4.22 Site Reforestation / Revegetation

**Description**
Site reforestation/revegetation refers to the process of planting trees, shrubs and other native vegetation in disturbed pervious areas to restore them to their pre-development conditions. The process can be used to help establish mature native plant communities (e.g., forests) in pervious areas that have been disturbed by clearing, grading and other land disturbing activities.

**LID/GI Consideration:** Restoring sites back to their pre-developed conditions improves their ability to reduce post-construction stormwater runoff rates, volumes and pollutant loads. The process can also be used to provide restored habitat for high priority plant and animal species.

**KEY CONSIDERATIONS**

**DESIGN CRITERIA:**
- Ideal for use in pervious areas that have been disturbed by clearing, grading and other land disturbing activities
- Methods used for site reforestation/revegetation should achieve at least 75% vegetative cover one year after installation
- Reforested/revegetated areas should be protected in perpetuity as secondary conservation areas

**ADVANTAGES / BENEFITS:**
- Helps restore pre-development hydrology on development sites and reduces post-construction stormwater runoff rates, volumes and pollutant loads
- Helps restore habitat for priority plant and animal species

**STORMWATER MANAGEMENT SUITABILITY CREDITS**

<table>
<thead>
<tr>
<th>CREDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑️ Runoff Reduction</td>
</tr>
<tr>
<td>☑️ Water Quality</td>
</tr>
<tr>
<td>☑️ Channel Protection</td>
</tr>
<tr>
<td>☑️ Overbank Flood Protection</td>
</tr>
<tr>
<td>☑️ Extreme Flood Protection</td>
</tr>
</tbody>
</table>

1 = helps restore pre-development hydrology, which implicitly reduces post-construction stormwater runoff rates, volumes and pollutant loads.

Commented [A1]: For the final formatted version, a symbol different from a star will be chosen.
### DISADVANTAGES / LIMITATIONS:
- Should have a minimum contiguous area of 10,000 square feet
- Should be managed in a natural state and protected from future land disturbing activities
- Soil must be adequate or amended to support plant material desired

### SITE APPLICABILITY
- Rural Use
- Suburban Use
- Urban Use

### IMPLEMENTATION CONSIDERATIONS
- Construction Cost
- Maintenance
- Area Required

### RESIDENTIAL SUBDIVISION
Use: Yes
High Density/Ultra-Urban: Yes
Roadway Projects: Yes

L = Low  M = Moderate  H = High

### RUNOFF REDUCTION CREDIT:
- 0% of the runoff reduction volume provided (see note 1)

1 = helps restore pre-development hydrology, which implicitly reduces post-construction stormwater runoff rates, volumes and pollutant loads. Runoff reduction credit is given to other BMPs that use soil restoration to improve hydrologic soil groups.

### STORMWATER MANAGEMENT PRACTICE PERFORMANCE

**Runoff Reduction**
- N/A
- Annual Runoff Volume
- N/A
- Runoff Reduction Volume

**Pollutant Removal**
- N/A
- Total Suspended Solids
- N/A
- Total Phosphorus
- N/A
- Total Nitrogen
- N/A
- Metals
- N/A
- Pathogens

1 = helps restore pre-development hydrology, which implicitly reduces post-construction stormwater runoff rates, volumes and pollutant loads.
4.22.1 General Discussion

Site reforestation/revegetation refers to the process of planting trees, shrubs and other native vegetation in disturbed pervious areas to restore them to their pre-development conditions (Figure 7.244-22-1). The process can be used to help establish mature native plant communities (e.g., forests) in pervious areas that have been disturbed by clearing, grading and other land disturbing activities. Mature plant communities intercept rainfall, increase evaporation and transpiration rates, slow and filter stormwater runoff and help improve soil porosity and infiltration rates (Cappiella et al., 2006a), which leads to reduced post-construction stormwater runoff rates, volumes and pollutant loads. The site reforestation/revegetation process can also be used to provide restored habitat for high priority plant and animal species (Appendix A).

Areas that have been reforested or revegetated should be maintained in an undisturbed, natural state over time. These areas should be designated as secondary—conservation areas (Section 7.6.2)—and protected in perpetuity through a legally enforceable conservation instrument (e.g., conservation easement, deed restriction). If properly maintained over time, these areas can help improve aesthetics on development sites, provide passive recreational opportunities and create valuable habitat for high priority plant and animal species.

To help create contiguous, interconnected green infrastructure corridors on development sites, site planning and design teams should strive to connect reforested or revegetated areas with one another and with other primary and secondary conservation areas through the use of nature trails, bike trails and other “greenway” areas.

4.22.2 Stormwater Management Suitability

"Credits"

The Center for Watershed Protection (Hirschman et al., 2008) recently documented the ability of the site reforestation/revegetation process to reduce annual stormwater runoff volumes and pollutant loads on development sites. Consequently, this low impact development practice has been assigned quantifiable stormwater management “credits” that can be used to help satisfy the reduce runoff volume and provide water quality improvements:

Stormwater Runoff Reduction

Site reforestation/revegetation is an effective low impact development (LID) practice that can reduce post-construction stormwater runoff and improve water quality. When used to improve site areas and create conservation amenities; runoff reduction, lower post-developed flow rates, and lower discharge velocities are all benefits of reforestation or revegetation.

 Subtract 50% of any reforested/revegetated areas from the total site area and re-calculate the runoff reduction volume (RRV) that applies to the development site.

Water Quality Protection:

Site reforestation and/or revegetation helps restore pre-development hydrology, which implicitly reduces post-construction stormwater runoff rates in addition to runoff volumes and pollutant loads.
Subtract 50% of any reforested/revegetated areas from the total site area and re-calculate the runoff reduction volume (RRv) that applies to the development site.

Aquatic Resource Channel Protection:
Assume that the post-development hydrologic conditions of any reforested/revegetated areas are equivalent to those of a similar cover type (e.g., meadow, brush, woods) in fair condition.

Overbank Flood Protection:
Assume that the post-development hydrologic conditions of any reforested/revegetated areas are equivalent to those of a similar cover type (e.g., meadow, brush, woods) in fair condition.

Extreme Flood Protection:
Assume that the post-development hydrologic conditions of any reforested/revegetated areas are equivalent to those of a similar cover type (e.g., meadow, brush, woods) in fair condition.

Reforested/revegetated areas can only be assumed to be in "fair" hydrologic condition due to the fact that it will take many years for them to mature and provide full stormwater management benefits.

If site reforestation/revegetation can be combined with soil restoration (Section 7.6.4.23) on a development site, the following stormwater management benefits and incentives are available to "credits" can be used to help satisfy the requirements SWM Criteria presented in this manual:

Stormwater Runoff Reduction:
Subtract 100% of any restored and reforested/ revegetated areas from the total site area and re-calculate the runoff reduction volume (RRv) that applies to the development site.

Water Quality Protection:
Subtract 100% of any restored and reforested/revegetated areas from the total site area and re-calculate the runoff reduction volume (RRv) that applies to the development site.

Aquatic Resource Protection:
Assume that the post-development hydrologic conditions of any restored and reforested/revegetated areas are equivalent to those of a similar cover type (e.g., meadow, brush, woods) in good condition.

Overbank Flood Protection:
Assume that the post-development hydrologic conditions of any restored and reforested/revegetated areas are equivalent to those of a similar cover type (e.g., meadow, brush, woods) in good condition.

Extreme Flood Protection:
Assume that the post-development hydrologic conditions of any restored and reforested/revegetated areas are equivalent to those of a similar cover type (e.g., meadow, brush, woods) in good condition.

In order to be eligible for these "credits," it is recommended that reforested/revegetated areas satisfy the planning and design criteria outlined below.

4.22.3 Applications and Site Overall Feasibility Criteria
The criteria listed in Table 4.22-1 should be evaluated to determine whether or not site reforestation/revegetation is appropriate for use on a development site.

### Table 4.22-1: Factors to Consider When Evaluating the Overall Feasibility of Using Site Reforestation/Revegetation on a Development Site

<table>
<thead>
<tr>
<th>Site Characteristic</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drainage Area</td>
<td>N/A</td>
</tr>
<tr>
<td>Area Required</td>
<td>Reforested/revegetated areas should be larger than 10,000 square feet in size in order to be eligible for the stormwater management “credits” assigned to this low impact development practice.</td>
</tr>
<tr>
<td>Slope</td>
<td>Maximum 25% in the disturbed pervious area to be reforested/revegetated.</td>
</tr>
<tr>
<td>Minimum Head</td>
<td>N/A</td>
</tr>
<tr>
<td>Minimum Depth to Water Table</td>
<td>No restrictions</td>
</tr>
<tr>
<td>Soils</td>
<td>Soils need to be capable of sustaining the vegetation proposed which will require significant amendments in most cases. No restrictions</td>
</tr>
</tbody>
</table>

**General Feasibility**
- Suitable for Residential Subdivision Usage – YES
- Suitable for High Density/Ultra Urban Areas – YES
- Stormwater Control – NO

**Site Applicability**
Although it may be difficult to apply in urban areas, due to space constraints, site reforestation/revegetation can be used on a wide variety of development sites, including residential, commercial, industrial and institutional development sites in rural and suburban areas. When compared with other low impact development practices, it has a moderate construction cost, a relatively low maintenance burden and requires no additional surface area beyond that which will undergo the reforestation/revegetation process. It is ideal for use in pervious areas that have been disturbed by clearing, grading and other land disturbing activities.

### 4.22.4 Planning and Design Criteria

It is recommended that the reforestation/revegetation process used on a development site meet all of the following criteria to be eligible for the stormwater management “credits” described above:

**General Planning and Design**
- Reforested/revegetated areas should have a contiguous area of 10,000 square feet or more.
- Reforested/revegetated areas should not be disturbed after construction (except for disturbances associated with landscaping or removal of invasive vegetation).
- Reforested/revegetated areas should be protected, in perpetuity, from the direct impacts of the land development process by a legally enforceable conservation instrument (e.g., conservation easement, deed restriction).

**Landscaping**
- A soil test should be performed to determine what type of vegetation can be supported by the soils in the area to be reforested/revegetated and/or what soil amendments will be required.
- A landscaping plan should be prepared by a qualified licensed professional for all reforested/revegetated areas. The landscaping plan should be reviewed and approved by the local development review authority prior to construction.
- Landscaping commonly used in site reforestation/revegetation efforts includes native trees, shrubs and other herbaceous vegetation. Because the goal of the site reforestation/revegetation
process is to establish a mature native plant community (e.g., forest), managed turf cannot be used to landscape reforested/revegetated areas.

- Methods used for site reforestation/revegetation should achieve at least 75 percent vegetative cover one year after installation.
- A long-term vegetation management plan should be developed for all reforested/revegetated areas. The plan should clearly specify how the area will be maintained in an undisturbed, natural state over time. Plan should include method for watering during plant establishment period of one to two years. Turf management is not considered to be an acceptable form of vegetation management. Consequently, only reforested/revegetated areas that remain in an undisturbed, natural state are eligible for this “credit” (i.e., pervious areas consisting of managed turf are not eligible for this “credit”).

4.22.5 Construction Considerations

To help ensure that the site reforestation/revegetation process is successfully completed on a development site, site planning and design teams should consider the following recommendations:

- Document the condition of the reforested/revegetated area before, during and after the completion of the site reforestation/revegetation process.
- To help prevent soil compaction, heavy vehicular and foot traffic should be kept out of all reforested/revegetated areas before, during and after construction. This can typically be accomplished by clearly delineating reforested/revegetated areas on all development plans and, if necessary, protecting them with temporary construction fencing.
- Simple erosion and sediment control measures, such as temporary seeding and erosion control mats, should be used on reforested/revegetated areas that exceed 2,500 square feet in size. If the reforested/revegetated areas will “receive” any stormwater runoff from other portions of the development site, measures should be taken (e.g., silt fence, temporary diversion berm) to prevent it from compromising the reforestation/revegetation effort.
- Construction contracts should contain a replacement warranty that covers at least three growing seasons to help ensure adequate growth and survival of the vegetation planted on the reforested/revegetated area.

4.22.6 Inspection and Maintenance Requirements

Reforested/revegetated areas require some maintenance during the first few months following construction, but typically require very little maintenance after that. Table 7.94.22.2 provides a list of the routine maintenance activities typically associated with reforested/revegetated areas.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water to promote plant growth and survival.</td>
<td>As Needed (Following Construction)</td>
</tr>
<tr>
<td>Inspect reforested/revegetated area following rainfall events. Plant replacement vegetation in any eroded areas.</td>
<td>Annually (Semi-Annually During First Year)</td>
</tr>
<tr>
<td>Inspect reforested/revegetated area for erosion. Plant replacement vegetation in any eroded areas.</td>
<td></td>
</tr>
<tr>
<td>Inspect reforested/revegetated area for dead or dying vegetation. Plant replacement vegetation as needed.</td>
<td></td>
</tr>
<tr>
<td>Prune and care for individual trees and shrubs as needed.</td>
<td></td>
</tr>
</tbody>
</table>

All best management practices require proper maintenance. Without proper maintenance, BMPs will not function as originally designed and may cease to function altogether. The design of all BMPs includes...
considerations for maintenance and maintenance access. For additional information on inspection and maintenance requirements, see Appendix XX.

Additional Resources


