

## Summary Fact Sheet

**Category:** 6.0 Vegetative Systems  
**Practice:** 6.3 Reforestation/Afforestation

**General Description:** Reforestation is the planting of trees in an area that was forested in the recent past (e.g. an area that was cleared for residential development). Afforestation is planting trees in an area where they were absent for a significant period of time (e.g. an old farm field or a riparian buffer). Plantings may be seeds, seedlings, or semi-mature trees. Trees reduce runoff volume through evapotranspiration and interception and improve the infiltration capacity of the soil, thereby reducing runoff potential. Trees may be placed strategically as a buffer, or in flow paths and depressions to adsorb runoff. Evapotranspiration (ET) refers to the combined effects of evaporation and transpiration in reducing the volume of water in a vegetated area during a specific period of time. Interception is a form of detention and retention storage that occurs when leaves, stems, branches, and leaf litter catch rainfall.

### Water Quantity Controls

Planting trees in a portion of the drainage area will reduce the runoff volume and peak discharge rate for the drainage area by lowering its runoff potential. The runoff potential can be expressed using the “C” value in the Rational Formula, as discussed in section 6-0803 of the PFM. It can also be expressed using the curve number (CN) in SCS methods, as discussed in PFM section 6-0802.

Planting individual trees scattered across the drainage area will not appreciably affect hydrologic calculations or reduce the runoff volume or peak discharge rate. Trees should be planted contiguously in order to influence the composite “C” or CN for the drainage area. Also, the long-term maintenance and landscaping of the planted area will determine its runoff potential. An area replanted and allowed to grow into a mature stand of trees with little or no clearing of undergrowth can be designated as “Woods” or “Forest.” However, if the ground is grass or another designated groundcover, the planted area should be considered “Open space” or “Park” for the purposes of hydrologic computations.

Volume reductions will also result from rainfall interception by leaves and increased ET, but quantifying these reductions will require more rigorous and intensive analysis. Interception and ET will have a greater effect on runoff volume reduction for small, frequently occurring, low intensity storm events.

### Water Quality Controls

Water quality benefits are gained from reforestation and afforestation because tree planting lowers runoff potential as described above. The pollutant mass loading is the product of pollutant concentration and runoff volume. The reduction in pollutant mass is dependent upon the reduction in runoff volume achieved through tree planting.

Phosphorous loading calculations are a function of the weighted runoff coefficient “C” in the Occoquan Method, as described in the *Northern Virginia BMP Handbook*. Calculated phosphorous loads are decreased by reforestation and afforestation because of the reduction in “C” that is achieved.

**Location:** Trees may be placed wherever there is sufficient room for the root zone and the canopy (allowing for future growth) and where vehicle safety is not unduly jeopardized. Planting in a vegetated area will provide the additional benefit of forming a vegetated stream buffer.

**Design Construction and Materials:** PFM section 12-0805 contains tree and shrub planting guidelines. Reforestation with seedlings or by direct seeding is allowed; see PFM sections 12-0701.13 and 12-0701.14. Section 12-0702.2E(2) of the PFM specifies the tree cover credit that can be calculated for afforestation and reforestation if *seedlings* are planted.

General tree planting guidelines include the following:

- Protective root and trunk structures may be required (PFM 12-0805.5E).
- The use of native trees is preferred (PFM 12-0501.5A).
- Soil amendments (see fact sheet 5.1) may be broadcast over areas with poor soil conditions. Avoid placing soil amendments for individual plantings. See PFM section 12-0502.1E(2) for more details.

The site characteristics and time frame for revegetation will influence tree stock selection. Container stock are appropriate for sites exposed to a high amount of stress (e.g. foot and animal traffic). Container stock also typically becomes established more quickly than less expensive types of stock. If stress and rapid establishment are not concerns, cuttings, bare roots, or other, less expensive stock may be the most economical choice. The time of year chosen for planting stock depends on the type of stock and nursery availability.

Take care not to compact the soil in areas to be planted. Surface roughening may improve seed establishment and moisture retention. Soil amendments can be used to increase permeability (see fact sheet 5.1).

Use mulch to increase water retention, decrease erosion and improve soil stability, and insulate seeds and stock from temperature extremes. Mulching or the use of matting is especially critical on steep slopes.

If trees are being planted for the specific purpose of providing a water quality management area, clearly post signs indicating so. Basic cost components for reforestation/afforestation are:

Item	Unit	Estimated unit cost (2005 dollars)
Tree seedling (depends on maturity)	Ea.	\$6 - \$25
Tree seeds	M.S.F.	\$30 - \$50
Mulch	S.Y.	\$4 - \$7

**Cost:** The cost to reforest or afforest ½ acre is comprised of both the installation cost and annualized costs. For consistency with other BMP cost estimates, cost calculations assume complete replanting after 25 years.

Item	Required Cost per Year (2005 Dollars)													
	0	1	2	3	4	5	6	7	8	9	10	...	25	
Installation <sup>1</sup>	5,000													
Weeding <sup>2</sup>		200	200	200	200	200	200	200	200	200	200	200		
Replace Vegetation		200	200	200	200	200	200	200	200	200	200			
Replant Site														5,000
<b>Total Cost</b>	<b>5,000</b>	<b>400</b>	<b>400</b>	<b>400</b>	<b>400</b>	<b>400</b>	<b>400</b>	<b>400</b>	<b>400</b>	<b>400</b>	<b>400</b>	<b>400</b>		<b>5,000</b>
Annualized Cost	\$575 / year (includes replanting in year 25)													

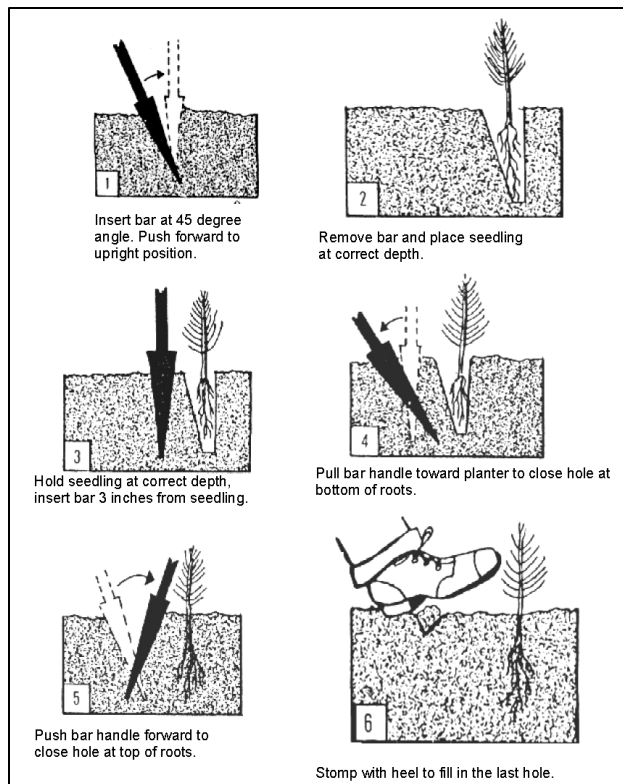
<sup>1</sup>Developer Cost. Not included in annualized cost.

<sup>2</sup>Includes invasive plant removal.

**Maintenance:** Incorporate reforested/afforested areas into the existing program for tree maintenance and inspection. Typical maintenance tasks include removal of dead or diseased limbs, checking for interference with utility lines and root heave of paved areas, pruning as necessary, and inspection for evidence of disease. Replace individual trees as necessary.

Protection from exotic/invaser species is a critical concern. Management strategies for dealing with exotics depend on their growth cycle (e.g. annual vs. perennial), available labor and resources to remove exotics, and the degree to which exotics are already established. Exotics may compete with native plants used to revegetate a site and hinder natural succession.

**Performance and Inspection:** A healthy tree cover will stabilize the soil and reduce runoff volumes. Inspect the site for signs of disease, invasive species establishment, and erosion. Perform this inspection annually in late spring. Replace trees and stabilize soil as necessary.



**Steps for Planting a Seedling**

Source: Virginia Department of Forestry, <http://www.dof.virginia.gov/mgt/how-to-plant-seedling.shtml>

**Potential LEED Credits:**

- Primary: Sustainable Sites – Credit 1 “Site Selection” (1 Point)  
Sustainable Sites – Credit 5 “Reduced Site Disturbance” (1-2 Points)  
Sustainable Sites – Credit 6 “Stormwater Management” (1-2 Points)
- Other: Water Efficiency – Credit 1 “Water Efficient Landscaping” (1-2 Points)  
Innovation & Design Process (1-4 Points)

**Links to Additional Information:**

Fairfax County Department of Public Works and Environmental Services. 2001. “Hydrologic design.” *Public Facilities Manual*, 6-0800. Available at <http://www.co.fairfax.va.us/dpwes/publications/pfm/6-0800.htm>

Fairfax County Department of Public Works and Environmental Services. 2001. “Stormwater runoff quality control criteria.” *Public Facilities Manual*, 6-0400. Available at <http://www.co.fairfax.va.us/dpwes/publications/pfm/6-0400.htm>

Fairfax County Department of Public Works and Environmental Services. 2001, amended effective April 15, 2002. “Vegetation preservation and planting.” *Public Facilities Manual*, 12-0000. Available at <http://www.co.fairfax.va.us/dpwes/publications/pfm/12.htm>

Natural Resources Conservation Service. “Native revegetation - trees and shrubs.” *Urban BMP's - Water Runoff Management*. Available at [ftp://ftp-fc.sc.egov.usda.gov/WSI/UrbanBMPs/water/erosion/natrevege\\_trees.pdf](ftp://ftp-fc.sc.egov.usda.gov/WSI/UrbanBMPs/water/erosion/natrevege_trees.pdf)

Northern Virginia Planning District Commission. 1992. *Northern Virginia BMP Handbook: A Guide to Planning and Designing Best Management Practices in Northern Virginia*. Available at <http://www.novaregion.org/pdf/NVBMP-Handbook.pdf>

Virginia Department of Conservation and Recreation. 1999. “Landscaping.” *Virginia Stormwater Management Handbook*, 3-05. Available at [http://www.dcr.virginia.gov/sw/docs/swm/Chapter\\_3-05.pdf](http://www.dcr.virginia.gov/sw/docs/swm/Chapter_3-05.pdf)