5.2.4 Protect and Preserve Natural Vegetation

Description

Natural vegetation, especially vegetation growing along flow paths and on steep hillsides, plays a major role in protecting Chattanooga from flooding, erosion, and landslides.

Typical development often begins with mass clearing, grubbing, and leveling of a project site to provide flat locations for large buildings. In the process, vegetation is removed, soils damaged, and drainage pathways obliterated. Remnant natural vegetation is often found on environmentally sensitive areas, such as steep slopes, wet areas, and rocky outcrops, where development was previously difficult and expensive. Destabilization of steep slopes can increase the cost of the project and ultimately impact the health and safety of the development.

The purpose of this BMP is to provide alternatives to the owner, designer, and contractor to avoid encroachment upon, disturbance to, and alteration of natural vegetation and to preserve these areas in a manner that benefits the development and reduces costs.

Because the term “Native Vegetation” is widely misunderstood and defined in a number of different ways, this BMP description explains several commonly used phrases that characterize different components of native vegetation. The term “Natural Vegetation” is used in this BMP to allow for naturalized plants, cultivars, and ornamentals as discussed below:

- Native Vegetation is not used to describe a single plant, but is understood to mean a community of plant species, growing together under similar environmental conditions. In general, this group of plants has adapted to a particular site and to its companions over a long period of time. Native vegetation found on a project site may be only a small portion or remnant of a former intact plant community. These remnants may be as small as a leftover grove of trees or as large as a mountain forest.

  Human impact is global and there is no pristine untouched landscape. The somewhat disturbed pieces of vegetation likely to be found on a development site in Chattanooga consist of native plants, exotic naturalized plants, and exotic invasive plants. Because there is considerable confusion about the meaning of these terms, they are defined briefly below:

  – In this manual, “Native Plants” are defined as those plants that have evolved with other plants and animals in response to specific conditions of climate, geology, landforms, soils, and water, and have not been seriously disturbed by human beings.

  – “Exotic Plants” are defined as plant species carried away from their native habitats and introduced to new places, by intention or by accident. Again, this definition is fuzzy because in

many cases, the specific origin of a plant is not known. These plants can simply naturalize and become a balanced member of the community, or they can overwhelm the other vegetation, becoming destructively invasive.

"Cultivars" and "Ornamentals" are non-native, exotic plants. Cultivars are plant varieties produced in cultivation by selective breeding. These plants are selected for particular characteristics, and when propagated, pass on these qualities.

- "Naturalized Plants" are non-native, exotic plants that do not need human help to survive and thrive over time in areas where they historically do not naturally occur. There is a general consensus in the scientific community that an "exotic plant," which does not spread aggressively in the landscape or significantly alter existing environmental conditions, is relatively harmless and can be planted and should be protected.

- "Invasive Plants" are non-native, exotic plants that are able to establish on many sites, grow quickly, and spread to the point of disrupting plant communities or ecosystems. Invasion by non-native plants reduces native plant diversity and abundance, and alters the species, structure, and functions of long-established plant communities. The much altered landscape of our urban and suburban areas encourages these species, which tolerate and even thrive in and around disturbance. At the same time, populations of more sensitive native species shrink, reducing competition and further encouraging the spread of disruptive species.

  "An invasive species is defined as a species that is 1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health."
  Presidential Executive Order 13112 (February 1999)

  Invasive exotic plants frequently found in eastern Tennessee are listed at:
  http://www.tneppc.org/invasive_plants.

  The USDA Federal and State Lists of Invasive and Noxious Weeds can be found at:
  http://plants.usda.gov/java/noxiousDriver#state.

- Flow paths are corridors where surface water (sheet flow) concentrates and travels from one place to another. These paths range from shallow swales to large river corridors. These flow paths may or may not be documented as drainage channels or intermittent or perennial streams on USGS maps, but can be identified by using the contours on the site survey with additional field verification.

- Steep slopes are generally defined as land with a slope angle of 15 percent or greater for a minimum of 100 feet horizontally. Development on steep slopes can create problems:

- Construction on steep slopes is costly and can include the expense of cut and fill, earthwork, retaining walls, erosion prevention, etc.
- Cities and towns can be left with heavy costs for erosion and pavement failure.
- Landslides include not only the direct costs associated with property damage, but also the indirect costs of loss of tax revenues, reduced real estate values, and degraded water quality.
- If development is allowed on steep slopes, care should be taken not to disturb natural scenic features, such as escarpments, cliffs, or rock outcroppings.
- Steep slopes are the places that most often have remnant natural vegetation.

- Critical Habitat Areas − Tennessee Wildlife Resources Agency has produced a comprehensive wildlife conservation strategy report with maps indicating priority terrestrial, aquatic, and subterranean habitats to be protected: http://www.state.tn.us/twra/cwcs/tncwcs2005.pdf.

BMP Functions Table

Many stormwater best management practices seek to mimic the stormwater management function of existing, mature plant communities, using infiltration, filtration, and evapotranspiration, etc. Preserving existing natural vegetation can be a very cost-effective BMP. High-quality existing vegetation can reduce peak discharge and runoff, minimize erosion and sedimentation, sequester carbon, reduce the heat island effect, and be aesthetically pleasing.

BMP	Applicability	Volume Reduction	Water Quality	Peak Rate Reduction	Recharge	Runoff Temperature Mitigation	Heat Island	Habitat Creation	Maintenance Burden	Cost
Protect and Preserve Natural Vegetation	U/S/R	H	H	H	H	H	H	H	L	L

KEY: U = Urban; S = Suburban; R = Rural; H = High; M = Medium; L = Low

Vegetation along Flow Paths

Vegetation protects the integrity of these flow paths by:
- Stabilizing banks and binding soil particles in place.
- Reducing the velocity of runoff.
- Enhancing and maintaining infiltration capacity.

Vegetation on Steep Slopes

Vegetation stabilizes slopes prone to surface sliding and/or movement of soil and loose rocks by:

- Reinforcing the soil with roots.
- Depleting excess soil water through transpiration.
- Reducing stormwater velocity by leaf interception.
- Reducing nutrient runoff into water bodies.
- Preserving existing drainage patterns.

Key Design Guidelines

- Identify steep slopes 15 percent and over, flow paths, and significant natural vegetation (even small remnants).
- Prioritize protection of vegetation based on critical locations within the drainage area and by the health of the vegetation.
- Plan and design the development project to preserve existing vegetation.
- Existing vegetation on the site may be highly disturbed, making protection a lower priority.
- Create measures to ensure that construction disturbance does not impact protected vegetation.

Advantages

- Low-cost and low-maintenance BMP.
- Stabilizes slopes.
- Reduces flooding hazards.
- Reduces erosion and sedimentation.

Disadvantages

- Can conflict with development goals or construction activities.
- Requires unfamiliar efforts and practices.

Applications

This BMP can be applied to sites with a broad range of scales and functions:

- This BMP is most applicable to sites with pronounced topographic change and identifiable streams, creeks, drainage channels, and swales.
- It is always applicable in rural areas and more applicable in areas of suburban or light urban development than the dense downtown.

If the site does not have existing vegetation, or the existing vegetation is of low quality (e.g., the majority of the species are invasive or the majority of the species are diseased or infested with pests), see section 5.4.2, Improve Native Cover Types, in this manual.

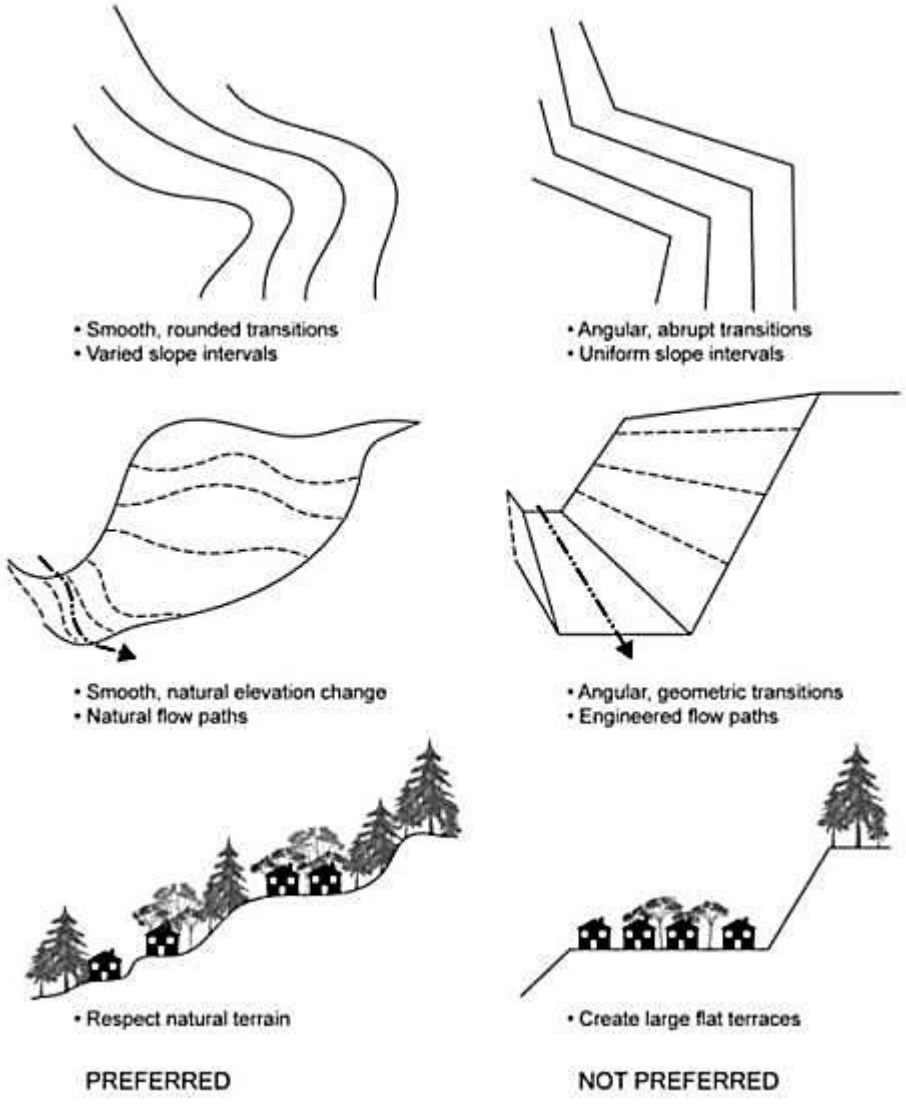

Figure 5.2.4-1. Protect existing slopes and flow paths.

Applicable Protocols and Specifications

Protocol 5 Planting Guidelines

Design Considerations

The overall purpose of this BMP is to discourage mass clearing and grubbing and unnecessary land disturbance of any kind. Vegetated areas, particularly in environmentally sensitive areas, such as steep slopes, along flow paths, and in critical habitats, should be a priority consideration throughout the design process and should be carefully evaluated for impacts throughout the development process.

- See Section 5.2.1.2 for detailed information regarding protection of steep slopes.
- See Section 5.2.2 for detailed information regarding protection of natural flow paths.
- See Section 5.2.3 for detailed information regarding protection of riparian corridors.

Figure 5.2.4-2. Protect environmentally significant areas such as flow paths.

<u>Analyze Existing Vegetation</u>

- Desktop Analysis
  In the concept phase, evaluate existing vegetation onsite by reviewing topographical surveys, aerial photography, and other resources (Google Earth Historic Photo Viewer, ArcGIS, archives of local historical societies, NRCS soil data, etc.). Delineate roughly the areas of:
  - Vegetation
  - Steep slopes – 15 percent and greater
  - Drainage patterns (see Section 5.2.2, Protect and Incorporate Natural Flow Paths, in this manual)

- Field Assessment
  With a rough overview of the site from the existing data, evaluate vegetation in the field in the preliminary phase. Determine and identify:
  - The location and condition of steep slopes greater than 15 percent, drainage pathways, and critical habitat areas.
  - Plant community type (i.e., red maple swamp).
  - Companion plants for that community.
  - Predominant species composition in the over-story, mid-canopy, understory, and ground layer.
  - Plant community age (successional stage or age of landscape – field to forest).

- Vegetation condition (healthy, declining, dying, non-native invasives, etc.). Note the presence of emerging diseases and pests (emerald ash borer, oak wilt, southern pine beetle, hemlock wooly adelgid, etc.).
- Ground condition (presence of fill, dumping, lack of organic matter, erosion, etc.).

The team landscape architect in coordination with an arborist or ecologist familiar with local ecosystems can determine the existing or remnant plant communities of the site.

Reference *U.S. Terrestrial Vegetation of the United States* (Grossman et al. 1998), Nature Serve and its State Natural Heritage partners http://www.natureserve.org/.

Field assessments of vegetation systems and species may also provide clues as to what species perform well on a site.

Prioritize Areas To Be Protected

Chose areas with:

- Higher conservation status, as defined by Nature Serve and the Tennessee State Natural Heritage program, http://www.tn.gov/environment/na/nhp.shtml.
- Mature forest stands.
- Systems in hydrologically significant areas (wetlands, areas immediately downhill from large impervious areas, natural flows paths, etc.).
- Systems in environmentally sensitive areas as defined by a local, state, or federal agency or areas that provide habitat for endangered or threatened species, http://www.state.tn.us/twra/cwcs/cwcsindex.html.
- Vegetation on steep slopes and ridge tops.
- Vegetation in flow paths.
- Vegetation in culturally significant areas, including view sheds (as defined by a local, state, or federal agency), http://www.chcrpa.org/divisions_and_functions/Comprehensive_Planning/CompPlan2030/Full_w_Appendices.pdf.
- Areas that maintain connectivity within a regional vegetated corridor, such as riparian or migratory corridors.

Design Strategies

- Incorporate Protection in Site Design
  - Identify and designate “Protected Areas” and “Areas of Minimal Disturbance” (see Section 5.2.1, Protect Undisturbed and Healthy Soils, in this manual for a description of these areas). Show these areas on the Existing Conditions Assessment and Site Protection Plan, the Grading and Soils

Plan, the Erosion and Sediment Control Plan, and the Stormwater Plan for both preliminary and final phases.
  - Areas of Minimal Disturbance will require application of Section 5.4.3, Restore and Amend Disturbed Soils, in this manual to receive credit.
  - Incorporate these areas into the overall landscape design plan for the site. Existing and proposed landscape types should work together to create functional and beautiful spaces.

- During the site design process, make every effort to avoid placing buildings and roads on Protected Areas and Areas of Minimal Disturbance. During the concept and preliminary stormwater management plan phases, reexamine proposed site plans to reduce site disturbance. Revisions should include minimizing impervious surfaces of all kinds, including circulation routes and building footprints, and minimizing land disturbance wherever possible (see Section 5.2.1.1, Preserving Landforms, in this manual).

- Design to protect designated areas. Rogue trails are created, and site resources are damaged, where circulation is poorly planned. Buffer protected areas by maintaining existing strips or creating new strips of vegetation that people would not care to walk through. These buffers will safeguard protected areas from damage by runoff and also help direct users to designated access routes after the project is implemented. (See Structural BMP 5.3.6, *Vegetated Filter Strips*, in this manual).

Construction Considerations

Site Protection

- The City of Chattanooga requires chain link fence around all protected areas.

Mitigate Impact from New Construction

- Edge conditions − Construction often leaves transition areas between remnant natural vegetation and building sites in a highly disturbed condition.
  - Locations where new grades meet steep slopes require sensitive grading to ensure a seamless transition.

Figure 5.2.4-3. Erosion at steep slope transition.

- Do not push excess soil over a slope edge when leveling areas above.
- Stabilize edges where a remnant natural area meets a manmade landscape.
- Where portions of a natural landscape, such as a forest, have been cut away to accommodate development, leaving islands of remnant vegetation and repair of the newly exposed edges are critical.
    - Regrade where necessary, stabilize the soil, and replant with fast-growing, tough native edge species.
    - Repairing damaged edges will protect the health of the natural landscape and enhance its stormwater benefits.
    - Where forest edges have been cut, trees are often vulnerable to wind throw. Replant a strip of fast-growing trees along newly exposed edges to buffer the remaining native landscape from increased wind, light, noise, and other impacts.

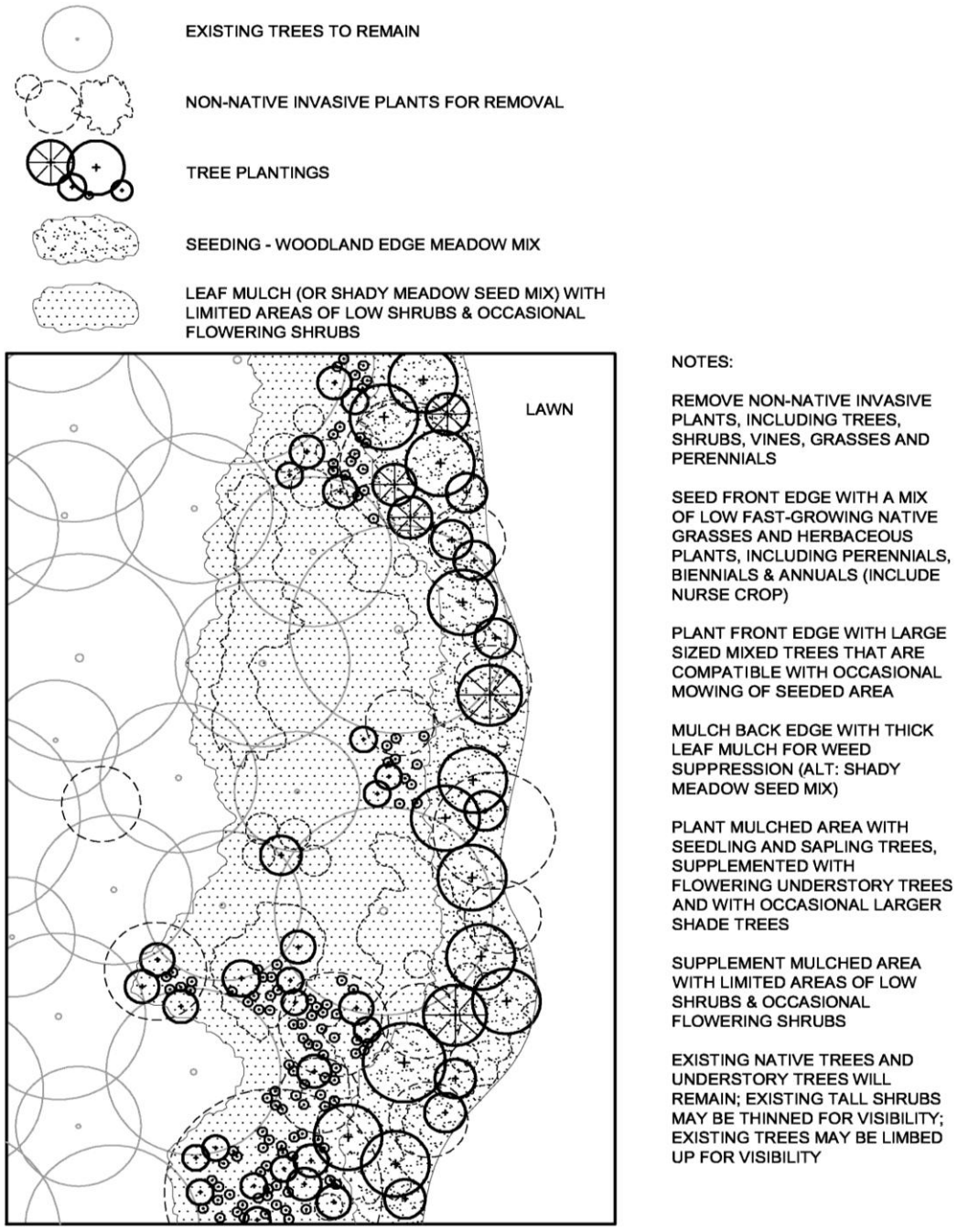

Figure 5.2.4-4. Repair forest edge – sunny.

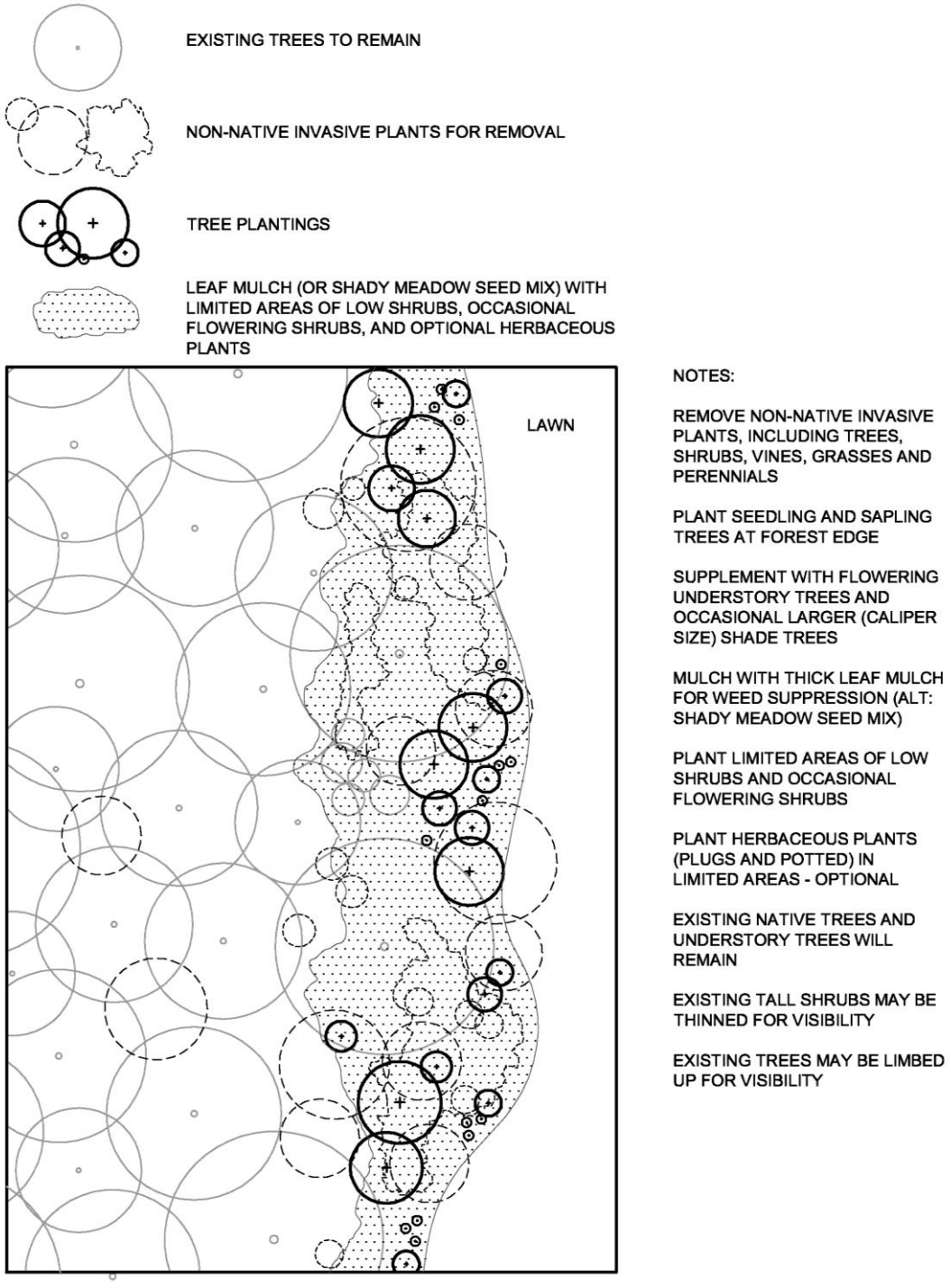

Figure 5.2.4-5. Repair forest edge – shady.

- See Section 5.2.1, Protect Undisturbed and Healthy Soils, in this manual, for steps in concept and preliminary design phases.
- Monitor areas designated as Protected Areas for impacts throughout the development and construction of the project design.

Operations and Maintenance

Although established native vegetation requires little maintenance, some additional steps may be necessary:

- Evaluate the need for additional temporary irrigation during drought conditions for at least a two-year recovery period, especially around disturbed edges.
- Monitor before, during, and after construction for any signs of erosion, disease, and invasive species and take corrective action.

References

Grossman D.H., D. Faber-Langendoen, A.S. Weakley, M. Anderson, P. Bourgeron, R. Crawford, K. Goodin, S. Landaal, K. Metzle, K.D. Patterson, M. Pyne, M. Reid, and L. Sneddon. 1998. *International classification of ecological communities: terrestrial vegetation of the United States*. Volume I, The National Vegetation Classification System: development, status, and applications. The Nature Conservancy: Arlington, VA.

Harker, Evans. 1993 *Landscape Restoration Handbook*, Lewis Publishers & United States Golf Association.

National Park Service. 1994. *36 Preservation brief: Protecting cultural landscapes- planning, treatment and management of historic landscapes*. Retrieved from http://www.nps.gov/hps/tps/briefs/brief36.htm.

Nature Serve. 2004. An *Invasive Species Assessment Protocol Evaluating Non-Native Plants for Their Impact on Biodiversity,* Retrieved from http://www.natureserve.org/library/invasiveSpeciesAssessmentProtocol.pdf.

Sustainable Sites Initiative. 2009. *Guidelines and Performance Benchmarks 2009.* Retrieved from http://www.sustainablesites.org/report/.

Tennessee Wildlife Resource Agency. 2005. *Tennessee Comprehensive Wildlife Conservation Strategy,* http://www.state.tn.us/twra/cwcs/tncwcs2005.pdf.

U.S. Department of Agriculture Natural Resources Conservation Service. 1996. *Engineering Field*

Handbook, Chapter 16 Streambank and Shoreline Protection and Chapter18 Soil Bioengineering for Upland Slope Protection and Erosion Reduction. Retrieved from www.fs.fed.us/publications/soil-bio-guide/.

U.S. Department of Agriculture Natural Resources Conservation Service. 2012. *The PLANTS Database.* Available from http://plants.usda.gov, 20 July 2012. National Plant Data Team, Greensboro, NC 27401-4901 USA.

U.S. Fish and Wildlife Service. 1999. *Executive Order 13112 (Federal Register Vol. 64, No.25).* Washington, DC: US. Federal Register.

Criteria Checklist BMP 5.2.4

ITEM DESCRIPTION	YES	N/A
The following checklist provides a summary of design guidance by the owner/applicant for successful implementation.		
• Steep slopes above 15 percent, drainage flow paths, and critical habitat areas if any are identified and included in documentation for all three design phases: concept, preliminary, and final.	☐	☐
• Vegetative cover has been evaluated by aerial photograph in concept phase.	☐	☐
• Vegetative cover has been evaluated by field assessment in preliminary phase. Photo documentation required. Plant community type, predominant species composition, community age, vegetation condition, and ground condition noted as narrative on site assessment.	☐	☐
• Prioritize protection of vegetation based on critical locations within the drainage area and by the health of the vegetation.	☐	☐
• Prioritized vegetation areas are designated “Protected Areas” and/or “Areas of Minimal Disturbance” and are delineated clearly on the Existing Conditions Assessment, Site Protection Plan, Grading and Soils Plan, Erosion and Sediment Control Plan, and Stormwater Plan.	☐	☐
• “Protected Areas” and/or “Areas of Minimal Disturbance” are safeguarded from sediment and stormwater loads during construction.	☐	☐
• Protection, fencing details, and associated signage details for “Protected Areas” and/or “Areas of Minimal Disturbance” have been provided.	☐	☐
• Provide written description of any work that may need to be performed within “Areas of Minimal Disturbance.”	☐	☐
• Smallest and lightest machinery is to be used in “Areas of Minimal Disturbance.”	☐	☐
• Details provided for protective layer on soil to absorb and spread compressive forces for work done in “Areas of Minimal Disturbance.”	☐	☐
• Notes on drawing clearly provide sequence for removal of protective layers and soil restoration if required in “Areas of Minimal Disturbance.” (Once removed, contractor performs a light tilling of soil to prevent surface crusting, including compost tea and other amendments.)	☐	☐
• Newly exposed forest edges have planting plan and maintenance strategy.	☐	☐
• Removal and management plan for invasive exotics within protected and minimal disturbance areas has been submitted during preliminary and final review phases along with schedule of tasks per season and timeline.	☐	☐
• Replanting plan for bare areas or those area left exposed by removal of invasive exotics has been incorporated into the Preliminary and Final planting plan.	☐	☐