which was approved by the Maryland Department of Natural Resources and the Department, and which:

1) Has not been the subject of application for a grading or building permit for development within 5 years after the logging or harvesting operation, and

2) Is the subject of a declaration of intent as provided for in Section 14-403 of this article, approved by the Department.

4. Agricultural activities not resulting in a change in land use category, including agricultural support buildings and other related structures built using accepted best management practices, except that a person engaging in an agricultural activity clearing 40,000 square feet or greater of forest within a 1-year period, may not receive an agricultural exemption, unless the person files a declaration of intent as provided for in Section 14-403 of this article which includes:

a) A statement that the landowner or landowner's agent will practice agriculture on that portion of the property for 5 years from the date of the declaration; and

b) A sketch map of the property which shows the area to be cleared.

5. The cutting or clearing of public utility rights-of-way licensed under Article 78, Sec. 54A and 54B or Sec. 54-I, Annotated Code of Maryland, or land for electric generating stations licensed under Article 78, Sec. 54A and 54B or Sec. 54-I, Annotated Code of Maryland, if:

a) Required certificates of public convenience and necessity have been issued in accordance with Natural Resources Article, Sec. 5-1603(f), Annotated Code of Maryland; and

b) Cutting or clearing of the forest is conducted to minimize the loss of forest.

6. Routine maintenance or emergency repairs of public utility rights-of-way licensed under Article 78, Sec. 54A and 54B or Sec. 54-I, Annotated Code of Maryland.

7. Except for a public utility subject to (b)(6) of this section, routine maintenance or emergency repairs of a public utility right-of-way if:

a) The right-of-way existed before the effective date of this article; or

b) The initial construction of the right-of-way was approved under this article.

8. The construction of a public utility or highway within a utility right-of-way or highway right-of-way if:

   a) The right-of-way existed before the effective date of this article; and

   b) A forest does not exist within the right-of-way.

9. Activities, including construction, of a linear nature conducted by a public utility on more than one lot if the activity:

   a) Is not within the boundaries of a proposed development;

   b) Does not result in the cumulative cutting, clearing, or grading of more than 40,000 square feet of forest; and

   c) Does not result in the cutting, clearing, or grading of a forest that is subject to the requirements of a previous forest conservation plan approved under this article.

10. A forest clearing activity conducted on a single residential lot of any size if the lot existed before January 1, 1993 and if the activity:

   a) Does not result in the cumulative cutting, clearing, or grading of more than 40,000 square feet of forest;

   b) Does not result in the cutting, clearing, or grading of a forest that is subject to the requirements of a forest conservation plan approved under this article; and

   c) Is the subject of a declaration of intent filed with the Department, as provided for in Section 14-403 of this article, stating that the lot will not be the subject of a regulated activity within 5 years of the cutting, clearing, or grading of forest.

11. Strip or deep mining of coal regulated under Natural Resources Article, Title 7, Subtitle 5 or 5A, Annotated Code of Maryland.

12. Noncoal surface mining regulated under Natural Resources Article, Title 7, Subtitle 6A, Annotated Code of Maryland.

13. An activity required for the purpose of constructing a dwelling house intended for the use of the owner, or a child or a grandchild of the owner, if the activity:

   a) Does not result in the cutting, clearing, or grading of more than 40,000 square feet of forest; and

b) Is the subject of a declaration of intent filed with the Department, as provided for in Section 14-403 of this article, which states that transfer of ownership may result in a loss of exemption.

14. Development in accordance with a valid CRG approved before July 1, 1991 pursuant to Title 26 of the Baltimore County Code, 1988, as amended; or a valid final development plan approved before January 1, 1993 pursuant to the Baltimore County Zoning Regulations.

15. Development in accordance with a valid CRG approved before January 1, 1993 for a commercial or industrial CRG, pursuant to Title 26 of the Baltimore County Code, 1988, as amended.

16. Development in accordance with a valid development plan pursuant to Title 26 of the Baltimore County Code, 1988 as amended, which was accepted for filing before January 1, 1993.

17. Development in accordance with a valid 3-lot or less subdivision plan approved before January 1, 1993.

18. Grading and sediment control activities in accordance with a valid, unexpired grading plan, erosion and sediment control plan or grading permit approved by Baltimore County before January 1, 1993. Grading and sediment control activities for development projects must be in accordance with all appropriate State and County laws, rules and regulations.

19. Development in accordance with a valid planned unit development that, before January 1, 1993, has:

    a) Met all requirements for planned unit development approval; and

    b) Obtained initial development plan approval by the County.

20. A real estate transfer to provide a security, leasehold, or other legal or equitable interest, including a transfer of title, of a portion of a lot or parcel, if:

    a) The transfer does not involve a change in land use, or new development or redevelopment, with associated land disturbing activities; and

    b) Both the grantor and grantee file a declaration of intent, as provided for in Section 14-403 of this article.

21. A County capital improvement project for which the preliminary site design plan has been completed before January 1, 1993.

22. A County capital improvement project which:

    a) Does not result in the cumulative cutting, clearing, or grading of more than 40,000 square feet of forest; and

b) Does not result in the cutting, clearing or grading of a forest that is subject to the requirements of a previous forest conservation plan approved under this article."

E. Use of the Forest Conservation Manual

This Manual was compiled to assist landowners and Baltimore County regulatory agencies to comply with the requirements of the State of Maryland Forest Conservation Act of 1991 (Natural Resources Article, Sections 5-1601 through 5-1612, Annotated Code of Maryland) and the Baltimore County regulations for forest conservation, Baltimore County Code, Sections 14-400 through 14-426. It provides guidelines for the site-specific assessments of the functions and environmental values of individual forested areas within the context of the County's comprehensive forest management goals.

The organization of this manual follows the format of the State Forest Conservation Manual. Modifications of the two major State-required components, the Forest Stand Delineation and the Forest Conservation Plan, have been made to adapt the manual to the needs and goals of forest conservation in Baltimore County while satisfying the intent and requirements of the State Act.

Changes include:

1. The Forest Stand Delineation procedure has been simplified to identify and characterize forest stands in order to determine their retention potential.

2. The forest protection components of the Forest Conservation Plan as well as reforestation and afforestation standards have been adjusted to better reflect the conservation of forests as functional units.

No project plan, erosion and sediment control plan, or grading plan for regulated activities may be approved until the final Forest Conservation Plan has been approved by the Department; no grading permit or building permit for regulated activities may be issued until the Final Forest Forest Conservation Plan has been approved by the Department.

F. Additional Program Elements

As indicated in the background section on the Forest Resources of Baltimore County, there have been major land conversions that have resulted in a changing balance among forests, agriculture, and development. While each county's mix of these major land uses varies with time and a host of environmental and economic factors, Baltimore County, in 1990, had rather equal shares of development, agriculture, and forests (32.7%, 29.8%, and 36.2%, respectively), interestingly the least difference among these land uses in the State. Although the County has lost 8.2% of its forest cover from 1973 to 1990, these losses have not resulted from uncontrolled or sprawl development, and neither has the County failed to consider the protection of forest resources.

This section identifies the growth management, regulatory, and capital program initiatives taken by the County to address protection of environmental resources and management of the growth that has resulted in more than doubling of the County's population during the past 40 years. Adoption and implementation of the Baltimore County Forest Conservation Program pursuant to the Maryland Forest Conservation Act of 1991 will further strengthen, expand, and provide direct focus for the efforts initiated by the County to protect the functions and values of its forest resources.

A major vehicle by which forest resources are protected in Baltimore County is the growth management strategy outlined in the 1970's following several decades of explosive suburbanization. The creation of two major town centers in Owings Mills and White Marsh provides for concentration of future growth in a manner which conserves rural land resources and optimizes the provision of public infrastructure and services for growth. This growth management structure is compatible with the intent of the "2020" growth management program introduced in the 1991 General Assembly and the Forest Conservation Act originally structured as its companion. An important feature of the County's growth management strategy was the establishment of Resource Conservation (RC) zones over more than 250,000 acres, or 65% of the County. These zones, which permit only relatively low density development (.02 to .2 dwelling units per acre) are comprised primarily of farmlands, forests, and small rural villages. The existing zoning structure of the County serves to protect forest resources to the extent that a total of 82.6% of existing forest cover is located in the RC zones, with the balance of 17.4% located in development zones.

The 1984-2000 Master Plan calls for the protection of the water supply reservoirs. Because a considerable portion of the County's rural, RC-zoned land is within the watersheds of the Liberty, Prettyboy, and Loch Raven reservoirs, the County's rural forests are provided significant protection through commitments by the County to the 1984 and 1990 Reservoir Watershed Protection Agreements. An important component of these agreements is the commitment to not increase the amount of development zoning in reservoir watersheds. In its review of the more than 1200 rezoning petitions during the 1988 Comprehensive Rezoning Process and the more than 600 petitions during the current 1992 Comprehensive Rezoning Process, numerous major development zone proposals have been rejected by the Planning Board and

County Council due to inconsistency with the Master Plan and the Reservoir Watershed Management Agreements.

The effectiveness of the protection afforded to rural land from subdivision has been evaluated, and recent changes have been enacted which will strengthen the protection of forest resources. In the course of focusing on an issue related to promotion of agriculture and protection of agricultural soils, changes to the RC4 (Watershed Conservation) zone have been enacted by the County Council. The RC4 zone has been restructured to allow clustering of development on 1 acre lots with the requirement that 70% of the total tract area be set aside by permanent easement for conservation purposes. The RC4 zoned land represents only 18.5% of the County land area, but is 63.5% forested and comprises 34.3% of the total forest resources of the County.

In addition to addressing the management of the built environment, the 1989-2000 Master Plan adopted by the County Council in February 1990 outlines an extensive set of policies, issues, and action statements for protecting and managing the natural environment. In support of a broad policy to improve the quality and quantity of the forest resource for multiple benefits, to manage forest resources for sustainable production, to control land clearing activities, and to retain and replant trees in developed areas, numerous resource management/planning, regulatory, and capital program actions are outlined. These actions are also related to policies and actions that address rural development, agricultural protection, reservoir management, and stream system protection and restoration. The Master Plan's environmental management commitments include development of a comprehensive forest management program - of which the proposed Forest Conservation Program is a major component - and direct the work program of the Department of Environmental Protection and Resource Management.

As development regulation, the proposed Forest Conservation Program will augment legislation enacted in January 1991 by the County for the Protection of Water Quality, Streams, Wetlands and Floodplains (Title 14, Article IX, Baltimore County Code). The basic structure of the regulation was also implemented in June 1989 under an Executive Order. The Forest Buffers, as they are termed, are comprised of stream system corridors and protect the stream itself, its associated wetlands, floodplains, and adjacent erodible slopes. This legislation was developed over a two-year period by the Baltimore County Water Quality Steering Committee through a process of negotiation and consensus-building among representatives from the engineering, homebuilding, and environmental communities, and from County agencies. The standards for Forest Buffers apply to all streams, including intermittent, perennial, mapped, and unmapped streams. Baltimore County requires protection of small streams which are essential to the ecological health of river systems. The degree to which Forest Buffers are applied to a site is dependent on the environmental sensitivity of that site and factors such as the stream order and designated water use. Buffers are determined for each stream up to as much as 300 feet from the edge of wetlands, or the stream where no wetlands exist. Specific management requirements to reduce disturbance of the Forest Buffers are required to be recorded in restrictive covenants in the Land Records of the County.

The growth management and land use planning frameworks instituted in the past 15 years and the recent regulations for stream buffers will serve the County well to protect critical environmental resources in the future. However, decades of development prior to those mechanisms have resulted in existing communities without beneficial tree cover, a reduction in critical forest habitat, and many miles of streams with inadequate riparian buffers. These conditions are of concern not only because of lost or degraded air and water quality functions, but also because they impact the quality of life of the County's communities. In an effort to address these impacts from existing development, the County Council approved the creation of a forestry capital improvement project as part of the larger Waterway Improvement Program. Because of the current recession, the urban forestry capital program approved in Fiscal Year 1992-1997 at $1.58 million has been reduced to $275,000 for Fiscal Year 1993-1998. Prior to this funding, the Department of Environmental Protection and Resource Management has coordinated local participation in the Tree-Mendous Maryland program and community greening projects and has supported activities of the Baltimore County Forest Conservancy District Board through an annual grant since 1990. When available, the capital project will fund community greening projects, reforestation of riparian buffers in priority watersheds, and the protection of critical forest-dependent habitats.

II. FOREST STAND DELINEATION (FSD)

Baltimore County Code, Section 14-405

A. Purpose

The purpose of the FSD is to identify, describe and evaluate forest vegetation on a site in order to make a preliminary assessment of the natural site constraints and forest value. The FSD augments the Environmental Assessment currently required by the Development Regulations in the Baltimore County Code, Title 22, Article V, Section 26-203, by providing a more detailed examination of the vegetation characteristics and structure of the forested sections of a site.

B. Submittal Requirements

1. Site Constraints Map showing total forest cover
2. Forest Stand Cover Map
3. Forest Stand Assessments
4. Summary Evaluation of Forest Site Characteristics
5. Completed Checklist

Recommended data sources for the interpretation of the maps are found within the list of elements for the Sites Constraints Map below. Map scales other than those required may be submitted with the approval of the Department of Environmental Protection and Resource Management. Once chosen, the map scale should be maintained throughout the review process.

C. Forest Stand Delineation Procedure

STEP 1: Prepare Site Constraints Map

General

1. Name and address of the preparer of the plan, including verification of qualified professional certification;
2. Location or vicinity map; and
3. Property boundaries.

Natural Environment Assessment (Consistent with Site Constraints Map, See Figure 1)

4. Existing topography as shown on County photogrammetric maps or other approved topographic maps, highlighting slopes greater than 25%;
5. Approximate 100-year floodplain limits or Baltimore County Department of Public Works approved 100-year floodplain;

6. Soils mapped and labeled in accordance with the Soil Survey, Baltimore County, Maryland;

7. Perennial and intermittent streams, seeps, ponds, or other water bodies on the development site and within 200 feet of the site's boundaries;

8. Wetlands;

9. Forest Buffer Limits, including adjustments for steep slopes and/or erodible soils in accordance with Section 14-341 of the County Code;

10. Existing land cover (e.g., forest, meadow, agriculture, etc.) on and within 200 feet of the development site;

11. Significant regulated plant or wildlife communities, according to the Natural Heritage Program of the Maryland Department of Natural Resources;

Built Environment Assessment

Approximate location of the following:

12. Existing well and sewage disposal systems on the development site and within 100 feet of the site's boundaries;

13. Soil evaluation tests (percolation tests).

14. Existing buildings and roads on the development site and within at least 200 feet of the site's boundaries;

15. Designated historic structures or sites as per the Landmarks Preservation Commission or the Maryland Historical Trust Inventory;

16. Significant views, as determined by the Baltimore County Office of Planning and Zoning, that may affect the development proposal;

17. Significant features (e.g., specimen trees, buildings, streetscaping, etc.) that may affect the development proposal;

18. Existing zoning on and within 200 ft. of the development site.

STEP 2: Prepare Preliminary Forest Stand Cover Map

This map must show all forest cover on the site delineated into major tree stands (aggregates of trees distinguished by differences in species composition or significant differences in age or structural features; stands can also often be distinguished by differences in their associated understory vegetation, although this feature is discernible only in the field). Show the approximate boundaries of the stand types inferred from photogrammetric maps, a knowledge of forest stand distribution based upon changing soil types (Soil Survey, Baltimore County, Maryland, "Use of the Soils as Woodland, pp. 69-92; Forest Cover Types of the United States and

Canada, Society of American Foresters), or field reconnaissance. For an example, see Figure 2.

STEP 3. Determine Forest Stands to be Assessed

Using the Preliminary Forest Stand Cover Map, number all major forest stands present. Indicate stream system resources including non-tidal wetlands, 100-year floodplains and forest buffers. Resources within the forest buffer easements/reservations do not require field assessment unless disturbance of these areas is anticipated.

If an alternatives analysis is required under Article IX, Section 14-334 (a),(2) or (3) of the Baltimore County Code, or an application for a variance to disturb forest buffers is anticipated under Section 14-334 (a), (1) or (4), all forest stands in which the disturbance is planned must have FSDs completed. Subsequent changes to the development concept or development plan which propose disturbance of stream system forests will require a new FSD and re-approval. All other forest stand types on the site must be assessed.

STEP 4. Conduct Forest Stand Assessment

The goal of the FSD is to provide a summary of forest species composition, apparent seral stage, degree of structural complexity, and environmental condition as a functioning ecosystem. This information, combined with topographical and water resources data, will be used to evaluate forest stands for retention value.

Examine the entire forested section of the site to confirm the boundaries of forest stands, and record the presence of any significant disruptions not apparent on the photogrammetric maps. For the purposes of this assessment, forest stands less than one acre in size should be incorporated into larger, adjacent stands unless some unique characteristic makes it imperative to evaluate the small stand as a separate entity, e.g., the presence of a rare, threatened or endangered species, or a tree species in need of conservation (on the Maryland Natural Heritage Program watchlist). A small stand of pioneer trees that is filling the gap left by the blowdown of a canopy tree should not qualify as a separate stand. The judgement of the qualified professional is critical at this early stage of the assessment.

Delineate the boundaries between forest stands with bright flagging on stakes or trees, flagging on other natural features, or field confirmation with staff of the DEPRM. Any other method for stand marking must be approved by the DEPRM before use.

After the forest stands have been delineated, investigate each stand, recording tree species in order of decreasing dominance. Record also the most common diameter at breast height (dbh) as well as the approximate average height of the ecologically dominant trees. Dominance, as used herein, is defined as the influence exerted upon the plant community composition by the canopy species showing the greatest height and areal coverage in the community. For the understory vegetation, estimate dominance by areal coverage alone. Indicate the approximate abundance of

each dominant tree species within the canopy and the understory (each column, the canopy and the understory, should total 100%) as well as any advanced regeneration species that can be identified within the shrub and ground layers. This information provides valuable clues about the age and successional stages operating in the stand.

The data sheets, 1 and 2, have been designed to assist the field investigator in organizing observations about dominance, forest structure, apparent seral stage and disruption patterns in order to compare the forest stands for ecological value. For an example of completed data sheets, see pp. 21-24. Although qualitative in nature, this information should produce a sufficient approximation of the forest stand conditions without a rigorous sampling procedure.

In stands where canopy dominance is very difficult to discern because of the number of canopy species, the option to use limited sampling, as described in the State Forest Conservation Technical Manual, can be helpful. However, the goal of the FSD is to show the relative differences in structural diversity, apparent seral stage and physical condition within the forest stands, and in most cases, sampling should not be necessary.

The success of this procedure depends upon the experience and knowledge of the qualified professional about forest structure. Should the DEPRM staff find that the FSD departs significantly from existing forest conditions, the applicant will be required to repeat the FSD using the procedure outlined in the State Manual (see Appendix P).

BALTIMORE COUNTY DEPARTMENT OF ENVIRONMENTAL PROTECTION
AND RESOURCE MANAGEMENT

FOREST STAND DELINEATION - DOMINANT PLANT SPECIES

Project Name: _____ Date: 9/15/92

Location: _____ Investigator(s): _____

Stand: #1 Type: Tuliptree/Red Oak Acreage: 12

Slope: 20% Aspect: North

Reviewed by: _____ Date: _____

Botanical Names of: Dominant Tree Species	Most Common dbh (in.)	dbh Range	Average Height (ft.)	* Approximate % of Each Dominant Species in Canopy	in Understory
1. Liriodendron tulipifera	12	4-12	80	35	
2. Quercus alba	18	12-28	80	15	
3. Q. rubra	6	6-9	70	35	20
4. Nyssa sylvatica	6	2-6	20		50
5. Acer rubrum	4	1-6	25	15	10
6. Amelanchier arborea	3	1-4	12		20

Common regeneration species: _____

**Common Shrubs and Vines	Average Height (ft.)	Approx. % Cover	Herbaceous Species	Approx. % Cover
1. Viburnum acerifolium	3	20	1. Typical mesic spp.	40
2. Nyssa sylvatica	5	20	2. Medeola virginica	5
3. Rhododendron nudiflorum	3	5	3.* Platanthera orbiculata	5
4. Vaccinium sp.	2	25	4.	
5. A. rubrum	6	10	5.	
6.			6.	
7.			7.	
8.			8.	

Rare, threatened or endangered plant species listed by the +MNHP and/or found:
* P. orbiculata - not listed but still not often encountered in Baltimore County forests.

List specimen-sized trees: (75% of champion size or ≥30" dbh; except Tuliptree)

Species	dbh (in.)	Condition

* Dominant tree species - each column reading down should equal 100%
** Shrubs - include young plants that are taxonomically considered tree species but are less than six feet tall.
% Cover for vines - indicate % distribution between the canopy and understory.
\+ Maryland Natural Heritage Program of the Department of Natural Resources

EXOTIC PLANT SPECIES MOST LIKELY TO BE FOUND IN FOREST COMMUNITIES

Indicate the occurrence of any of the following species using one symbol from both (a) and (b):

(a) O = occasional
C = common
A = abundant

(b) S = scattered throughout
L = localized

	SPECIES	IF OCCURRENCE IS A AND L, RECORD LOCATION IN STAND:
	Acer platanoides (Norway Maple)	
	Ailanthus altissima (Tree of Heaven)	
	Alliaria officinalis (Garlic Mustard)	
	Ampelopsis brevipedunculata (Porcelain Berry)	
	Berberis thunbergii (Japanese Barberry)	
	Celastrus orbiculatus (Oriental Bittersweet)	
	Euonymus alatus (Winged Euonymous)	
	Euonymus fortunei (Climbing Euonymous)	
OS	Glecoma hederacea (Ground Ivy)	
	Hedera helix (English Ivy)	
	Hemerocallis fulva (Common Daylily)	
	Lonicera japonica (Japanese Honeysuckle)	
	Lonicera tatarica (Tatarian Honeysuckle)	
	Pachysandra terminalis (Japanese Pachysandra)	
	Paulownia tomentosa (Empress Tree)	
	Pueraria lobata (Kudzu)	
	Polygonum perfoliatum (Asian Tearthumb)	
	Rosa multiflora (Multiflora Rose)	
OS	Rubus phoenicolasius (Wineberry)	
	Vinca minor (Periwinkle)	
	Wisteria floribunda (Wisteria)	
	Wisteria sinensis (Chinese Wisteria)	

Others:

Estimate total % cover by all exotic species in:

Canopy	—	Shrub Layer	<10%
Understory	—	Ground Cover	<10%

BALTIMORE COUNTY DEPARTMENT OF ENVIRONMENTAL PROTECTION
AND RESOURCE MANAGEMENT

FOREST STAND DELINEATION - FOREST STRUCTURE

Project Name: _____ Date: 9/15/92

Location: _____

Stand: #1 Type: Tuliptree / Red Oak

Acreage: 12 Slope: 20% Aspect: North

% Canopy Closure: (>80% ✓) (50% to 80% ____) (30% to 49 % ____) (≤30% ____)
% Shrub Cover: 70 Shrub height range: 2 feet to 6 feet
% Ground Cover (May to October): 50
Number of woody vegetation layers: (<3 ____) (3 ✓) (4 ____) (≥ 5 ____)
Litter Depth (inches) to mineral soil (exclusive of fresh leaf fall): 6
Downed woody debris: (≥6" dia.) ____ rare ____ common ____ abundant
Tally standing snags (≥20" dbh): 0

Stand Narrative:

1) Condition of canopy trees: Excellent. The white oaks especially have full, spreading crowns and probably predate the succession of the stand.

2) Evidence of significant disease or insect infestation in the stand: None. Trees are healthy; no significant bark damage or diseased branches.

3) Patterns of disruption within the stand: None apparent. The high structural diversity and open spacing in the understory indicate that this stand is entering a mid-to-late seral stage towards maturity.

4) Evidence of management: Several decomposing large stumps on the slope may indicate selective harvesting in the past.

5) Recommendations for improving the structural diversity of the stand: The understory is clearly dominated by black gum. A minor thinning could benefit the red oak regeneration; however, the ground layer should not be disturbed.

FOREST STRUCTURE ANALYSIS

For each of the following parameters, circle the value that best describes the structural conditions in the stand. Add the numerical score for each parameter to get a total value for the stand.

From April through October A score of:		From November through March, omit #5 & #6 A score of:
22 to 33	<-------indicates priority forest structure------->	16 to 27
14 to 21	<-------indicates good forest structure---------->	8 to 15
0 to 13	<-------indicates poor forest structure---------->	0 to 7

1. Percent Canopy Closure (2)

≥ 80%	6
≥ 50 < 80	4
> 30 < 50	2
< 30	0

2. Size Class of Dominant Trees (1)

≥ 20" dbh	6
12 - < 20	4
6 - < 12	2
< 6	0

3. Number of Native Tree Species (≥ 6" dbh) (1)

> 6	6
4 - 6	4
2 - 3	2
1	0

4. Number of Woody Vegetation Layers (2)

≥ 5	6
4	4
3	2
< 3	0

5. Number of Native Shrub Species (1) (April through October)

> 6	3
4 - 6	2
2 - 3	1
1	0

6. Number of Common Native Herbaceous Species (1) (April through October)

> 12	3
8 - 12	2
3 - 7	1
> 1	0

7. Average Litter Depth* (in.) (2)

> 6	3
4 - 6	2
1 - 3	1
< 1	0

Total Value = 25

(1) From Data Sheet 1A
(2) From Data Sheet 2A

* exclusive of fresh leaf fall in the autumn

HABITAT POTENTIAL FOR FOREST INTERIOR BIRD (FIB) SPECIES

If the forested area is ≥ 25 acres, or if the forested area and any adjacent forest combined is ≥ 25 acres, indicate Breeding Bird Atlas Survey documentation for FIB species within the nearest sixth block of the appropriate USGS topographical quadrangle: _____

STEP 5. Prepare a Summary Evaluation of Site Characteristics.

Write a summary of forest characteristics for the site, including the forest's proximity to other forested areas, the number of major stands present on the site, and any overall disruption patterns from significant disease or insect infestation (e.g., large-scale fungal blights or Gypsy Moth damage) or invasion by exotic plant species, and any fragmentation patterns from physical causes (e.g., paved roads, firetrails, clearcuts, etc.). Stands that were eliminated from the assessment requirements should be identified, and reasons given for their elimination.

STEP 6. Prepare the Final Forest Stand Delineation Map

After the FSD has been completed, adjust the Preliminary Forest Stand Map to show:

1. Forest stand boundaries (see Figure 3).

2. Approximate location of any specimen trees (see Appendix A).

3. Approximate location of any threatened or endangered plant species as listed by the Natural Heritage Program of the Maryland Department of Natural Resources.

4. Approximate location of major disruption or fragmentation patterns.

STEP 7. Complete the Forest Stand Delineation Checklist

FOREST STAND DELINEATION CHECKLIST

Project Name _____

Date _____

Investigator(s) _____

_____

Indicate items not applicable to the site by writing N/A in the appropriate space.

SITE CONSTRAINTS MAP

____ Name and address of the preparer of the plan

____ Location or vicinity map

____ Property boundaries

____ Existing topography as shown on County photogrammetric map highlighting slopes greater than 25%

____ 100 year floodplain limits, Approximate ____ DPW approved ____

____ Soils mapped and labeled in accordance with the Soil Survey, Baltimore County, Maryland

____ Perennial and intermittent streams, seeps, ponds, or other water bodies on the development site and within 200 ft. of the site's boundaries

____ Wetlands within ____ ft. of site. Approximate ____ Field delineated ____

____ Forest buffer limits, including adjustments for steep slopes and/or erodible soils in accordance with Section 14-341 of the County Code, Approximate ____ Field delineated ____

____ Existing land cover (e.g., forest, meadow, agriculture, etc.) on and within 200 ft. of the development site

____ Significant regulated plant or wildlife communities

____ Existing well and sewage disposal systems on the development site and within 100 ft. of the site's boundaries

____ Soil evaluation tests (percolation tests)

____ Existing buildings and roads on the development site and within at least 200 ft. of the site's boundaries

____ Designated historic structures or sites as per the Landmarks Preservation Commission or the Maryland Historical Trust Inventory

____ Significant views that may affect the development proposal

____ Significant features (e.g., specimen trees, buildings, streetscaping, etc.) that may affect the development proposal

____ Existing land uses (e.g., commercial, single family, residential, townhouses residential, etc.) on and within 200 ft. of the development site

____ FINAL FOREST STAND DELINEATION MAP

____ FOREST COMPOSITION DATA SHEETS

____ FOREST STRUCTURE DATA SHEETS

____ SUMMARY EVALUATION OF FOREST SITE CHARACTERISTICS

D. Interpretation of the FSD Data

The evaluation of forest stands for retention potential depends upon three sets of information:

1. Components that are general indicators of forest structural diversity;

2. Components that have differential habitat values for a range of wildlife species; and

3. The degree of disruption by exotic species, fragmentation, or significant diseases.

The numerical score for forest structure represents only a partial although important assessment of the stand for overall habitat value. Other structural features, e.g., shrub and ground cover and downed woody debris, were not given numerical values because they have differential habitat value depending upon the wildlife species considered. Even so, a qualitative assessment of these features gives a better description of the stand's structural diversity than the valued parameters alone and may influence the weight of the numerical score. (As more information is learned about the habitat requirements of the County's forest-dependent wildlife species, the forest structure analysis will be updated to reflect their conservation requirements.) When evaluating a stand for retention potential, the numerical score for the forest structure should be considered in light of the qualitative aspects of the forest stand delineation.

E. Using the FSD to Direct Development Activities

The goal of the forest stand delineation is to direct development away from the most ecologically valuable parts of the forest on a site. To make this determination, the forest map for the site should indicate the relative priorities of the individual stands, placing the limits of disturbance on the lowest valued areas.

Although development is site-specific, the applicant should also consider areas of contiguous forest that lead off-site to other forest patches. To the fullest extent possible, site design should attempt to minimize disruption of the forest stands by roads or other openings, particularly when the forested portions of the site are adjacent to other forested areas off-site.

III. FOREST CONSERVATION PLAN (FCP)

Baltimore County Code, Sections 14-406 through 14-408

A. Purpose

The Forest Conservation Plan must be constructed to protect existing forested areas and specimen trees to the fullest extent possible before, during and after construction, and to design planting plans and maintenance schedules appropriate to the site conditions for any required reforestation or afforestation. The Plan must also provide legal mechanisms for the permanent protection of any reforested or afforested areas.

Specific guidance is provided for the calculations that determine Forest Conservation requirements, forest retention procedures, forest protection procedures, and specifications for reforestation and afforestation. At the end of the section, an example of a Forest Conservation Plan example is provided.

The Forest Conservation Plan (FCP) influences the pattern of development on a site by:

1. determining the minimum forest acreage that must be retained or established;

2. directing clearing, grading, and sediment control to the least environmentally valuable forest stands; and

3. identifying the best areas on a site for reforestation or afforestation efforts, if applicable.

B. Submittal Requirements for FCP

Preliminary FCP

A Forest Conservation Plan shall be submitted as part of any regulated activity that requires a Forest Stand Delineation (FSD). The FCP must be prepared by a licensed forester, licensed landscape architect or other qualified professional specified in COMAR 08.19.01.04.

The components of a preliminary FCP (Baltimore County Code, Section 14-407) are:

1. Approved FSD (see Section II of this Manual).

2. Forest Conservation Worksheet (see p. D-5).

3. Forest Conservation Map (see Figure 13).

4. Conceptual Reforestation and Afforestation Plans, if required.

See individual sections for details of required procedures.

Final FCP

The components of the final FCP are:

1. through 3. Same as for the Preliminary FCP.

4. Final Reforestaion and Afforestation Plans, if required.

   a. Planting plan

   b. Maintenance plan

   c. Protection measures (temporary and permanent)

5. Forest Protection Plan

C. Forest Retention Procedure

This section includes information designed to assist the applicant in completing the worksheet for land use types and thresholds (Table 1), a completed worksheet for clearing up to the Forest Conservation Threshold (Figure 4), and a graphic illustrating the "break-even point" (Figure 5). The latter figure will be helpful in determining the appropriate retention acreage needed to avoid reforestation requirements. Examples provided illustrate five potential scenarios (Figures 6-10).

STEP 1. Prepare the Forest Conservation Worksheets (FCW)

This sheet is used to calculate the preliminary minimum forest retention requirement based upon pre-established Forest Conservation Thresholds for different land use categories. It also determines the reforestation requirement for sites where anticipated clearing reduces forest cover to levels below the Forest Conservation Threshold, and the afforestation requirement for sites where existing forest is absent. The final forest retention area acreage may be adjusted to reflect on-site conditions. The following information is needed for the FCW (see p. 31):

1. Land use category for the site determined from Table 1.

2. Total site area from tax plats and boundary surveys.

3. 100-year floodplain and the area within any existing transmission line easement where tree planting is prohibited.

4. Areas in agricultural production.

5. Existing forest cover of the site determined from the approved Forest Stand Delineation.

6. Forest areas proposed for clearing including anticipated utility rights-of-way, roadside grades and rights-of-way, stormwater and sediment control setbacks, and any other expected setbacks that will disrupt forest cover.

TABLE 1: LAND USE THRESHOLDS

Land Use Type	Conservation Threshold	Afforestation Threshold
Agricultural and Resource Areas (RC2, RC4)	50%	20%
Medium Density Residential (RC3, RC5, DR1)	25%	20%
Institutional Development Areas	20%	15%
High Density Residential Areas (DR2, DR3.5, DR5.5, DR10.5, DR16, ROA)	20%	15%
Mixed Use and Planned Unit Development Areas (OT, O-1, O-2, RAE1, RAE2, PUDR-1, PUDR-2)	15%	15%
Commercial and Industrial Use Areas (RO, RCC, BL, BM, BR, MR, MLR, ML, MH, SE, BMM, BMB)	15%	15%

Site areas governed by the Chesapeake Bay Critical Area Protection Law (Natural Resources Article, Section 8-1801 through Section 8-1816, Annotated Code of Maryland) are exempt from the Forest Conservation Act of 1991.

STEP 2. Determine Priority Retention Acreage

This section provides a framework for identifying forest areas to be retained. Using the information gathered in the Forest Stand Delineation and forest retention criteria defined in the State Act and the Baltimore County regulations for forest conservation, a final plan for forest retention can be accomplished. This section provides a framework for prioritizing forested areas using specific retention criteria. Once priority areas are mapped and the acreage calculated, this section provides additional guidance for the identification of the most important areas to be retained as Forest Retention Areas.

Applying the data from the approved FSD, delineate priority forest retention areas as defined below from the most environmentally valuable (Priority 1) to the least valuable (Priority 4).

Priority Area 1: High

1. Critical habitats of rare, threatened, or endangered species.

2. Forest associated with:

a. areas within the forest buffer;

b. slopes over 25%;

c. hydric soils;

d. soils with a K value greater than 0.32 on slopes of 20% or more.

3. Trees, shrubs and herbaceous plants that are part of a community that has one or more of the following characteristics:

a. high forest structural diversity;

b. is included within a contiguous forested area of approximately 100 acres that connects the largest or most vegetated tracts of land within and adjacent to the site;

c. is part of a forested area which provides a corridor 300 feet wide or more of primarily native vegetation between two larger forested tracks.

Priority Area 2: Moderate

1. Forest stands or portions of forest stands with good structural diversity.

2. Contiguous forested areas approximately 20 acres or more in size connecting the largest or most vegetated tracts of land within and adjacent to the site.

3. Expansion of forest buffers up to 300 feet from a stream or to the ridge, whichever is less.

4. Soils with a K value of 0.32 on slopes of 10% to 19%.

5. Soils with a K value of 0.24 on slopes of 20% or greater.

6. Individual trees with one or more of the following characteristics:

a. trees that are part of a historic site or associated with a historic structure;

b. trees designated as national, state, or local champions;

c. trees measuring 75% or more of the diameter measured at 4.5 feet above the ground (DBH) of designated state champion trees of the same species;

d. trees with a DBH of 30 inches or greater except the species Tuliptree (*Liriodendron tulipifera*).

Priority Area 3: Low

Forest stands or portions of forest 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% of land covered with exotic or invasive species (see Appendix H).

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

Construct a table showing the acreage for each priority retention area, the combined acreage of the critical root zones (see Figure 11) of all specimen trees outside the retention areas, and the forest retention credit associated with the critical root zones for specimen trees ($\frac{1}{4}$ x combined acreage of the critical root zones). Present this table on the preliminary Forest Conservation Map.

STEP 3. Designate Forest Retention Areas

1. Satisfying the Forest Conservation Threshold Requirement

The Forest Retention Area shall be a minimum area of 10,000 square feet in size and located a minimum of 35 feet from a primary structure. Critical root zones of retained areas that are protected shall be counted toward the total Forest Retention Area. The critical root zones of isolated retained specimen trees (not already within the above-defined retention areas) shall also be counted toward the total Forest Retention Area. However, for specimen trees, only one quarter of the entire critical root zone shall be credited toward the total Forest Retention Area. This retention credit shall only apply if the entire critical root zone is retained.

In the process of determining the Forest Retention Areas on site, the factors listed under Priority 1 in Step 2 shall be used to designate areas of highest importance for retention. If there are any changes to the designated retention areas after they have been approved, the amended plans shall be reapproved before construction can proceed on the amended areas.

This step represents a critical stage for the developer and the forest environment. Armed with the preliminary forest retention acreage requirement from the Forest Conservation Worksheet and the Priority Retention Area data for the site, the applicant should compare this information with the development plan to review environmental constraints on the site and to decide the most efficient and cost-effective ways to achieve the development while satisfying the forest conservation requirements for the land use category.

The Baltimore County Act strongly recommends retention of existing forest over reforestation. The restoration of a forest ecosystem is a

largely untested activity. Although tree plantations for forest products have been successfully established with long-term maintenance regimes, there is no evidence to show that their hydrologic or ecological function are equivalent to that found in naturally established forests.

There is ample evidence, however, that disruptions to forest systems alter hydrologic function, displace many native plant and animal populations, encourage the proliferation of weedy, intrusive plant species into the fragmented forest, and attract wildlife species that can damage reforestation plantings by their feeding activities. For example, deer are a major pest in new forest plantations because they browse the young woody vegetation. Elaborate protective devices against deer and other edge adapted herbivores and the suppression of unwanted vegetation are typical components of forest management regimes.

Because forests, like other natural ecosystems, are dynamic, competition among plants for space, light and nutrients, and among animals for food and shelter is a continuing phenomenon. Maintenance programs that favor the establishment of some species over others cannot be withdrawn after short periods without risking failure of the restoration.

Unless there is no other reasonable alternative, forest clearing should be kept to a minimum. Reducing the forested area to below the conservation threshold will necessitate a reforestation project whose cost per acre for the restoration should be weighed against a reduced development goal.

2. Protecting the Highest Quality Forest Stands

Priority 1 areas, as defined in Step 2, should be set aside as Forest Retention Areas first. If additional acreage is needed to reach the forest conservation threshold, it should be taken from Priority 2 areas. Construction and other disturbances should be directed toward Priority 3 and 4 areas.

If the land in Priority 2 areas is above the target retention acreage, use the following elements in deciding between stands of apparently equal environmental value:

a. Increase forest buffer width along streams and wetlands to safeguard hydrologic function and protect riparian habitat from degradation. Buffers of at least 300 feet width can also serve as usable wildlife corridors. This effect can increase the value of building lots by providing residents with nature trails for recreational and educational experiences.

b. Use 300+ foot wide Priority 2 areas as connecting corridors for separated Priority 1 areas.

c. Save forested areas along roads to trap particulate pollution and to provide aesthetically pleasing views for the residents.

d. Retain forested areas that can act as windbreaks or moderate temperature extremes around proposed buildings or lots.

e. Consider the shapes of forest fragments which may be connected to forested areas off-site, or when combined may serve as nuclei for future contiguously forested tracts after forest restoration (see Figure 12).

Thoughtful planning that includes consideration of the needs of both human residents and forest-dependent wildlife species can create developments whose functional, aesthetic and economic value are maintained or enhanced.

3. Determine the Forest Retention Area Edges in the Field

Factors to consider in delineating retention area borders:

a. Trees that have developed in the low light and high humidity of the forest interior will be exposed to the stresses of sunscald and desiccation when adjacent forest is cleared.

b. Newly created edges will also be immediately subject to invasion by weedy species to a depth of at least 100 feet, placing tree seedlings and saplings into severe competition for survival.

c. The naturally occurring climax tree species for the County's forests are typically intolerant of compaction and transplantation. Older trees, especially, tend to be less resistant to disturbances.

d. Trees along newly created edges will tend to increase their crown growth in the direction of the openings causing imbalances in form and stability.

e. Bark damage, disease, insect presence and decay are all natural conditions of forest trees and useful sources of food, shelter and nest sites for the animal species that depend upon forests for their survival. Intermittent outbreaks of disease and pest infestations are followed by recovery where the roles of predator and prey shift within the food web because of the species diversity and structural complexity that characterizes a functioning forest ecosystem. Signs of damage or disease in a forest tree do not necessarily make it a candidate for removal.

Recommendations

Whenever possible, follow the line of existing edges in which the trees and other plants have already adjusted successfully to prevailing environmental conditions. When this is not practical, plan on losing older or shade-tolerant trees in the newly-created edges for all the reasons above. Tall trees along the new edges may also have to be removed because they become more vulnerable to shear damage due to increased exposure.

To save the cost and effort of replanting later on in order to maintain the required size of the retention area, it is recommended that an additional 100 feet be added to the retention border to protect the interior trees.

STEP 4. Prepare a Forest Conservation Map

At the same scale as the grading plan or subdivision plan submitted for approval, clearly indicate the location and acreages of the following:

1. Forest Retention Areas (with priority rating and acreage) (see Figure 13);

2. Specimen trees, isolated from retained areas, and their critical root zones;

3. Limits of Disturbance;

4. Reforestation Areas (if applicable);

5. Afforestation Areas (if applicable).

D. Forest and Specimen Tree Protection Procedures

1. Introduction

At this point in the preparation of the Forest Conservation Plan, the applicant should have identified and designated forest retention areas, isolated specimen trees, and the siting of all utilities, access roads and limits of disturbances such as grading or stormwater management areas. The process of delineating these areas, however, does not guarantee their continued viability beyond the construction phase of the project. The impacts of construction activities to tree health are summarized in Figure 14.

This section of the manual is intended to guide the applicant through the construction phase of a project, ensuring that construction activities will not adversely affect the forest stands that have been identified as retention areas, or specimen trees. Examples of specifications for protection devices are located in Appendix J.

2. Protection of Forest Retention Areas During Construction

There are certain requirements for the management of Forest Retention Areas, once designated on the Forest Conservation Plan. By definition, construction activities may not take place in the retention area. This includes:

a. Siting and construction of:

   1) Utility Lines
   2) Access roads
   3) Staging, storage, and temporary parking areas
   4) Stormwater management devices
   5) Impervious Surfaces

b. Grading - If any of these or other construction activities take place in designated retention areas, these disturbed areas will no longer be credited toward retention. The applicant shall be

subject to a penalty for violation of the Forest Conservation Plan agreements.

3. Future Protection of Forest Retention Areas

The future protection of retention areas, as well as reforestation and afforestation areas, is required by the State Act and the Baltimore County Forest Conservation Act. These areas shall be protected through the use of legal mechanisms (see Appendix F). Compatible uses of retention areas may include such activities as unpaved hiking trails or silvicultural activities associated with an approved forest management plan.

4. Submittal Requirements for Forest Protection Plan

The applicant shall provide:

a. A Forest Protection Plan addressing:

1) Pre-construction activities, when appropriate, including stress reduction and temporary and permanent protection devices; and

2) Future protection measures

b. An overlay map to be added to the Forest Conservation Map showing:

1) Placement of stockpile areas, temporary and permanent tree protection devices (see Appendix J);

2) Specifications for required devices.

<u>Contents of the Forest Protection Plan</u>

The above submittal requirements shall address the following issues:

a. Pre-construction activities*

1) Stress reduction of specimen trees isolated from forest retention areas: The applicant shall address each item below, noting if a technique is used and for what reason:

a) Root pruning
b) Crown reduction or pruning
c) Watering
d) Fertilizing
e) Mulching

2) Temporary protection measures, such as fencing and signage for retained and reforested areas (see Appendix J).

3) Permanent protection devices of disturbed areas within the Critical Root Zone of retained areas (see Appendix J).

* If these situations do not occur, the applicant may indicate within the pre-construction activities section of the Forest Conservation Plan that "No Critical Root Zone impacted, therefore, no permanent devices are needed."

b. Future protection measures:

The applicant shall include with the conservation plan a strategy for protecting all retention, reforestation and afforestation areas for the future. Appendix F describes alternative methods that are suitable to ensure this protection.

5. Procedural Requirements for Forest Protection Plan

a. Planning and design of protection devices

For all retained areas, including both forested and isolated specimen trees:

1) All retention areas and isolated specimen trees shall be protected by highly visible, well-anchored, temporary protection devices.

2) All protection devices shall be in place prior to any grading or land clearing.

3) All protection devices shall remain in place until all construction has ceased in the immediate vicinity.

4) Devices shall be maintained throughout construction.

5) Attachment of signs, or any other objects to trees is prohibited.

6) No equipment, machinery, vehicles, materials or excessive pedestrian traffic shall be allowed within protected areas.

b. Pre-construction meeting.

After the boundaries of the retention area have been staked and flagged and before any disturbance has taken place on site, a pre-construction meeting at the construction site shall take place. The developer, contractor or project manager, and Baltimore County inspectors shall attend.

c. On-site decisions

Any significant changes made to the Forest Conservation Plan due to on-site conditions shall be made with the prior consent of the Department of Environmental Protection and Resource Management.

d. Post-construction phase

The following measures shall be taken:

1) Corrective measures if damages were incurred due to negligence:

a) Stress reduction.

b) Removal of dead or dying trees. This may be done only if trees pose an immediate safety hazard.

2) Removal of temporary structures:

a) No burial of discarded materials will occur on-site within the conservation area.

b) No open burning within 100 feet of a wooded area.

c) All temporary forest protection structures will be removed after construction.

PENALTY FOR VIOLATION

Following the completion of construction, prior to use, the County inspector shall inspect the entire site. If trees in the retention areas are found severely damaged or dead due to mechanical intrusion, the area may be considered to be in violation of the conservation plan and fees may be assessed accordingly at $1.20 per square foot of the affected area. Other penalties may apply.

6. An example of the Forest and Tree Protection Process

The following is a suggested procedure for the protection of forest retention areas and corresponds to the specifications found in Appendix J of this manual.

STEP 1: Pre-Construction Activities

This section applies after the site planning phase is complete. Its purpose is to prescribe measures that should be taken on-site prior to any clearing. A development project may be completed in several phases. The measures outlined below should be completed before the start of any phase of a project.

Stress Reduction for Specimen Trees Isolated from Forest Retention Areas

Isolated specimen trees that are to be preserved should be examined to determine if stress reduction techniques are needed. The applicant shall address each item below on the conservation plan by noting if a technique is being used and for what reasons.

a. Root Pruning

1) Evaluation Criteria

Will the critical root zone be affected by construction activities such as grade changes, digging for foundations and roads or utility installation?

2) Design Considerations

a) Prune prior to construction as shown in Appendix J, Figure J1.

b) Prune root with a clean cut using proper pruning equipment.

c) Exposed roots should be covered immediately with topsoil, or other suitable material.

d) For trees over 15" diameter, root pruning may be done up to one year in advance of construction.

e) Monitor for signs of stress.

b. Crown reduction or pruning

1) Evaluation Criteria

Has the root system been significantly reduced (> 30%) or are there dead, damaged, or diseased limbs?

2) Design Considerations

a) Reduce only at specified times of the year. Flowering trees: only after flowering and before bud set. Non-flowering trees: in late winter, early spring or mid-summer.

b) No more than one-third of the crown should be removed at one time using acceptable pruning methods (Appendix J, Figure J2).

c) Monitor for signs of stress.

c. Watering

1) Evaluation Criteria

Will construction activities alter the hydrology of the site? Has or will root pruning occur?

2) Design Considerations

a) Water only as necessary

b) Monitor for signs of stress.

d. Fertilizing

1) Evaluation Criteria

Is or will the tree be under stressful conditions? Has or will root pruning occur?

2) Design Considerations

a) Use low nitrogen and slow release fertilizers.

b) Apply in late fall or early spring (see Figure 16).

c) For small trees (<3" in diameter), use the broadcast method.

d) For larger trees (>3" in diameter), use punch hole method or pressurized injection method (Appendix J, Figure J3). Avoid root injury.

e) Do not apply fertilizer any closer than 3' from tree trunks for the pressurized injection method.

f) Monitor for signs of stress.

e. Temporary Forest and Specimen Tree Protection Devices

1) Forest retention areas and specimen trees that are to be protected from construction activities shall be identified at the construction site. Placement of highly visible, well anchored devices and highly visible signage shall be used to protect these areas and should be placed prior to any land clearing or grading. These devices shall be maintained throughout the entire construction phase of the project. Attachment of signs or other objects to trees is prohibited and no equipment, machinery, vehicles, materials or excessive pedestrian traffic shall be allowed within protected areas.

2) Design Considerations

a) Combine protection and sediment and erosion control devices when possible.

b) Avoid injuring roots when installing anchoring posts.

c) At a minimum, fencing should be at least 4 feet high.

d) Fencing should be flagged with highly visible flagging.

e) Fencing should be securely anchored; at a minimum, one-third of the anchor post should be below ground level.

f) Signs should be posted at all retention areas and specimen trees clearly identifying the area.

3) The following are representative of the types of devices that may be used:

a) For forest protection only (Appendix J)

(1) Blaze orange plastic mesh fencing (see Figure J4)

(2) Two to three strand barbed wire fencing with highly visible flags (see Figure J5)

(3) Snow fencing with highly visible flags on anchor posts (see Figure J6)

(4) Highly visible signage (see Figure J7).

b) For combined forest protection and silt fencing:

(1) Filter cloth on wire mesh (see Figure J8)

(2) Straw bale dike (see Figure J9)

(3) Perimeter dike or swale. Construction of this device will be within 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 (see Figure J10).

f. Permanent Forest and Specimen Tree Protection Devices

The following activities should be undertaken, when construction activities will impact the critical root zone of specimentrees. The construction of these protection devices may take place either before or after the grading process has started although their locations should be noted on the Forest Conservation Plan. The devices are to remain in place for the life of the tree. The value of the impacted tree should be determined and compared with the cost of implementing the following.

1) Evaluation Criteria

Is a significant portion of the critical root zone of a specimen tree or retention edge (>30%) impacted by the construction activity?

2) Design Considerations (See Appendix J)

a) Install root aeration system as appropriate (Figure J11)

b) Install tree wells as appropriate (Figure J12)

c) Install retaining walls as appropriate (Figure J13)

d) Install raised sidewalks as appropriate (Figure J14)

e) Use reinforced pier and panel wall as appropriate (Figure J15)

f) Apply tunneling practice (Figure J16).

STEP 2. Pre-Construction Meeting

After the boundaries of the limits of disturbance have been staked and flagged and the forest protection devices have been installed, and before any disturbance has taken place on site, a pre-construction meeting at the construction site shall take place. The developer, contractor or project manager, and appropriate County inspectors should attend. The purpose of this meeting will be to:

a. Identify the locations of the forest retention areas, specimen trees within 50 feet of the Limit of Disturbance, limits of construction, employee parking areas, and equipment staging areas on site plans.

b. Inspect all flagged boundaries and protection devices.

c. Assign responsibilities as appropriate and discuss penalties.

The meeting may also be used to inform all construction personnel of the purpose of the various flagging, protection devices, etc.; and explain the importance of preserving these retention areas.

STEP 3. Construction Phase

Improper or sloppy construction techniques can cause the death of trees immediately or as late as 10 years after construction has been completed. Tree conditions should be monitored during construction and corrective measures should be taken when appropriate.

a. Design Considerations

1) The following should be monitored:

a) Soil compaction - aerate and monitor.

b) Root injury - prune and monitor; consider crown reduction.

c) Limb injury - prune and monitor;

d) Flooded conditions - drain and monitor; correct problem;

e) Drought conditions - water and monitor; correct problem;

g) Other stress signs - determine reason, correct and monitor.

2) On-site decisions shall be made in consultation with a qualified professional certified by the Maryland Department of Natural Resources.

3) Permanent tree protection devices may be installed at this time as described earlier in the pre-construction activities.

STEP 4. Post-Construction Activities

a. Corrective Measures

After construction has been completed, trees or tree limbs that are posing a safety hazard to the public as determined by a qualified professional may be removed with the concurrence of the DEPRM.

b. Removal of Temporary Structures

After construction has been completed, it is necessary to remove all temporary structures such as temporary roadways, short-term protection devices, and sediment control devices. No material should be buried within the conservation area. Open burning should not take place within 100 feet of a wooded area. Other items to consider include:

1) Remove temporary roads by removing stone or broadcasting mulch; pre-construction elevation should be maintained.

2) Aerate compacted soil.

3) Replant disturbed sites with trees, shrubs and/or herbaceous plants.

4) Retain signs for retention areas or specimen trees.

c. Review and Approval of Protected Areas.

Following the completion of construction, prior to use, the DEPRM shall inspect the entire site. If trees in the retention areas are found severely damaged or dead due to mechanical intrusion, the area will be considered to be in violation of the conservation plan and fees will be assessed accordingly or other penalties may be imposed.

d. Future Protection measures

The forest conservation areas, including the retention, reforestation and afforestation areas, shall be protected long after construction ceases. Appendix F describes methods that are suitable to insure this protection.

Forest Protection Procedures Checklist

Step 1: Pre-Construction

Address stress reduction of isolated specimen trees
__ Root Pruning
__ Crown reduction or pruning
__ Watering
__ Fertilizing
__ Mulching

Temporary forest protection devices
__ Forest protection fences or
__ Combined sediment control and tree protection fences
__ Forest retention area signs

Permanent forest protection devices
__ Tree wells
__ Root aeration system
__ Retaining walls

Include on site plan:
__ Forest retention areas
__ Isolated specimen trees
__ Employee parking areas
__ Equipment staging areas on site plans

Pre-construction Meeting
__ Discuss penalties
__ Inspect protection devices on site

Step 2: Construction Phase

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

Step 3: Post-construction

Stress Reduction
__ Root Pruning
__ Crown reduction or pruning
__ Watering
__ Fertilizing
__ Mulching

Repair of tree damages
__ Root repair
__ Removal of dead limbs
__ Soil aeration

__ Removal of dead or dying trees posing an immediate safety hazards
__ Removal of temporary tree protection structures
__ On-site inspection by local or state project inspector

Future Protection Measures _____

_____

_____

_____

_____

E. Reforestation and Afforestation Mitigation

1. Introduction

After an assessment of forest retention areas has been made, an option exists for the reforestation and afforestation of tracts of land. Two goals to keep in mind while developing a reforestation or afforestation plan are:

a. The need to integrate native forest associations into developed landscapes, and

b. The promotion of diverse, stable forests that are able to provide multiple benefits to the community.

This section presents a process to assist the applicant in developing reforestation and afforestation plans.

2. Criteria for Reforestation and Afforestation

a. Reforestation is necessary:

1) If an applicant plans to clear existing forest cover below the break-even point, and

2) If it can be shown that "every reasonable effort" has been made to minimize the cutting or clearing of forest areas.

b. Afforestation is necessary:

1) If there were no trees on the site; or

2) If the existing forest cover on site is below the afforestation threshold.

c. The priority areas for reforestation and afforestation that the applicant shall follow are listed in Step 2 of the Reforestation and Afforestation Procedure on page 47.

3. Submittal Requirements

The following items shall be submitted as part of the Forest Conservation Plan:

a. The locations of reforestation and afforestation areas on the Forest Conservation Plan Map.

b. Planting Plan

The Planting Plan shall include:

1) Summary of the site assessment and site preparation needed.

2) Plant materials table including plant material sources. The applicant shall follow the procedures under the Example Process for Step 4, Develop a Planting Plan (species selection, plant material selection and site stocking).

d. Binding Three-year Maintenance Agreement

The Maintenance Agreement shall address:

1) Watering plans*

2) Fertilizing plans*

3) Control of competing vegetation*

4) Protection from disease, pests and mechanical injury*

5) Reinforcement planting provisions if survival falls below accepted levels

6) Name of the company or individual responsible for tree care

* Agreement may indicate little or no action if appropriate.

4. Penalty for Violation

A site inspection shall take place upon completion of any planting work and at the end of the required three-year maintenance agreement. If the stem density of reforestation and afforestation areas falls below established survival requirements, replanting will be required to bring the planting density up to the survival requirements.

5. An Example of the Reforestation and Afforestation Procedure

STEP 1. Determine Reforestation and Afforestation Acreage

The determination of reforestation and afforestation acreage is based on the land use, existing cover, and percentage of the existing forest retained. The Forest Conservation Worksheet (Appendix D) will guide the applicant through these calculations.

STEP 2. Identify Priority Reforestation and Afforestation Areas

Certain areas are more sensitive than others to the lost of forest cover. Priority areas established in the State Act for reforestation and afforestation are listed below. With reference to the priority retention area map created in Step 4 of the Forest Conservation Plan procedure, priority reforestation and afforestation areas can be delineated.

Priority areas for reforestation and afforestation:

a. Areas adjacent to intermittent and perennial streams.

b. 100-year floodplains.

c. Areas that enhance or establish forested corridors

d. Areas that establish or enhance forest buffers adjacent to critical habitats.

e. Areas of steep slopes of 20% or greater or slopes of 10% to 19% or more with soils having K values greater than 0.32, including the slopes of ravines or other natural depressions.

f. Areas adjacent to large tracts of forests.

Please note: Some wetlands may not be suitable for reforestation or afforestation due to hydrologic conditions and/or the species composition of the existing community.

STEP 3. Evaluate Reforestation and Afforestation Methods

The decision to employ any specific forest restoration method can be made only after a thorough diagnosis is made of the existing site conditions, including:

a. Soil types and conditions; nutrient content, pH and cation exchange capacity; the presence or absence of topsoil and humus, the depth of these components, soil erodibility index and the degree of soil compaction;

b. Hydrologic conditions; depth to water table, existing drainage patterns and likely moisture regimes on the proposed site;

c. Existing vegetation composition, including advanced regeneration species;

d. Site aspect and exposure;

e. Potential seed recruitment from vegetation on adjacent sites;

f. Site vicinity and adjacent land use (see Step 4 below).

In addition to existing site conditions, a knowledge of past uses may direct the applicant towards special treatments and limitations for the reforestation and afforestation sites. For example, past uses that compacted soils may lead to a prescription of intensive soil discing. Soils that have been actively farmed within the past several years may need to be evaluated for pesticide or herbicide contamination.

Consideration of future uses of adjacent land can also direct the reforestation and afforestation plan. High use areas may need larger plant stock to insure survivability. Special attention should be given

to design considerations, such as visual diversity for areas immediately adjacent to human-built structures.

The primary goal of reforestation and afforestation in the resource conservation zones is to achieve a functioning forest ecosystem (for the benefits that have been enumerated in the Introduction to this Manual). Because forests typify the natural vegetation cover for Baltimore County, it is reasonable to expect that, in the absence of continued disruptions, forests would become reestablished on sites where the soils remain undisturbed. However, because forest regeneration to stages approaching high structural diversity typically requires decades of elapsed time, techniques to speed up the successional processes can also be desirable. Within other land uses, reforestation and afforestation can incorporate forest features into landscaping plans for the multiple needs of the human community as well as urban wildlife.

Sequence for Selecting a Reforestation or Afforestation Site

Based upon a thorough diagnosis of the existing site conditions, the following options in order of priority must be considered:

a. Supplemental planting to enhance the size of Priority 1 and 2 retained forest on site;

b. On-site reforestation and/or afforestation within other priority areas identified in Step 2, p.49;

c. Off-site reforestation and/or afforestation within priority areas as in b. above,
OR
On-site reforestation and/or afforestation within remaining areas;

d. Off-site reforestation and/or afforestation within remaining areas.

When it can be shown to the satisfaction of the DEPRM that the above-mentioned sequence was applied, that the proposed development site is not suitable for reforestation or afforestation, that an exhaustive search for off-site mitigation areas has not been successful, or that an unwarranted hardship is imposed upon the project by the reforestation or afforestation requirements, a fee-in-lieu payment for the mitigation at the rate of $0.40 per square foot of mitigation acreage may be paid to Baltimore County.

STEP 4: Develop a Planting Plan

Goal of the Plan

The planting plan should either establish forest or enhance existing woody vegetation in areas that do not meet the definition of forest and have not been set aside as retention areas. In either case, the

planting plan should be appropriate for the site based upon land uses in the vicinity.

For example, in:

a) Resource Conservation and Medium Density Residential Areas

The primary goal of reforestation or afforestation is to achieve a functioning forest with a canopy, understory, and the complex structural diversity that characterizes a forest ecosystem.

b) High Density Residential, Commercial and Industrial Land Use Areas

When planting areas are less than 10,000 square feet, integrating native trees and other plants within a landscape plan for an area of at least 2500 square feet and 35 foot width may satisfy the reforestation or afforestation requirement. The goal of this kind of enhanced landscaping should include urban wildlife habitat and environmental education through appropriate signs about native plants and urban wildlife in managed landscapes, as well as aesthetics.

c) Institutional Development Areas

These areas may require full reforestation or afforestation or enhanced landscaping or a combination of both types of plantings depending upon their location.

Requirements for Planting Plans

(1) For Zoning Categories:

- Agricultural and Resource Areas (RC2, RC4)
- Medium Density Residential (RC3, RC5, DR1)
- Institutional Development Areas within rural zones

Species Selection

Species native or naturalized in Baltimore County shall be used (see list of tree species in Appendix G). There shall be a minimum of five different tree species (unless sites are to be actively managed under an approved Forest Management Plan) in the following distribution:

a) approximately one-third pioneer species to two-thirds mid-to-late successional species.

b) 60% canopy dominant species
40% understory species

Within the zoning categories listed in (1) above, reforestation and afforestation plantings must be designed to recreate a

forest community. Site conditions will determine which plant community will most likely survive. Information about typical forest cover types and their associated vegetation in Baltimore County can be found in Appendix G.

Site Stocking

Stocking, as a minimum standard, shall meet the following density requirements:

Trees Per Acre	Sizes**	Equivalent Tree Units*	Individual Spacing***
100	2" caliper	7 units/plant	20' X 20'
200	1" caliper	3.5 "	15' X 15'
350	hardwood whips/ potted stock	2 "	11' X 11'
700	seedlings****	1 "	8' X 8'

* Total equivalent tree units must equal 700.

Other Requirements:

1. ** The sizes used depend upon individual site conditions. In any case, no more than 25% seedlings may be used.

2. *** Grid patterns shall be avoided. Plantings shall consist of unevenly-spaced clusters of mid-to late sucessional species, interplanted with larger-sized pioneer species.

3. All stock must be Zone 6 or hardier.

4. **** Seedlings of conifers shall be clustered together. Conifers may not exceed more than 5% of the planting stock (to imitate the current natural distribution of coniferous species in Baltimore County).

5. Ground covers shall include native leguminous species, e.g. clover species, and native clumpgrasses, e.g., switchgrass (*Panicum virgatum*), not turfgrasses. Mowing is not an acceptable method for protecting planted trees from invasive plants. The Forest Conservation Plan must address in detail all proposed measures for the protection of planted trees from invasive exotic plant species.

Recommendations:

1. Stock should have been raised or acclimatized within a 100 mile radius of the planting site for the greatest survival potential.

2. Biodegradable tree rings may be used to slow invasion by weedy, exotic plant species.

3. Tree shelters (plastic tube or biodegradable) may be used on sites where excessive deer browsing is anticipated.

Survival Requirement

The minimum survival rate shall be 75% of the total number of trees planted per acre at the end of the three-year maintenance period. Wild tree seedlings from natural regeneration on the planting site may be counted towards the total survival number if they are healthy, native species at least 12 inches tall.

(2) For Zoning Categories:

- High Density Residential (DR2, DR3.5, DR5.5, DR10.5, DR16, ROA)
- Mixed Use and Planned Unit Development Areas (OT, O-1, O-2, RAE1, RAE2, PUDR-1, PUDR-2)
- Commercial and Industrial Use Areas (RO, RCC, BL, BM, BR, MR, MLR, ML, MH, SE, BMM, BMB)
- Institutional Development Areas within any of the above mentioned zones

Species Selection

Within the zoning categories listed in (2) above, reforestation and afforestation projects covering 10,000 square feet or more must follow the requirements and guidelines for resource conservation (RC) and medium density residential (DR) areas.

For planting areas of less than 10,000 square feet, fewer tree species may be used as part of an enhanced landscaping plan subject to the approval of the Department of Environmental Protection and Resource Management (DEPRM). The limited use of non-native, non-invasive, tree or other woody plant species may be permitted based upon some unique or appropriate feature important for the site but not available in native species, and must also be approved by the DEPRM.

Site Stocking

Stocking, as a minimum standard, shall meet the following density requirements:

Trees Per Acre	Size	Equivalent Tree Units*	Individual Spacing
100	2" caliper	7 units/plant	20' x 20'
200	1" caliper	3.5 "	15' x 15'
350	hardwood whips/ potted stock	2 "	11' x 11'

* Total equivalent tree units must equal 700.

Other Requirements:

1. Seedlings may not be used in these plantings.

2. All stock must be Zone 6 or hardier.

Recommendations:

1. Stock should have been raised or acclimatized within a 100 mile radius of the planting site.

2. Stocking for small planting areas should utilize large caliper stock (1-2") on the edges of the planted area when high public use is anticipated in the vicinity, and smaller stock inside the planted area.

Survival Requirement

The minimum survival rate shall be 75% of the total number of trees planted per acre at the end of the three-year maintenance period. Wild tree seedlings from natural regeneration on the planting site may be counted up to 50% towards the total survival number if they are healthy, native species at least 12 inches tall.

F. Standards and Specifications

1. Plant Material Selection

a. All plant materials greater than 1" caliper shall meet or exceed the requirements of the American Nurserymen's Association standards. All plants shall be typical of the species and variety, shall have a normal habit of 535 growth, and shall be first quality, sound, vigorous, well-branched, and with healthy, well furnished root systems. They shall be free of disease, insect pests and mechanical injuries.

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

Seedlings/whips:

Hardwoods - 1/4" to 1/2" caliper with roots not less than 8" long

Conifers - 1/8" to 1/4" caliper with roots not less than 8" long and top height of 6" or more

Shrubs: 1/8" or larger caliper with 8" root system

2. Planting Site Preparation

a. Undisturbed sites.

Disturbance of soils should be limited to the planting field for each plant. For plantings where large stock is chosen, the planting field of radius of 5 times the diameter of the root ball is recommended, as shown in Figure 15 (Moll, 1989).

In areas of steep slopes or erodible soils, soil disturbance should be limited to the planting field whose radius is equal to 2.5 x diameter of the root ball (see Figure 15).

b. Disturbed areas.

Soils should be treated as directed in Figure 15C, by incorporating natural mulch within the top 12 inches, or amendments as determined by a soils analysis. Natural amendments, such as organic mulch or leaf mold compost, are preferred.

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

3. Planting period

Depending on the size stock being used, the allowable planting windows differ. Recommended planting windows are shown in Figure 16.

4. Plant Material Storage

It is recommended that planting occur within 24 hours of delivery to the site. Plant materials which are left unplanted for more than 24 hours should be protected from direct sun and weather and kept moist. Bare root stock which are unplanted for more than 24 hours should be heeled in as shown in Figure 17. Nursery stock should not be left unplanted for more than 2 weeks. On-site or local transplanted materials should be stored in tree banks if unplanted for more than 24 hours, following the guidance presented in Figure 18.

5. On-site inspection

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

6. Planting Specifications

a. Seedlings/Whips

Planting small stock, such as seedlings and whips, and balled and burlaped stock up to 2" caliper, can be accomplished using manual methods of planting (see Figure 19. Satisfactory equipment includes shovels, planting or dibble bars, and

mattocks. For larger areas, planting machines may be used but linear, plantation-type plantings should be avoided.

Extreme care should be taken to insure retained moisture of the roots. While planting seedlings and whips, a moist carrying container should be used to further prevent desiccation (see Figure 20). For greater protection, seedlings may be planted with tree shelters.

Areas planted with seedlings or whips should be mulched after planting as shown in Figure 21.

b. Container-Grown Stock

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

As shown in Figure 15, the planting field should be prepared as specified. Native stockpiled soils should be used to backfill planting field. Rake soils evenly over the planting field and cover with 2 to 4 inches of mulch.

c. Balled and Burlapped Trees

Tree spades are usually employed to plant larger tree stock (balled and burlapped stock greater than 2" caliper). This technique is particularly useful when transplanting on-site or with local plant materials. For trees larger than 6" dbh, specialized equipment is recommended.

Balled and burlapped trees must be handled with care while planting. Trees should not be picked up by the trunk or dropped, as both practices will tend to separate the trunk from the root ball. Prior to planting, root balls should be kept moist.

7. Planting Methods

Planting fields should be created as shown in Figure 15. Use watering to settle soil backfilled around trees. Stockpiled native topsoils, if available, should be used to backfill the planting field. Amendments are not recommended in the planting field, as studies have shown that roots will be encouraged to stay within the amended soils. Soils should be raked evenly over the planting field and covered with 2 to 4 inches of mulch.

Staking of trees is not recommended except in areas of high winds. Staking may be used for trees larger than 8 feet in height. Movement is necessary to strengthen the trunk of the planted tree. If stakes are used, they should be removed after the first growing season (see Figure 22). Wrapping is also not recommended due to the increased opportunities for insect infestation and disease.

8. Post-planting Considerations

a. Soil Stabilization

For areas of large-scale disturbance, soils must be stabilized using a non-turf-building ground cover or engineering fabric.

b. Protection Devices

To prevent damage of planted areas, all reforestation and afforestation sites must be posted with appropriate signs and fenced (see Figure 23). Construction equipment shall be prohibited in these areas.

c. Watering (See Figure 24)

How Often?

Any watering plan should compensate for recent rainfall patterns. Trees can die from too much water as well as too little. Newly planted trees may need water as much as once a week for the entire growing season. The next two years may require watering only a few times a year, every month during July and August. After that period, trees should only need water in severe droughts. Bare root transplants, as opposed to balled and burlap material, if they were sufficiently watered during planting, may not need water for almost 2-4 weeks after growth begins.

Soil and Watering

Soil texture influences the downward flow of water. Soils with more clay tend to hold on to the water more and can be watered less often; soils with more sand drain more quickly and need to be watered more often (Figure 25). See Figure 26 for examples of on-site evaluation recommendations.

If the soil was well prepared before planting, then there should not be many drainage problems. If there is restricted downward flow of water, then the soil may have been compacted during construction and not aerated before planting, or there may be a clay hardpan.

How to Water

The best way to water is deeply and slowly using a regular hose, a soaker hose, or drip irrigation. On larger trees start by watering the root ball thoroughly and then expand the watered area to include the whole root zone after the tree becomes more established. Mulching around the base of newly transplanted trees insulates roots from drying too quickly while still providing air movement to the roots.

d. Fertilizing

What Nutrients to Apply

Trees depend on three major nutrients, nitrogen, phosphorus, and potassium, and a host of other minor ones (or micronutrients), such as calcium, magnesium and iron. In most soils most of the micronutrients are available in abundance. Of the major nutrients, nitrogen is usually the limiting one. Nothing should be added to the soil without testing it first to determine its needs.

When to Fertilize

In general, while soils may be deficient in nitrogen, it is not recommended to fertilize a tree within the first growing season after planting. Too much nitrogen may cause a spurt of canopy growth which the roots cannot support. It is best to wait until after the end of the first growing season, either in the late fall or early spring.

What Type of Fertilizer

When it is time to fertilize, organic fertilizers are preferred to synthetic fertilizers. Bone meal or seaweed based products are available commercially. Their effectiveness is based on their ability to supply nutrients to the plant as needed while minimizing the risk of excess nutrients entering the forest system and the water supply. Some synthetic fertilizers can mimic this slow-release action and may be appropriate for use.

e. Control of competing vegetation

In some cases unwanted vegetation growing near newly planted trees can take over the site. The extent to which this problem is controlled depends on the ability of the planted material to withstand the intrusion. Smaller trees need more care, although some seedlings survive among the overgrowth and shade it out when they reach a greater height. As a preventive measure, consider the potential for growth of invasive species while choosing a reforestation or afforestation area. Unfortunately, good sites for reforestation and

afforestation are generally good sites for unwanted vegetation as well. (See Appendix H for a list of species.)

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

f. Protection: pests, diseases and mechanical injury

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

1) Elimination of some low vegetation before planting. This will help control the rodent population which thrives in brushy environments.

2) Use of tree shelters to protect the trunks of seedlings or whips from animal damage. The shelters act as mini-greenhouses to speed growth. These trees need more water than those planted without tree shelters.

3) Mulching around the trees to minimize invasion by exotic plant species.

4) Pruning dead and diseased branches with a clean cut to prevent spreading of disease.

Sunscald is a problem which thin barked young trees encounter. Tree wrap is commonly used to protect these trees from sunscald but is not recommended due to the increased opportunities for insect infestation and disease. An alternative is to allow small non-competitive branches, commonly pruned, to grow along the sunny side of the trunk to help shade the trunk.

Newly planted trees usually do not have the structural roots to support them during high winds. Stakes and guy wires, appropriate only in locations with high winds, should be used but must be removed after one growing season or they may cause damage to the tree as it grows (see Figure 22).

9. Design Guidance for Special Circumstances

a. Forest Buffers

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

1) Check for erosion problems

2) Minimize or eliminate any chemical use

3) Maintain an undisturbed leaf layer and understory

4) Eliminate exotics

b. Steep Slopes

Plantings can stabilize steep slopes. However, until the roots become established, there may still be erosion problems. Monitoring the stability of the soil will be important to the survival of the trees.

c. In order to avoid the penalty for violating the survival requirement, the applicant must establish reinforcement plantings on-site, after one year, should the reforestation or afforestation not meet standards. Inspection for survival potential should take the following into account:

1) Vigor of the planted specimens;

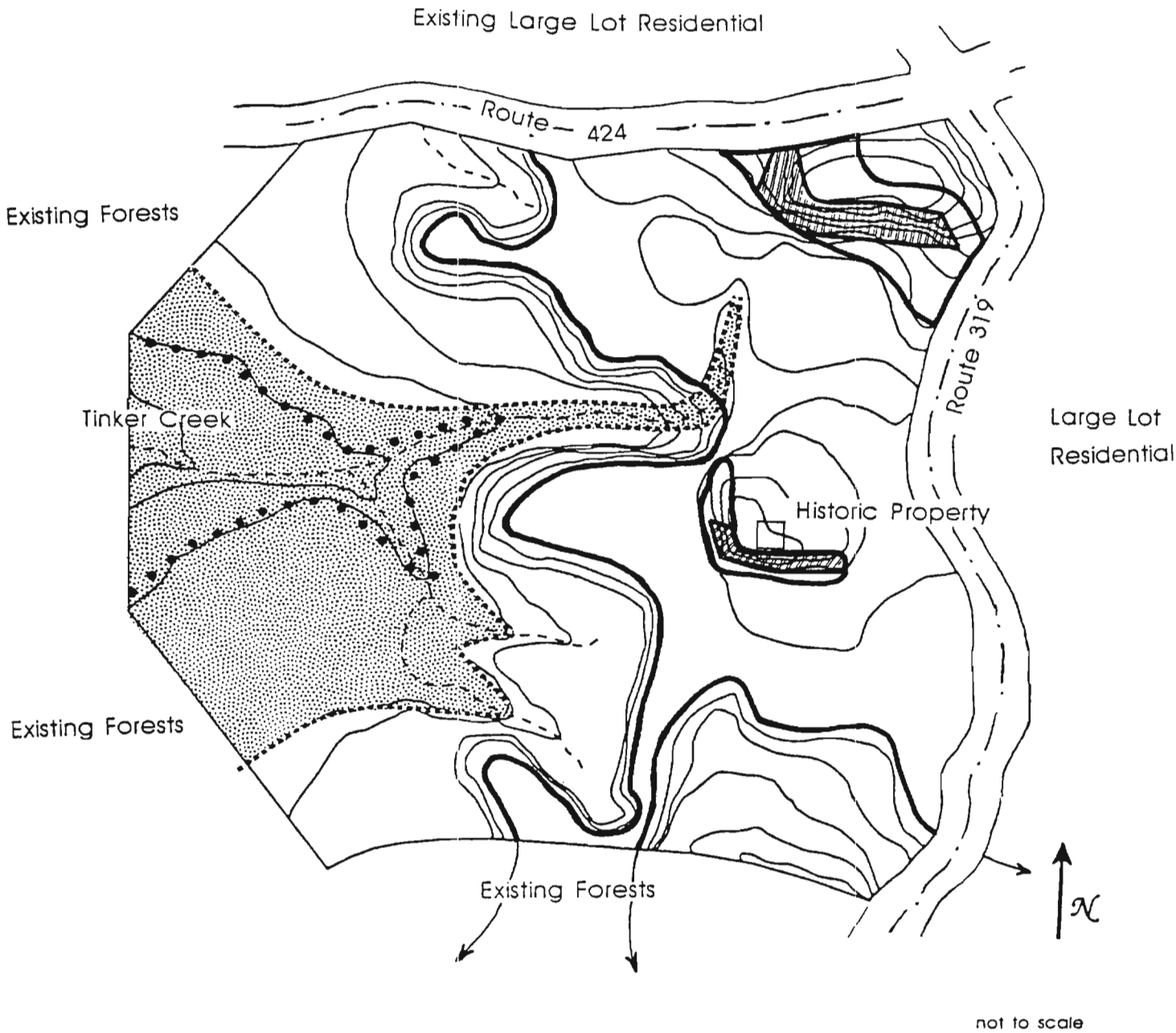
2) Significant signs of water stress in the foliage;

3) Signs of mechanical damage to the trunks or other woody tissue;

4) Extent of competing vegetation on the planting site and in-place procedures to protect planted specimens;

5) Actual growth rate of the planted species compared to the potential growth for the site conditions.

Figure 1 Site Constraints Map



LEGEND

Wetlands
100-Year Floodplain
Steep Slopes
Existing Forest

Figure 2 **Preliminary Forest Stand Map**

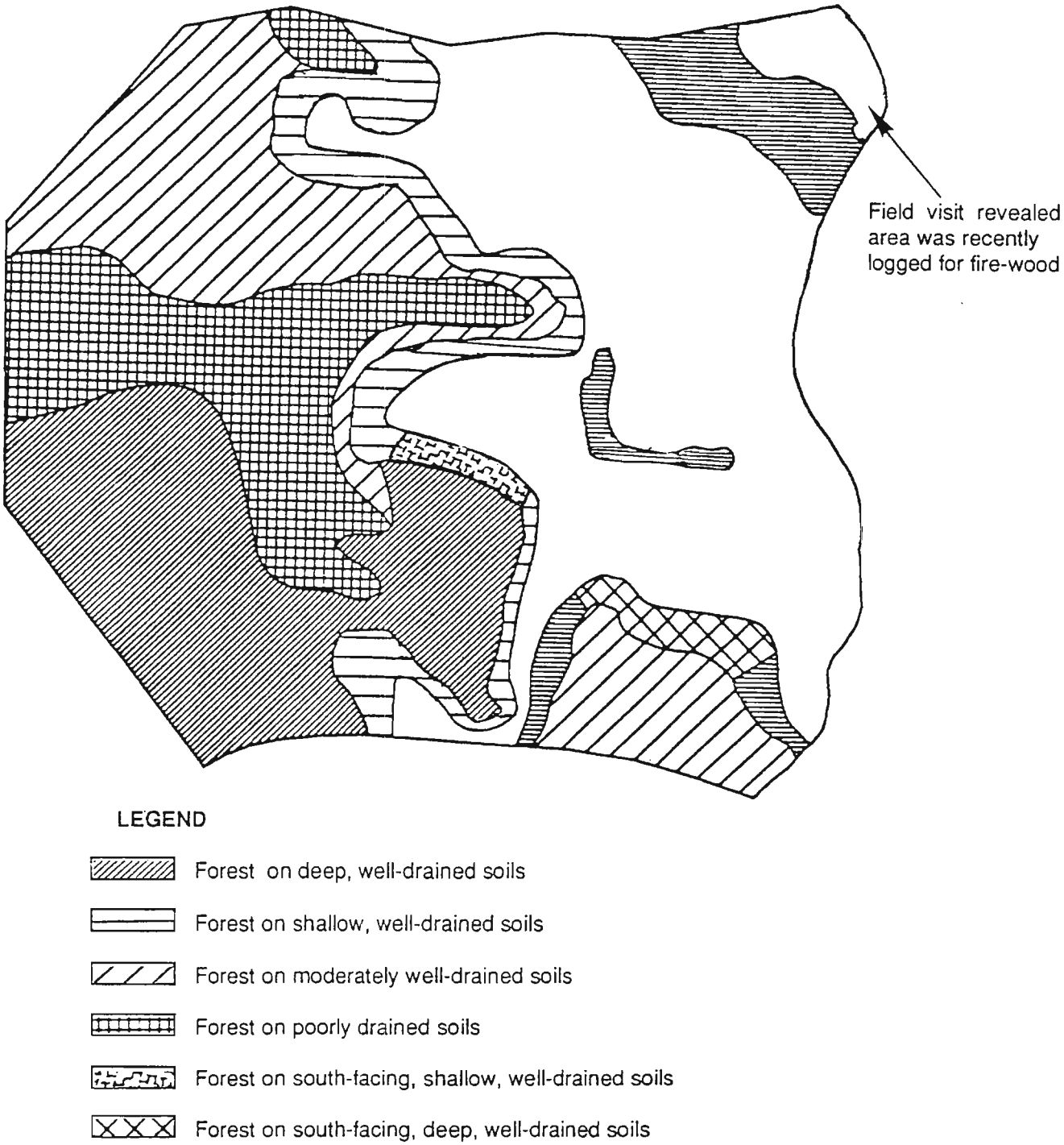
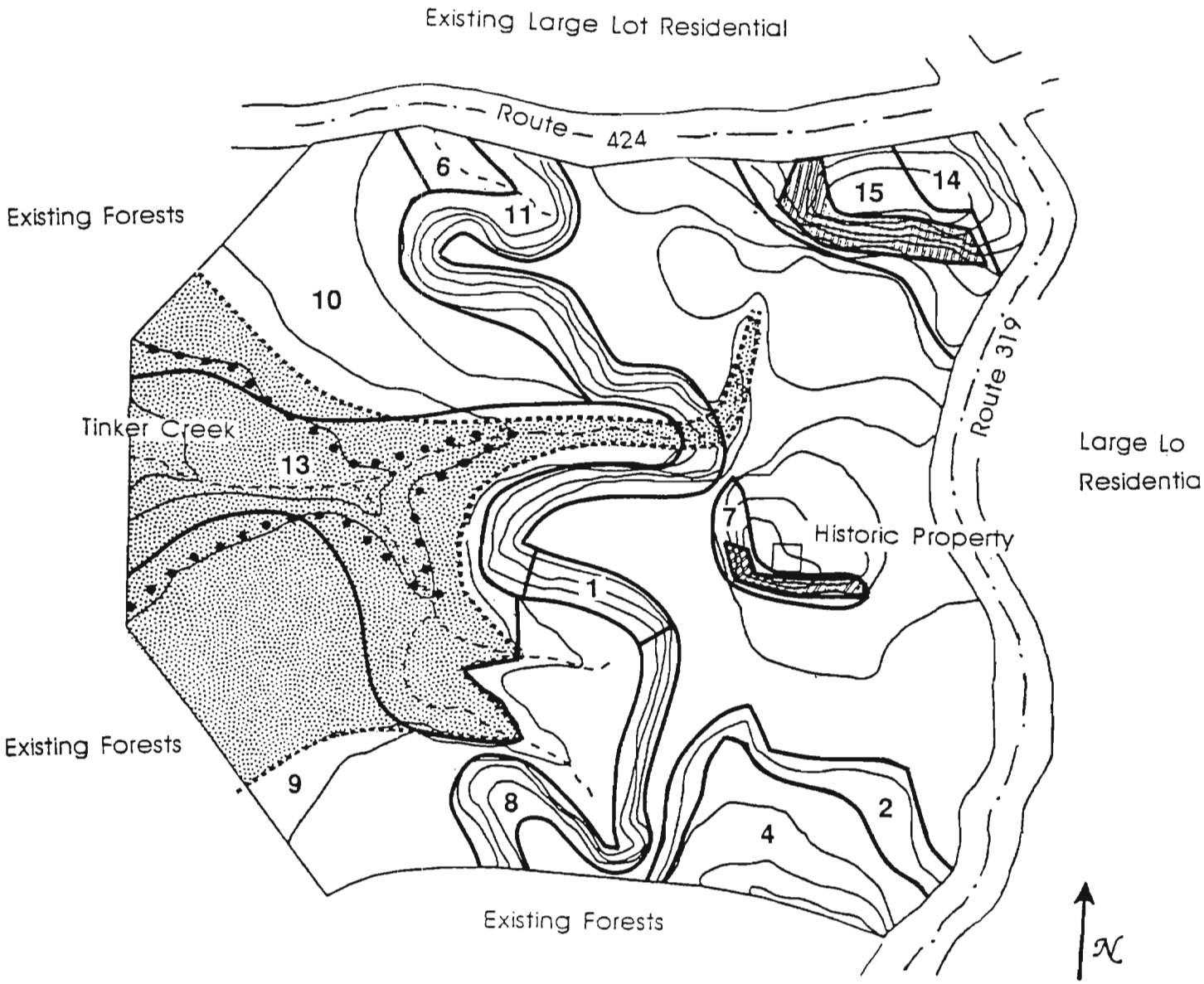


Figure 3 Final Forest Stand Delineation Map



not to scale

LEGEND

Wetlands
100-Year Floodplain
Steep Slopes
6 Stand Number

Figure 4

FOREST CONSERVATION WORKSHEET FOR BALTIMORE COUNTY

PROJECT NAME/PROPERTY OWNER: _____ DATE: _____

LOCATION: _____ REVISION: _____

REVIEWED BY: _____ APPROVAL DATE: _____

I. BASIC SITE DATA

	ACRES (0.1 acre)
GROSS SITE AREA	125
AREA WITHIN 100 YEAR FLOODPLAIN	5
AREA WITHIN AGRICULTURAL USE OR PRESERVATION PARCEL (if applicable)	20
AREA IN OVERHEAD TRANSMISSION LINE EASEMENTS (if applicable)	0
NET TRACT AREA	100
LAND USE CATEGORY (see p.31 of Manual or Baltimore County Code, Section 14-410B)	RC 5

II. INFORMATION FOR CALCULATIONS

A. NET TRACT AREA	100
B. FOREST CONSERVATION THRESHOLD (25 % x A)	25
C. AFFORESTATION THRESHOLD (20 % x A)	20
D. EXISTING FOREST ON NET TRACT AREA	70
E. EXISTING FOREST ABOVE FOREST CONSERVATION THRESHOLD	45
F. BREAK-EVEN POINT (the amount of forest to be retained for no mitigation) {(E x 0.2) + B}	34
G. FOREST TO BE CLEARED	45
H. FOREST TO BE RETAINED	25

III. APPLICABILITY OF AFFORESTATION AND REFORESTATION TO SITE

1. Afforestation Only

   If existing forest areas are below the Afforestation Threshold (if D is less than C), and no forest clearing is proposed, afforestation requirements apply.

   GO TO SECTION IV

2. Combined Afforestation and Reforestation

   If existing forest areas are below the Afforestation Threshold (if D is less than C) AND clearing of forest is proposed, both afforestation and reforestation are required.

   GO TO SECTION IV

3. Reforestation Only

a) If existing forest areas are at or above the Afforestation Threshold (if D is equal to or greater than C) and no clearing of existing forest resources is proposed, no reforestation is required. STOP. No further calculations are needed.

b) If existing forest areas are retained at or above the breakeven point (if H is equal to or greater than F), STOP. No further calculations are needed and no mitigation is required.

c) If existing forest areas are at or above the Afforestation Threshold (if D is equal to or greater than C), and clearing of forest areas is proposed, reforestation requirements may apply.

GO TO SECTION V

IV. AFFORESTATION CALCULATIONS

		ACRES (0.1 acre)
A.	NET TRACT AREA	_____
C.	AFFORESTATION THRESHOLD (_____ % x A)	_____
D.	EXISTING FOREST ON NET TRACT AREA	_____
G.	FOREST AREAS TO BE CLEARED	_____
H.	FOREST AREAS TO BE RETAINED	_____

Select the alternative that applies:

1. No clearing:

If existing forest areas are below the Afforestation Threshold (if D is less than C) and no clearing is proposed, the following calculations apply:

TOTAL AFFORESTATION REQUIRED C - D _____

Afforestation must make the forest area equal to the minimum required by the Afforestation Threshold.

2. Clearing:

If existing forest areas are below the Afforestation Threshold (if D is less than C) and clearing is proposed, the following calculations apply:

AFFORESTATION FOR UNFORESTED AREAS BELOW AFFORESTATION THRESHOLD C - D _____

REFORESTATION FOR CLEARING BELOW AFFORESTATION THRESHOLD G x 2 _____

TOTAL PLANTING REQUIRED (C - D) + (G x 2) _____

The afforestation planting brings the site up to the minimum forest required (the Afforestation Threshold). The reforestation component compensates for clearing.

STOP

V. REFORESTATION CALCULATIONS

		ACRES (0.1 acre)
A.	NET TRACT AREA	100
B.	FOREST CONSERVATION THRESHOLD (25 % X A)	25
D.	EXISTING FOREST ON NET TRACT AREA	70
E.	EXISTING FOREST ABOVE FOREST CONSERVATION THRESHOLD	45
G.	FOREST AREAS TO BE CLEARED	45
H.	FOREST AREAS TO BE RETAINED	25
I.	FOREST AREAS CLEARED ABOVE FOREST CONSERVATION THRESHOLD (If H equals or is greater than B, Alternate 1. If H is less than B, Alternate 2.)	45
J.	FOREST AREAS CLEARED BELOW FOREST CONSERVATION THRESHOLD (B-H, if applicable)	
K.	FOREST AREAS RETAINED ABOVE FOREST CONSERVATION THRESHOLD (H-B, Retention Credit, if applicable)	

Select the alternative that applies:

1. Clearing Above the Forest Conservation Threshold Only

   If forest areas to be retained are at or above the Forest Conservation Threshold (if H is equal to or greater than B), the following calculations apply:

REFORESTATION FOR CLEARING ABOVE THRESHOLD I x $\frac{1}{4}$	11.3
CREDIT FOR FOREST AREAS RETAINED ABOVE THRESHOLD K = Retention Credit	0
TOTAL REFORESTATION REQUIRED (I x $\frac{1}{4}$) - K	11.3

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

2. Clearing Below the Forest Conservation Threshold

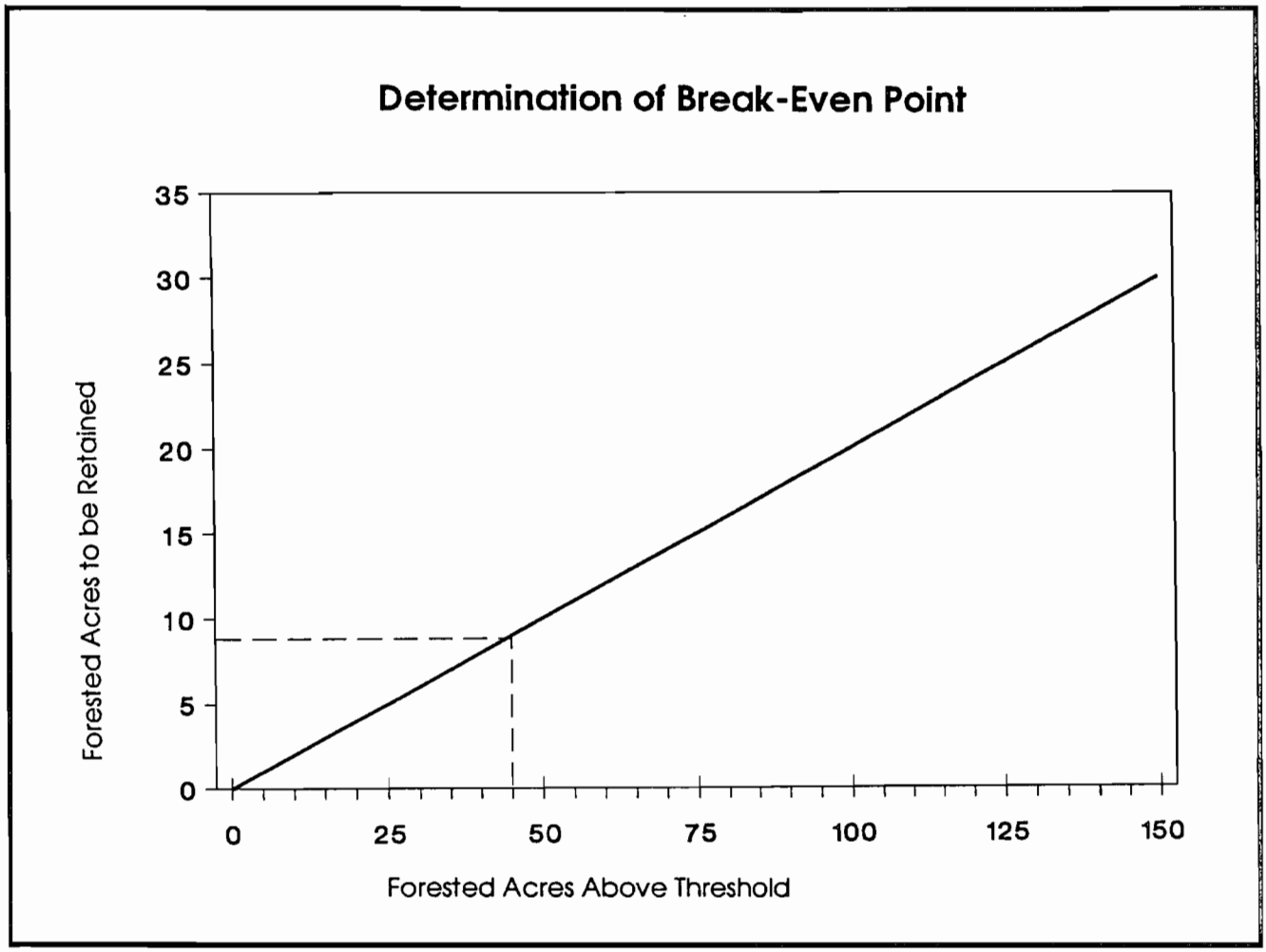
   If forest areas to be retained are below the Forest Conservation Threshold (if H is less than B), the following calculations apply:

REFORESTATION FOR CLEARING ABOVE THRESHOLD I x $\frac{1}{4}$	
REFORESTATION FOR CLEARING BELOW THRESHOLD J x 2	
TOTAL REFORESTATION REQUIRED (I x $\frac{1}{4}$) + (J x 2)	

STOP

WORKSHT/DEPRM/TXTPHC/REV. 2-11-94

Figure 5



A simple relationship exists between the number of forested acreas above the conservation threshold and the amount required to be retained in order to be exempt from reforestation requirements. The dashed lines above indicate how an applicant would calculate this number given the information in Example 3 (Figure 8). This chart can be used, similarly, for other site configurations.

Figure 6

Determination of Reforestation Requirements: Example 1

Clearing Up to Threshold

Net Tract Area:	100 acres
Current Forest Cover:	70 acres
Forest Cover Above Threshold:	45 acres
Area of Forest To Be Cleared:	45 acres
Land Use Category:	Medium Density Residential Area
Conservation Threshold:	25%

Reforestation Calculations:

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

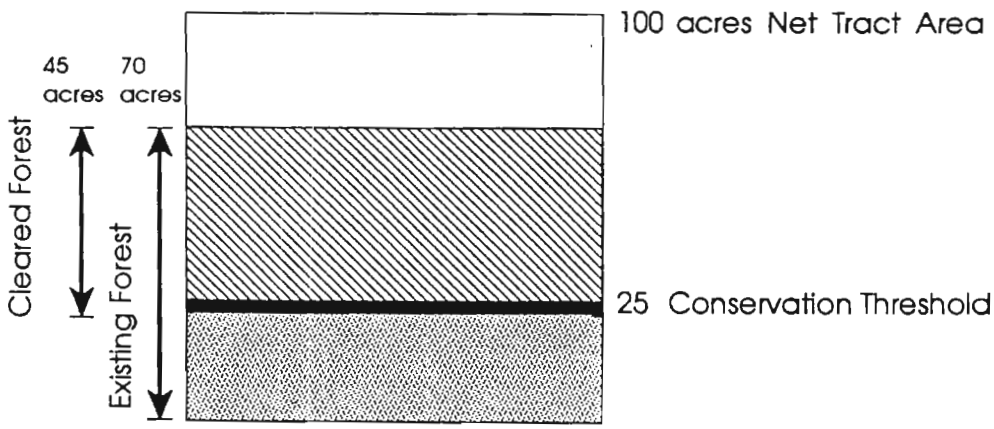


Figure 7

Determination of Reforestation Requirements: Example 2

Clearing Below Threshold

Net Tract Area:	100 acres
Current Forest Cover:	70 acres
Forest Cover Above Threshold:	45 acres
Area of Forest To Be Cleared:	50 acres
Land Use Category:	Medium Density Residential Area
Conservation Threshold:	25%

Reforestation Calculations:

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

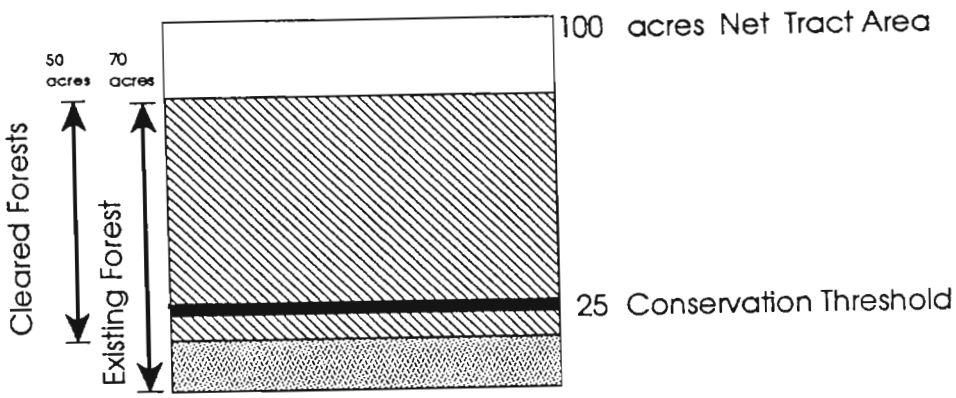


Figure 8

Determination of Reforestation Requirements: Example 3

Use of Reforestation Credit

Reforestation Credit Rule: Each acre of forest retained in the net tract area, above the forest conservation threshold, reduces the reforestation requirement by 1.25 acres. A break-even point exists such that the retained acreage compensates for the cleared acreage and no reforestation is required.

> 20% (one acre retained per four acres cleared = 1/5) of the original forested area above the Conservation Threshold must be retained, so that no reforestation will be necessary.

Using Example 1, how many acres of the 45 forested acres above the Conservation Threshold must be retained to compensate for cleared forest and eliminate the reforestation requirement?

Net Tract Area:	100 acres
Current Forest Cover:	70 acres
Forest Cover Above Threshold:	45 acres
Area of Forest To Be Cleared:	see calculations
Land Use Category:	Medium Density Residential Area
Conservation Threshold:	25%

Calculations:

Break-even Point:	45 acres * 20% = 9 acres
Forest To Be Cleared:	45 acres - 9 acres = 36 acres

If 9 acres are retained above the Conservation Threshold, no reforestation is needed.

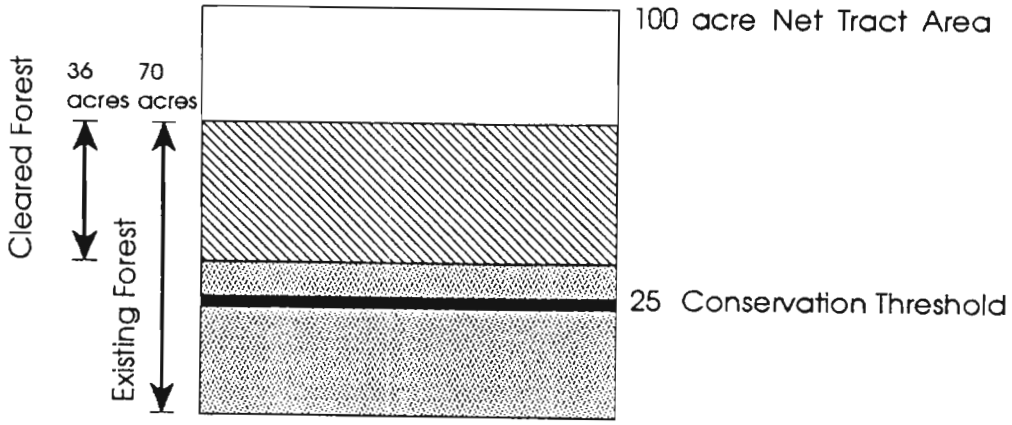


Figure 9

Determination of Afforestation Requirements: Example 1

Total Forested Acreage Below Afforestation Threshold

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

Net Tract Area:	100 acres
Current Forest Cover:	15 acres
Forest Cover Above Afforestation Threshold:	0 acres
Area of Forest To Be Cleared:	0 acres
Land Use Category:	Medium Density Residential Area
Afforestation Threshold:	20%

Calculations:

100 acres * 20%	=	20 acres must contain forest
20 acres - 15 acres (existing forest)	=	5.0 acres must be afforested

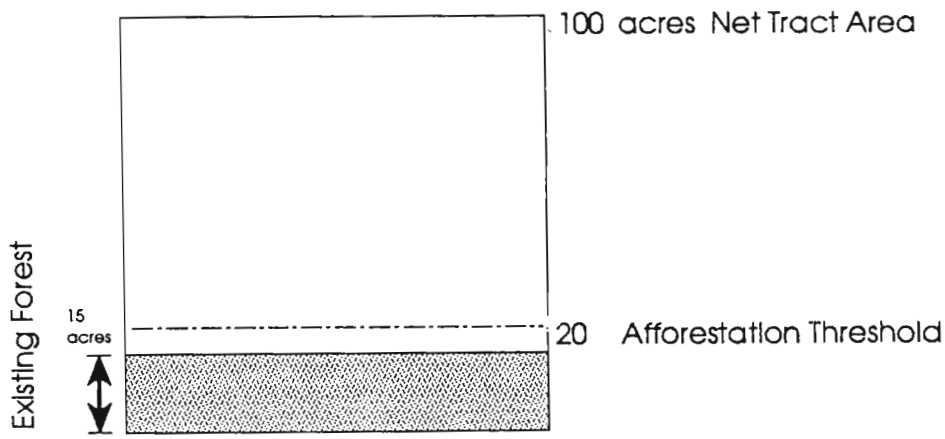


Figure 10

Determination of Afforestation Requirements: Example 2

Clear Forest Below Afforestation Threshold

Net Tract Area:	100 acres
Current Forest Cover:	15 acres
Forest Cover Above Afforestation Threshold:	0 acres
Forest Cover Above Conservation Threshold:	0 acres
Area of Forest To Be Cleared:	5 acres
Land Use Category:	Medium Density Residential Area
Afforestation Threshold:	20%
Conservation Threshold:	25%

Calculations:

Afforestation Requirement -

100 acres * 20% = 20 acres of forest required

20 acres - 15 acres (existing forest) = 5 acres must be afforested

Reforestation Requirement -

Area cleared below Conservation Threshold:

5 acres * 2 = 10 acres

Total Planting Requirement = 5 acres afforestation
+10 acres reforestation

15 acres

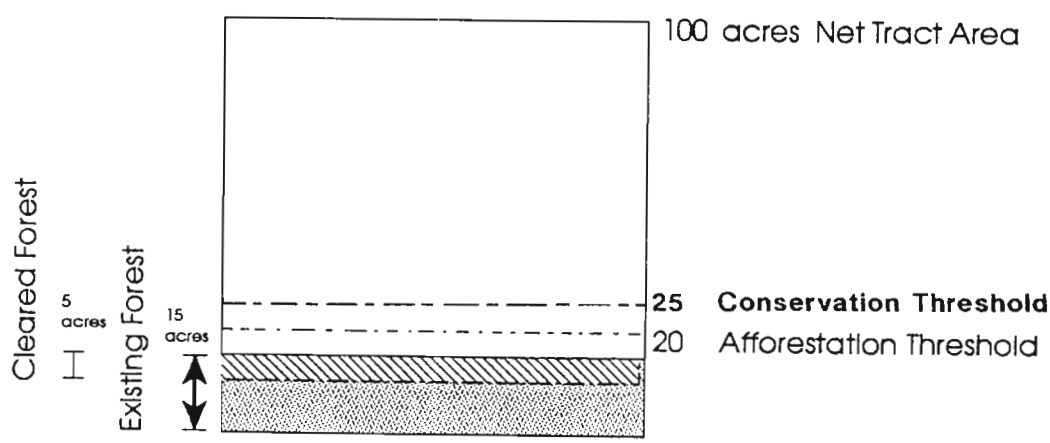


Figure 11

The Critical Root Zone

Roots are vital to the functioning of any tree. They provide structural support as well as the major mechanism for nutrient and water uptake for use by the tree. Destroying a section of a tree's roots, will ultimately result in a proportional loss to the tree's canopy.

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

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

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

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

For the edges of large areas, use the greater of the two choices below:

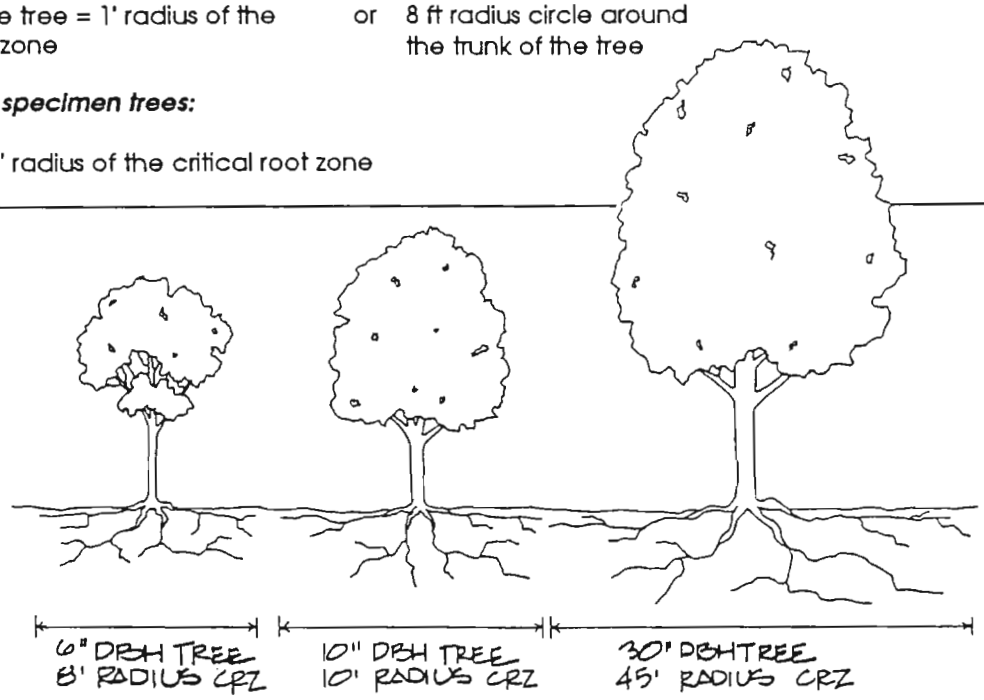
1" DBH of the tree = 1' radius of the critical root zone

or

8 ft radius circle around the trunk of the tree

For isolated specimen trees:

1" DBH = 1.5' radius of the critical root zone

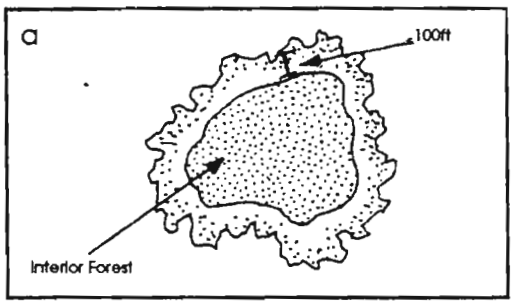


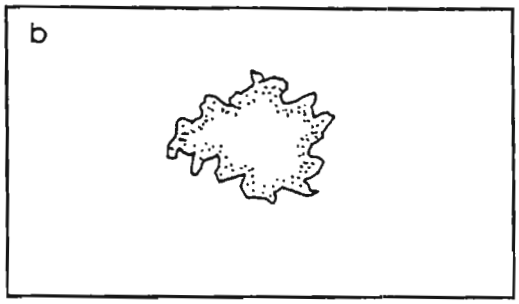
The Critical Root Zone is the area in which most of a tree's roots lay. Retaining this area, along with the tree itself will help to insure a healthy retention area. Source: MD Department of Natural Resources

Figure 12

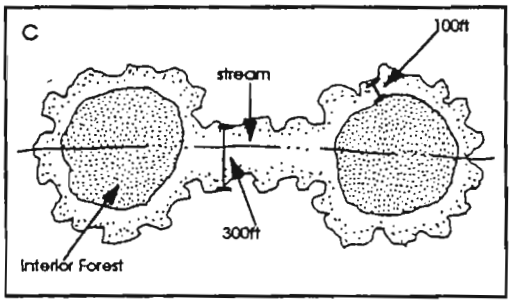
Forest Shapes and Functions

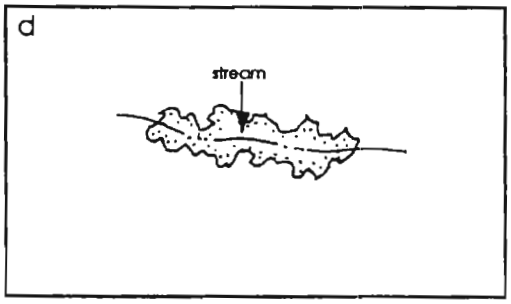
The following figures are generalizations of what one might find in forests. Scale is for comparison purposes unless indicated otherwise.



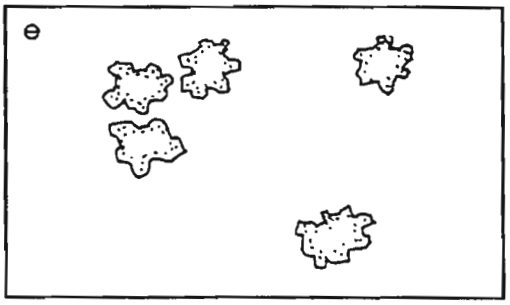


While a has enough interior forest to support interior dwelling wildlife and to discourage the movement of disturbed edge floral species inward, b depicts a forest that is too small to contain a true interior habitat.





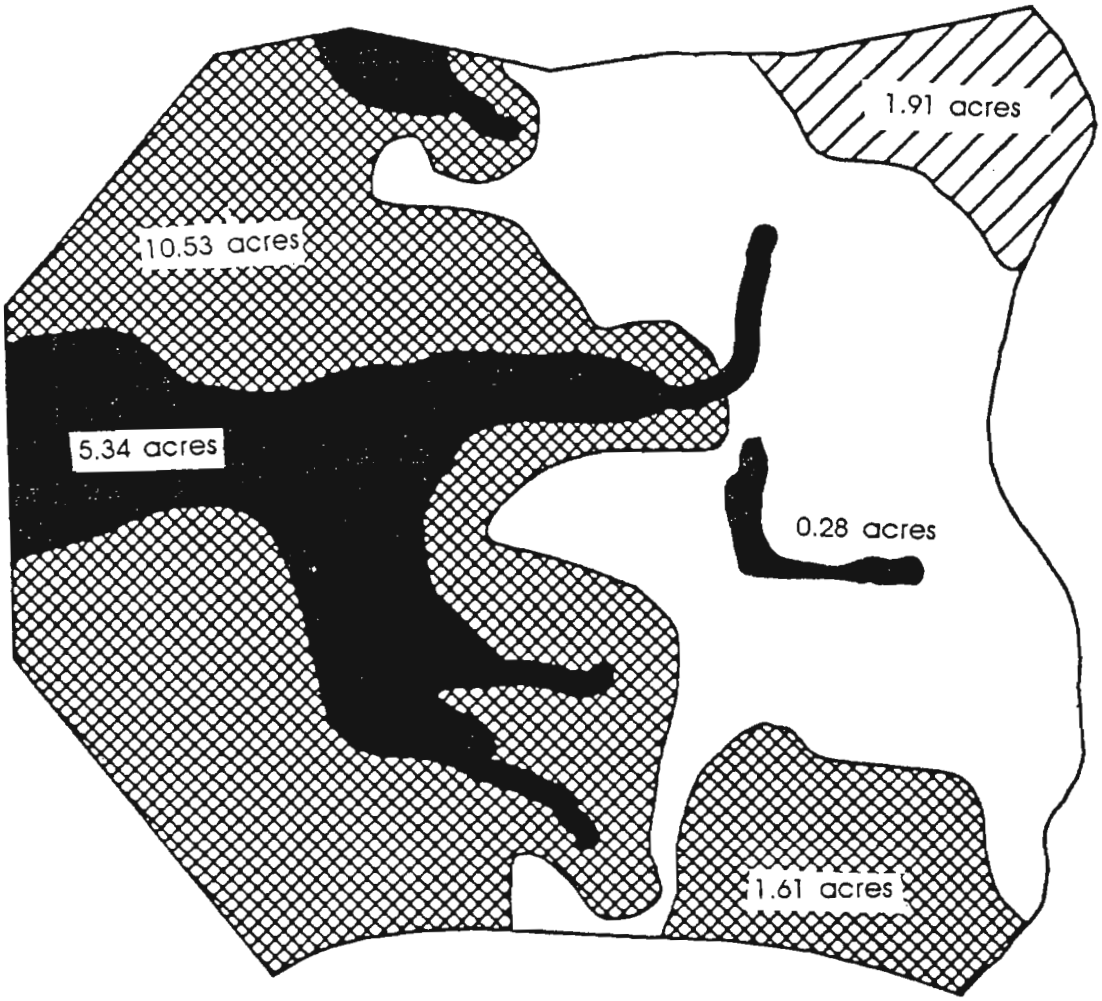
C above, with a corridor of 300 feet, provides both good water quality protection and a good corridor for maintaining native forest species within adjacent interior stands as well as wildlife movement. d, however, is too thin to serve any of these purposes. It may create a visual buffer between differing land uses but it provides no noise buffer.



If retaining three fragments from the above five, it is better retain closely spaced fragments and target adjacent areas for afforestation.

The shape and size of a forest is one of many factors which determine its function and its priority for retention.

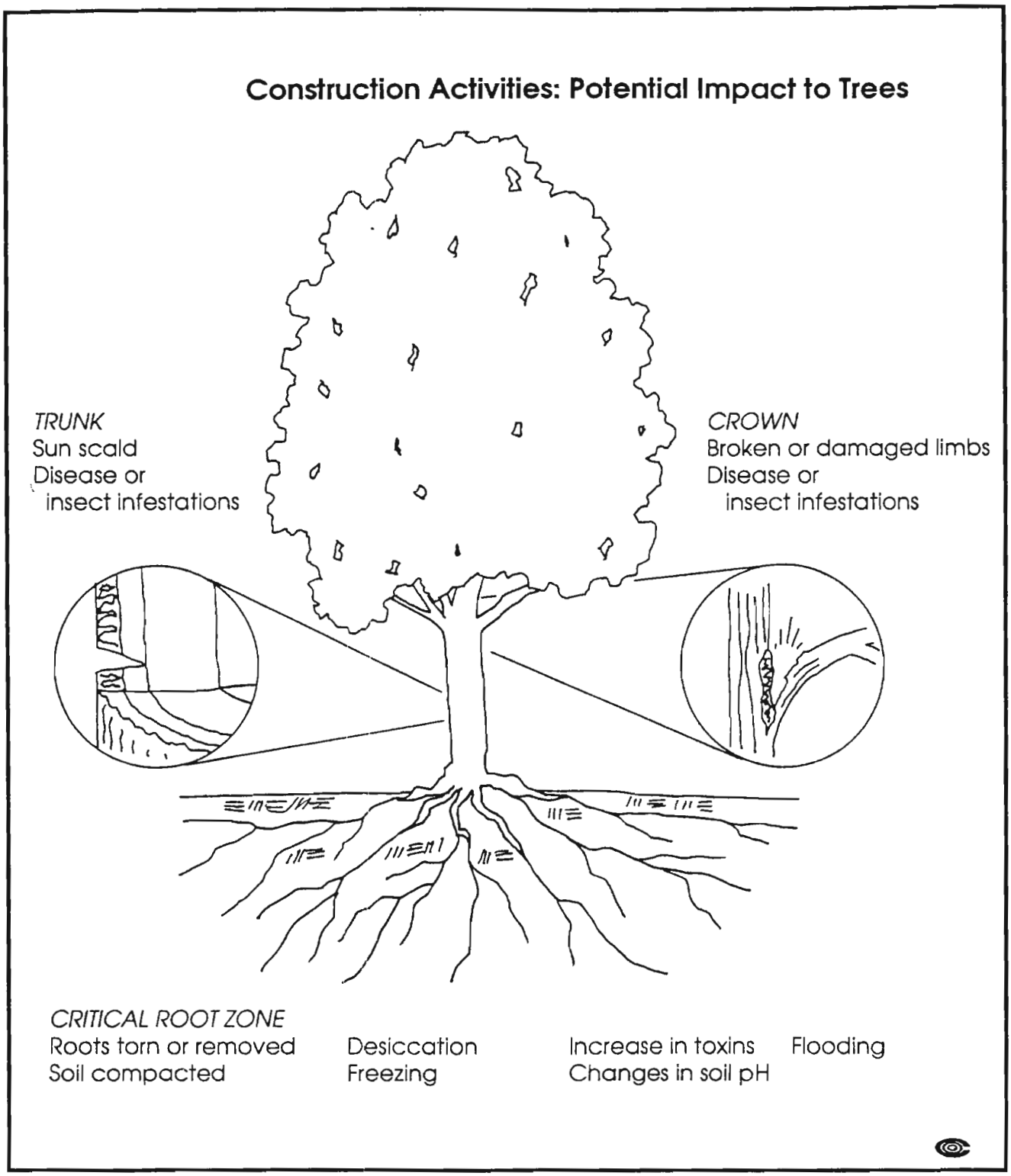
Figure 13 Forest Conservation Map



LEGEND

- Priority 1
- Priority 2
- Priority 3
- Priority 4

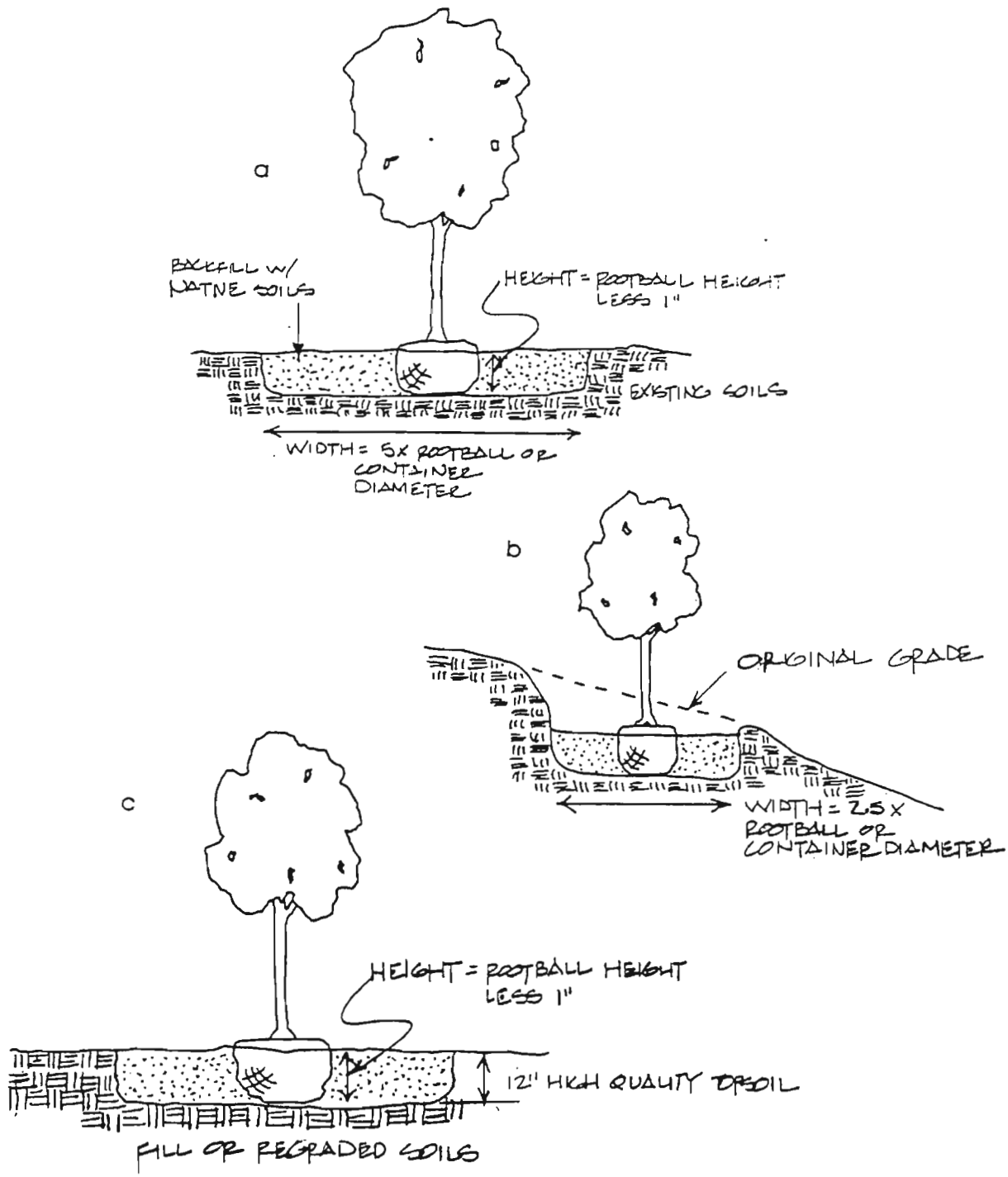
Figure 14



Maintaining healthy forests during the construction process necessitates avoiding contact with all above and below ground tree parts. Figure 14 summarizes some common construction impacts.

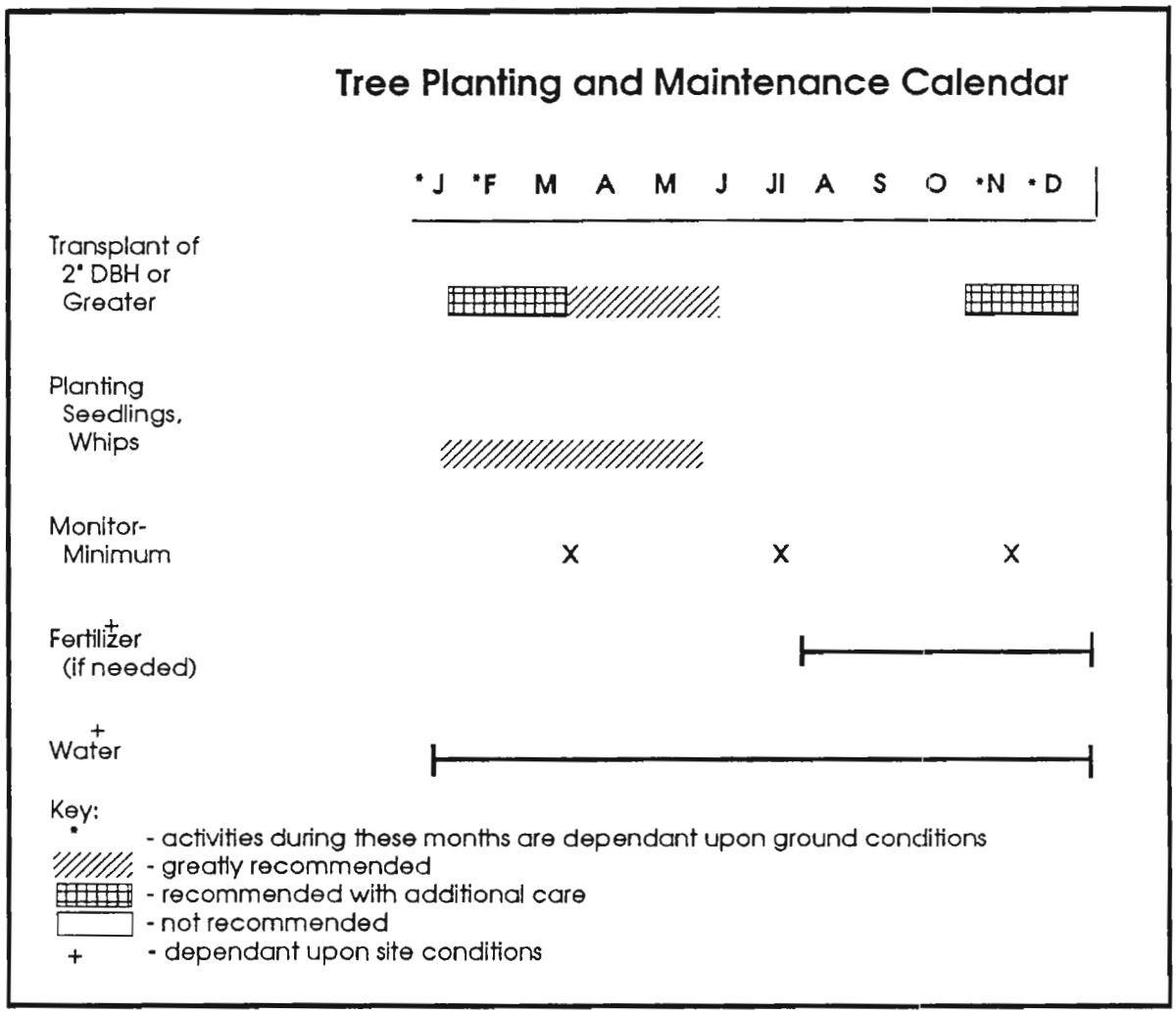
Figure 15

Planting Specifications:
Container Grown and Balled and Burlapped Stock



Changes in recent planting specifications for container grown and balled and burlapped stock, illustrated above, include wider planting fields and a larger amount of mulch.

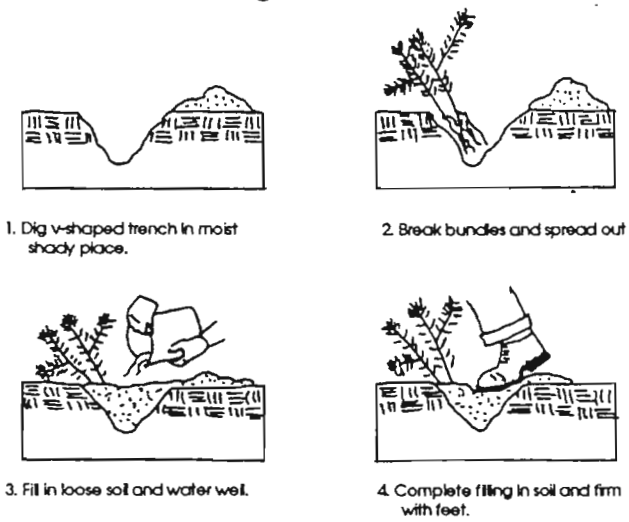
Figure 16



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

Figure 17

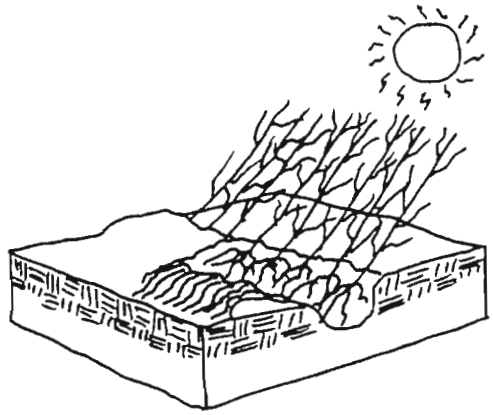
Heeling In Bare Root Stock



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

Figure 18

Tree Banking

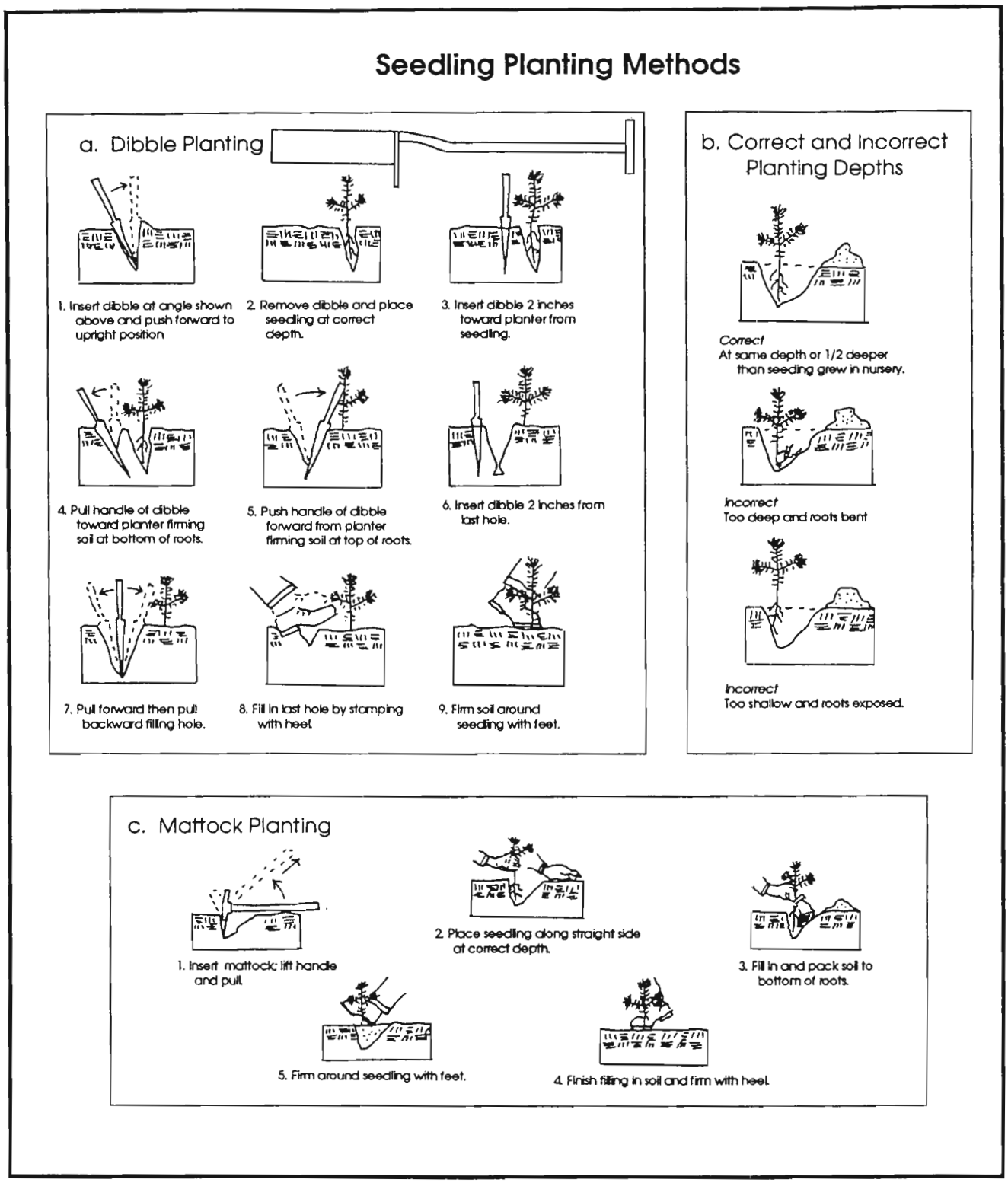


Place trees in an east-west trench with the tops of the trees pointing toward the afternoon sun. Moist soil should be worked around the roots to cover them and minimize air pockets. Pointing the tree tops toward the afternoon sun exposes the least surface to the sun so the buds will be less likely to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

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

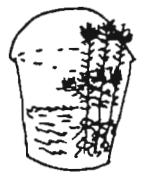
When bare root trees must be held in the open for longer than a few days, the method of tree banking described above is recommended.

Figure 19



Seedlings and whips need special care when planted. Figure 19 details the recommended manual planting procedures which include correct planting depths (b) as well as methods for two different planting tools: the dibble (a) and the mattock (c).

Figure 20 Handling Seedlings in the Field

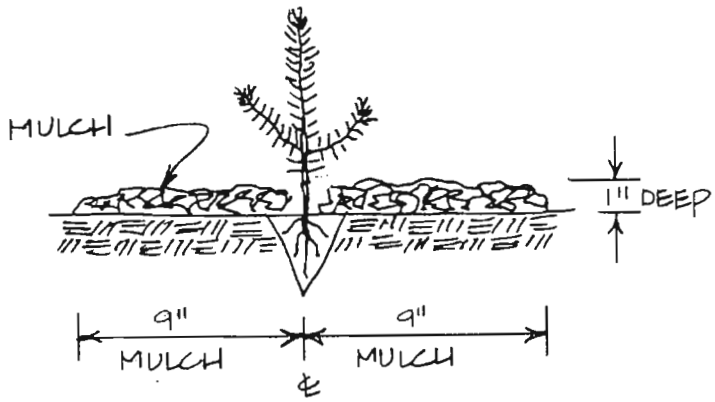


Correct
In bucket with sufficient water to cover roots

Incorrect
In hand: roots dry out.

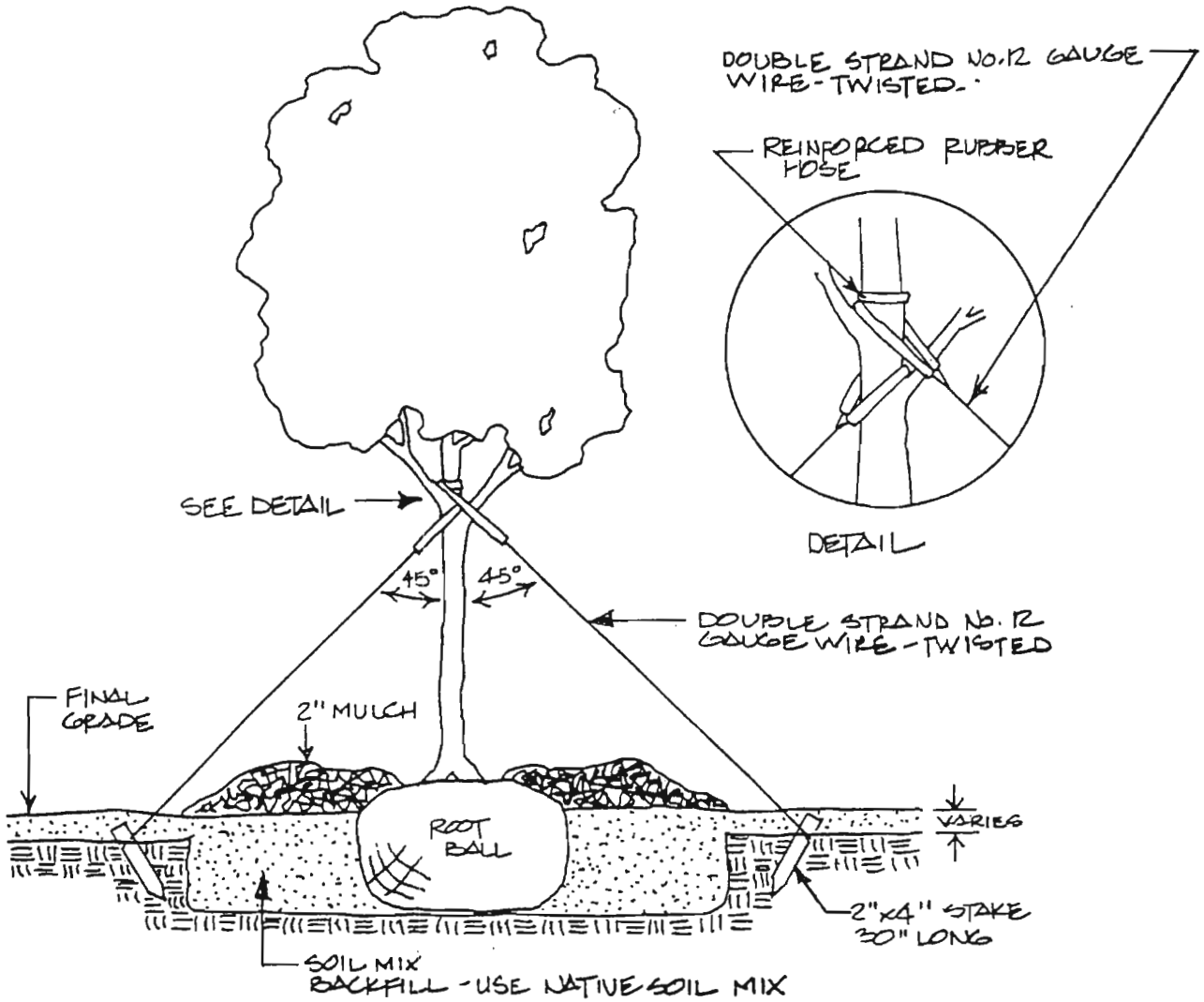
Figure 20 notes the correct method for handling seedlings in the planting field. Seedlings dry out very quickly and, once dry, often are not usable even after moistening.

Figure 21 Seedling and Whip Planting Specification



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

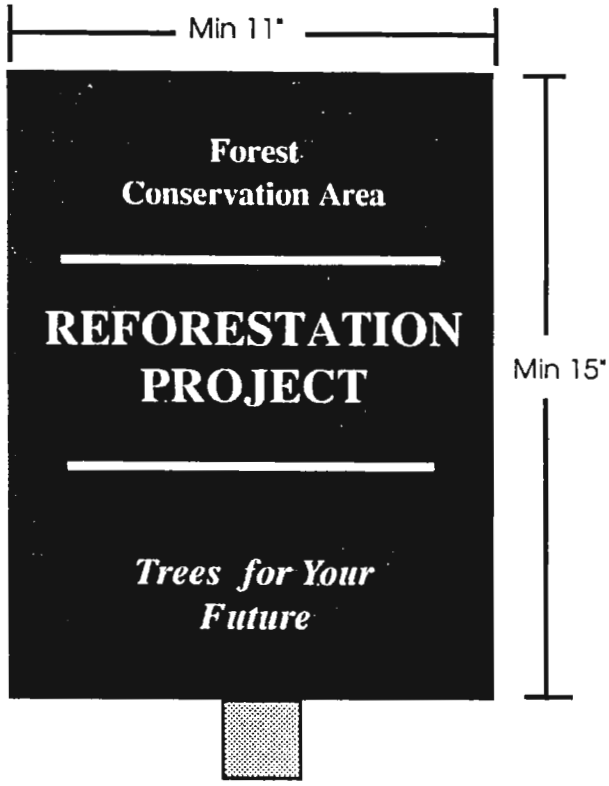
Figure 22 Staked Tree Specification



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

Figure 23

Reforestation and Afforestation Area Protection Signage



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

Figure 24

Watering Plan

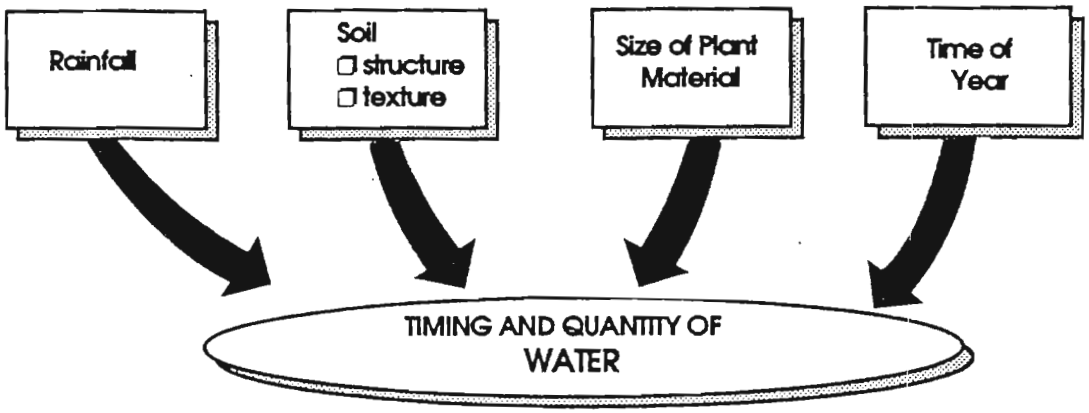
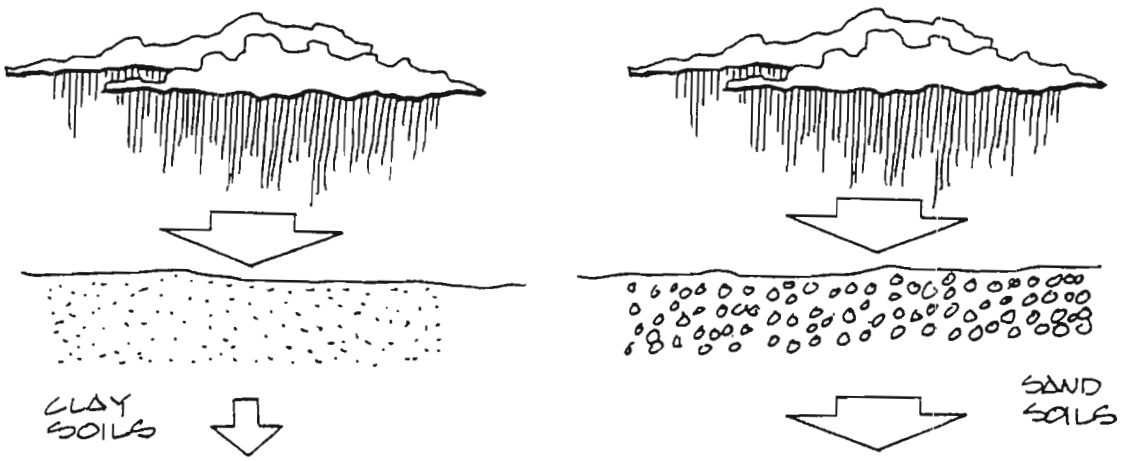


Figure 25

Soil Characteristics



Soil contains sand, silt and clay in varying quantities. Particle size of the three components range from 0.002 mm to 2.0 mm with sand being the largest and clay the smallest. Water drains more quickly through sand than it does through clay.

Figure 26 HOW CAN I TELL IF MY SOIL IS WET OR DRY?

You can tell approximately how much water your soil will hold by examining the soil around the tree. The following guidelines can help in deciding whether or when to change your watering schedule. Watch leaves for signs of wilting to be sure the time between irrigations is not too long.

Check texture, Is it mostly sand or clay? Does it have a lot of fine particles, smaller than sand grains (silt)? If, as is normal, it is a mixture of these, which one is more abundant?

Smell the soil. Does it have the odor of fresh, rich garden soil or woods soil? Or does it have a rank, soured smell, something similar to a faint odor of sewer gas? Use the table below to interpret your examination results.

Regardless of soil texture, the following conditions indicate excessively wet soil:

- There is a rank smell.
- Water can be squeezed out of the ball or soil.
- There is water in the bottom of the hole.

SOIL CHARACTERISTICS	*DIAGNOSIS*	*SOIL CHARACTERISTICS*	*DIAGNOSIS*
Half or more sand Won't form into a ball, or else crumbles easily.	Too dry	Half or more clay Won't form a ball, or else crumbles very easily; dusty.	Too dry
Forms into a ball, crumble readily under pressure. Has a smell like fresh soil, or freshly wet sand or cement.	Okay	Can be readily formed into a ball, and crumbles under pressure. Smells like fresh, damp soil from a field, garden, or woods.	Okay
Reacts as above, but when ball is squeezed it leaves a film of moisture on your skin. May have a sour soil odor.	Too wet	Sticks to shovel or trowel when dug. When formed into a ball, acts like modeling clay: doesn't crumble readily, but breaks into large chunks or extends like a ribbon. Leaves a film of water on your skin when squeezed.	Too wet

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