

# Forest Stand Delineation

- A forest stand delineation (FSD) may be used for the purpose of calculating the total square footage of forest canopy coverage of building sites, and providing an ecological assessment of a property. An FSD must be approved by the building official. Required information in an FSD is determined by the building official.
  - Tree Survey Assessment
  - Institutional, Community Service, and Recreation Use Canopy Assessment
  - Illegal Removal of Tree Stand Assessment
  - Conservation Easement Baseline Assessment
  - Tree Canopy Coverage Credit for Single Family and Duplex Uses Assessment
  - Sustainable Development Incentive Canopy Coverage Assessment

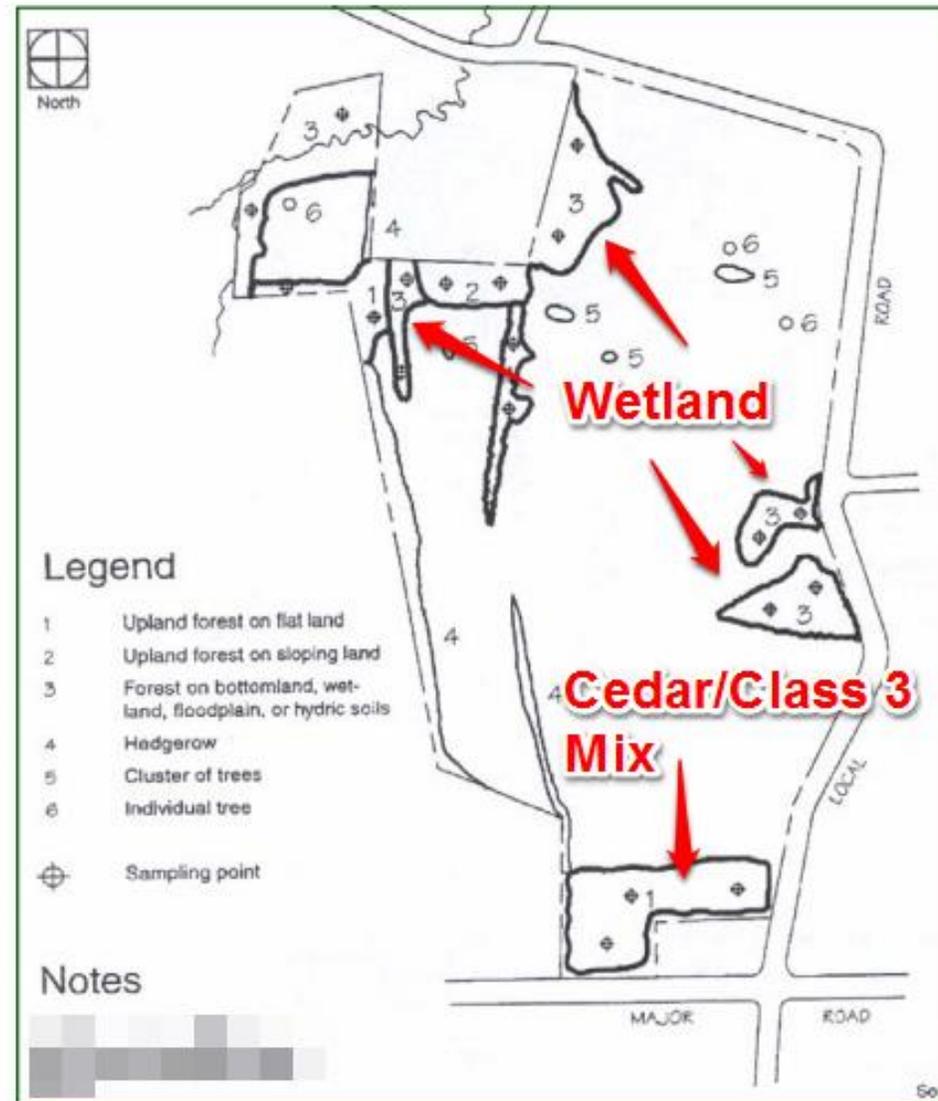
# Forest Stand Delineation Tree Survey Assessment

Survey option for properties 10 acres and greater.

Conduct a pre-tree survey assessment to define tree stand types and areas on the property.

Determine areas of upland cedar or mesquite dominant stand of 70% or greater, or cedar/mesquite and Class 3 species dominant of 70% or greater.

A fixed plot sampling method for 1/5 or 1/10 of an acre may be conducted in the Mixed species upland area to determine general species and size determination for a replacement requirement based on the survey data.



Source: Maryland State Forest Conservation Technical Manual

# Forest Stand Delineation Tree Survey Assessment - Fixed Point Plots

Apply fixed point plots in the defined area in which to sample the number and species of trees, and the diameter of the trunk and canopy.

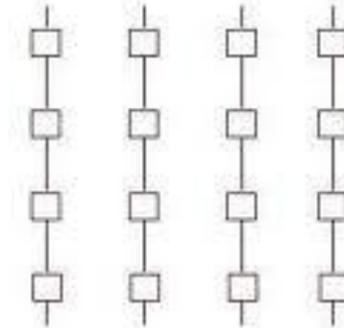
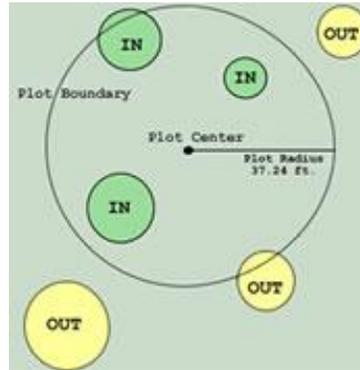
Determine:

Trees per acre – species and size (dia. Inches) of protected tree is recorded for each plot.

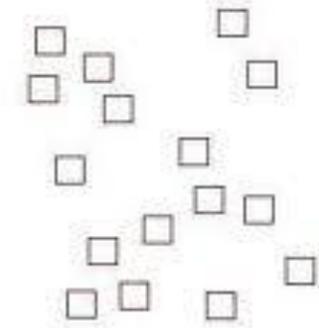
Measure canopy area (square feet) of protected trees in plot area.

Develop a stand table from:

- Average number of protected trees/species
- Average number of protected inches
- Average tree canopy diameter.

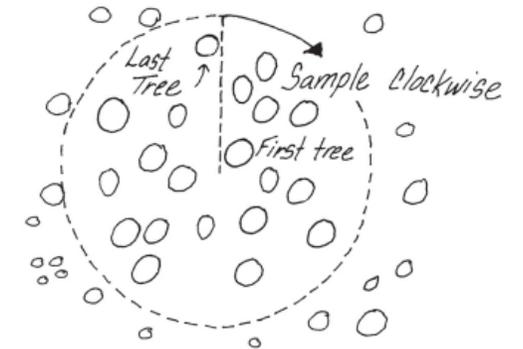
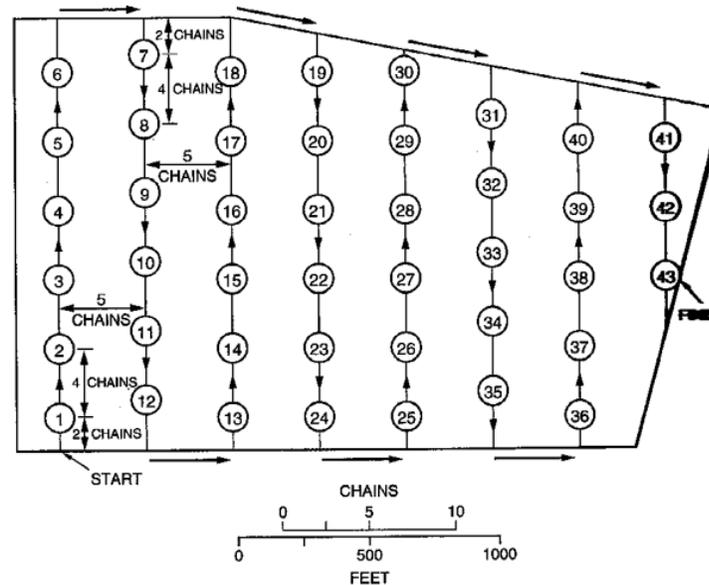


Systematic layout



Random layout

Diagrammatic plan for a 10 percent systematic line-plot cruise utilizing 1/5-acre circular sampling units.

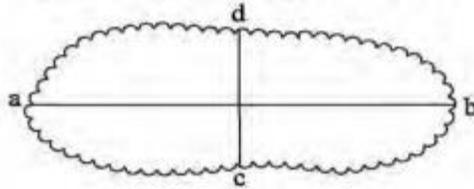


Acre	Radius
1	117.8 ft
1/2	83.3 ft
1/3	68.0 ft
1/4	58.9 ft
1/5	52.7 ft
1/10	37.2 ft
1/50	16.7 ft

# Forest Stand Delineation

## Determining Tree Canopy Cover

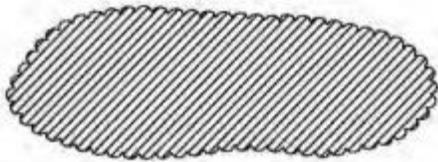
### Calculating Tree Canopy Area (For forested area or group of trees)



#### METHOD 1

a to b=658.5 feet  
c to d=242.5 feet

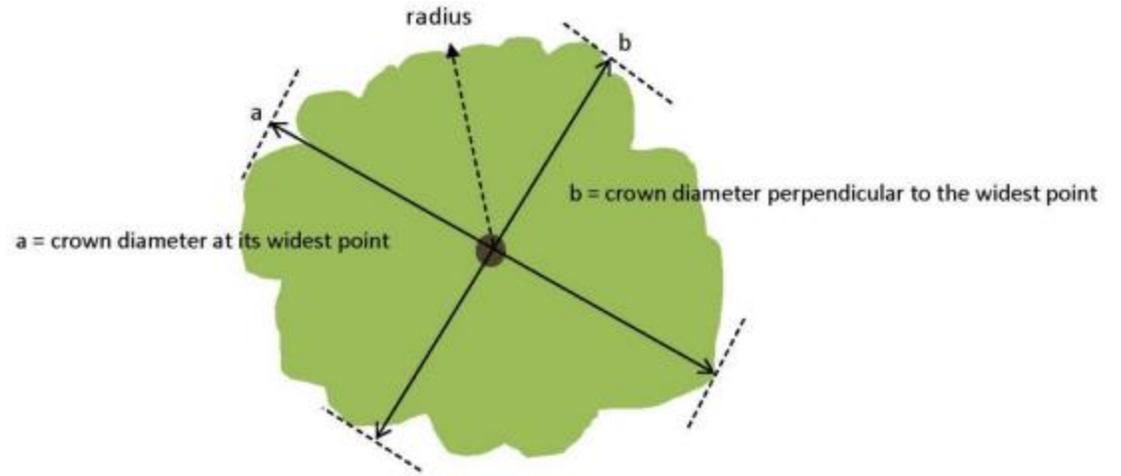
$(a \text{ to } b) \times (c \text{ to } d) = \text{square footage of tree canopy}$   
(This method gives you a fairly accurate area but not exact)



Calculated in AutoCAD, where the existing tree line is created using a polyline. Use "Area" command and specify "Object". Pick polylined treeline.

#### BEST METHOD FOR ACCURACY

1. Or planimeter may be used



#### CALCULATING TREE CANOPY COVER

1. Measure the diameter of the crown at its widest point in feet (a).
2. Measure the diameter of the crown perpendicular to its widest point in feet (b).
3. Add those two diameters together, divide by 2 to get the average diameter.
4. Divide the average diameter by 2 to get the average radius.
5. Square the radius (r) and multiply by pi (a constant of 3.14) to get the canopy cover in square feet.

For example, if (a) is 65 feet and (b) is 55 feet, then:

$65 \text{ feet} + 55 \text{ feet} = 120 \text{ feet}$ ,  $120 \text{ feet} / 2 = 60 \text{ foot average diameter}$

$60 \text{ feet} / 2 = 30 \text{ foot average radius}$

$30 \text{ feet} \times 30 \text{ feet} \times 3.14 = 2,826 \text{ square feet}$

# Forest Stand Delineation Institutional, Community Service, and Recreation Uses, over 5 acres

Survey and replacement option for Institutional and Community Service Uses, and Recreational Uses, on properties five acres or larger.

The FSD must be completed prior to any disturbance resulting in the removal of trees on the property.

The measured tree canopy coverage is the baseline for determining the number of trees required for replacement by using the canopy cover replacement calculation for legacy trees.

The property must maintain the balance of, or plant an increase of, the tree canopy coverage for the property recorded in the most recent FSD.

- Forest Stand Delineation Map of existing site conditions is required.
- Tree canopy coverage assessment of designated lot area

*iTree, dot grid, ground research, etc.*

- Report of environmental assessment of tree stand.
- Determine existing canopy base for future contrast (Ex: 33% tree canopy coverage in Feb 2016).
- Determine reduction of canopy for any site amendments (Ex: 2.4% canopy reduction for minor building addition on campus).
- Canopy reforestation determined by Legacy Tree Planting Assessment.

Ex: 33% canopy: 2.4% canopy reduction;  
must plant 2.4% canopy or greater.

**If 2.4% reduction is 15,000 sf of tree canopy, must plant 15,000 sf or more tree canopy, which is equivalent to 12.5 planted Legacy Trees.**

# Forest Stand Delineation Illegal Removal of Trees

A tree replacement requirement for the removal, or serious injury, of protected trees enacted without a tree removal application or a building permit upon written notice of a violation of this division.

The methods of tree replacement of Section 51A-10.135 are available for the property if the building official determines the site conditions do not favor the planting of trees on the property.

If individual protected tree diameter evidence is removed, and not accurately assessed and provided by the owner prior to the removal, the building official may impose a FSD assessment of the stand for the square footage removal of tree canopy coverage on the lot ascertained to have occurred within, or about, a specified time frame.

- Provide a Forest Stand Delineation Map of existing conditions at time of the report of removed trees.
- Provide contrasting aerial photos from multiple time periods from reliable sources.
- Create a field assessment report, if available, and if the property is accessible.
- Show calculations for rate of removal of square footage of tree cover based on the time period.
- After assessment, provide a Notice of Violation to property owner with the complete report.
- Confirmation of acceptance by the owner.
- Determine reduction of canopy for the property from a certain date (Ex: Compare tree canopy coverage for Mar 2012 to Mar 2014).
- Calculate canopy reforestation estimates determined by Legacy Tree Planting Assessment and standard tree planting. Show canopy reduction levels over the time period and amount of canopy required to be restored.

Ex: 80% canopy in origin document: 28% reduction discovered over the study period. The owner must reforest the 28% removed.

**If 28% reduction is 2.3 acres (100,188 sf) of tree canopy, the owner must plant 100,188 sf or more tree canopy, which is equivalent to 83 Legacy trees. The Replacement Value for the square footage at \$2.00 per square foot is \$200,376.**

# Forest Stand Delineation Tree Canopy Coverage – Single family and duplex uses assessment

In this optional tool, tree replacement requirements are reduced by preserving all or part of the tree canopy goal coverage of 40% of the property.

Healthy existing and non-invasive large and medium trees, including boundary trees, may be measured to attain the square feet of canopy cover retained for the property.

Nursery stock trees can add 100 square feet per tree to the existing canopy.

Large and medium healthy trees within the front yard setback may qualify for double the total square footage of each tree in the front yard.

Tree protection must be fully applied throughout demolition and construction, per 10.136, to qualify for the optional tree credit.

- The owner may provide a site plan of property with a complete tree survey.
- Apply tree canopy coverage to the survey by representing the edge of the crown over the property on the drawing, including the canopies of boundary trees which may be off the property or right-of-way.
- Calculate the tree canopy coverage of the property except for the removed trees.
- Compare existing tree canopy at time of permit to canopy goal.
- Determine the replacement reduction by the percentage difference of the existing canopy to the 40% canopy goal.

Ex: If the measured and credited tree canopy coverage for the lot is 32% (the goal is 40%), and the tree replacement due is 40", an 80% reduction is provided and the replacement due is 8 inches. Additional nursery stock may be added to replace the remaining 8 inches.

# Forest Stand Delineation Conservation Easements

Conservation easement baseline documentation requires detailed information describing the property's physical and biological conditions and its conservation values.

Items to be considered include health and condition of trees and other vegetation, the suitability for wildlife habitat, and other unique features worthy of preservation.

The FSD will be used to define upland and floodplain areas as well as distinct stands of trees.

The easement must be at least 25% of the size of the development impact area on the tree removal property.

- Provide a Forest Stand Delineation Map of existing conditions at the time of the report.
- Provide a Fixed plot vegetation assessment report.
- Provide a 100% tree survey (if and where it may be required by the building official).
- Provide a general report of environmental conditions of property by a trained professional.
  - Assessment of field study
  - Species, age, average diameter
- Present a Preservation Strategy concept for review to the building official for an exhibit with the conservation easement.
- Provide the building official a full description of the replacement qualifications and calculations for the tree removal property and the conservation easement property.

# Forest Stand Delineation Sustainable Development Incentives (SDI)

This FSD option must be initiated at the beginning at the conceptual stage of the development for the process of site design, tree and site assessment, and land preparation. A consulting arborist must be employed through key processes of the FSD. The FSD includes additional detailed information about the property:

- Soil management and topsoil retention
  - Grading and sustainable site use planning to restrict use of wooded and sensitive land areas
  - Utility location and distribution
  - Water conservation and irrigation strategy
  - Sustainable site maintenance, schedule, and implementation
- Provide a Forest Stand Delineation Map of existing conditions at report.
  - Conduct soil assessments of the property for planting areas and purposes. The soils must meet standards for ANSI A300 for planting and ISA BMP's for planting.
  - A conceptual landscape plan must be initiated for determining planting locations for legacy trees.
  - The conceptual landscape plan must include areas in the critical root zones for allowing methods of tree preservation and tree root retention.
  - Designated protected areas map (on assessments) must show restricted areas from development and provide details for intrusions through engineering reviews.
  - Provide a grading plan submitted for engineering.
  - Reports must be provided from a **consulting arborist** as needed to address site limitations for planting and tree protection, and to provide assurances of soil conditions for tree planting as called for in Section 51A-10.104 and the landscape and tree manual.
  - Provide calculations and analysis of tree canopy coverage related to reduction goals for the property
    - Assess existing tree canopy
    - Assess projected legacy trees
  - A site maintenance schedule for a minimum of five years is to be provided and implemented prior to final landscape inspection.

Sustainable  
Development  
Incentives

# Conservation Easement

