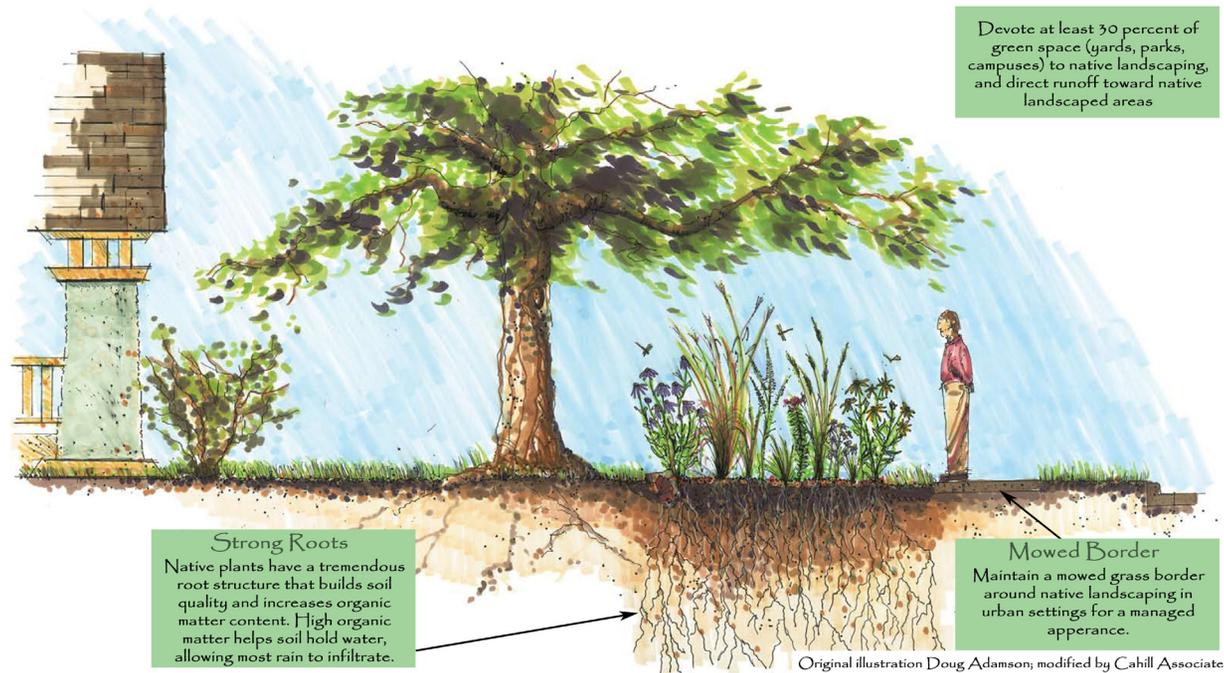


Landscape Restoration with Natives



Landscape Restoration, including restoration of forest and/or meadow from lawn/maintained turf, is an effective method of improving runoff quality and reducing runoff volume. Landscape Restoration involves conversion of an existing lawn or otherwise maintained area into a native vegetative cover, such as natural/native woodland (preferred) or meadow. This conversion typically occurs through intentional re-planting and re-vegetation and then proper maintenance of the restored landscape as it matures. Landscape Restoration may occur throughout an entire property or lot for maximum benefit, or may be limited to portions of a property.

Landscape Restoration involves the careful selection and use of vegetation that does not require significant chemical maintenance by fertilizers, herbicides and pesticides. Implicit in this BMP is the assumption that native species have the greatest tolerance and resistance to pests and require less fertilization and chemical application than do non-native species. The good news is that a remarkable number of homeowners in Trout Creek Watershed have tucked their homes into the "natural" forest with minimum disturbance and minimum maintenance. The bad news is that many have not, opting for large-scale conversion of the native forest to maintained lawns - even on the many steeply sloping hillsides which dominate the Watershed, worsening water quality and water quantity impacts. These maintained areas need to be restored to their natural (native) cover condition.



Image: JFNew



Image: Cahill Associates, Inc.

Benefits



Benefits

Native species are customarily strong growers with stronger and denser root and stem systems, thereby generating less runoff. Meadow re-establishment is more environmentally beneficial than conventional lawn planting, although not so much as the woodland landscape. Native grasses tend to have substantially deeper roots and more root mass than turf grasses, which results in:

- Increased volume of water uptake (evapotranspiration)
- Improved soil conditions through organic material and macropore formation
- Greater infiltration
- Minimizes use of pesticides
- Creates habitat

If the objective is re-vegetation with woodland (which is the natural cover of the Trout Creek Watershed), rather than meadow species, the longer-term effect is an even greater reduction in runoff volumes, with increases in infiltration, evapotranspiration, and recharge, when contrasted with conventional lawn planting (woodlands are even better than meadows). Peak rate reduction also is achieved. Again, these benefits are long term in nature and will not be forthcoming until the species have had an opportunity to grow and mature (one advantage of the meadow is that this maturation process requires considerably less time than a woodland area).

Landscape Restoration **improves water quality** preventively by minimizing application of fertilizers and pesticides/herbicides. Given the high rates of chemical application which have been documented at newly created maintained areas for both residential and nonresidential land uses, eliminating the opportunity for chemical application is important for water quality - perhaps the most effective management technique. Of special importance here is the reduction in fertilization and nitrate loadings. For example, Delaware's *Conservation Design for Stormwater Management Manual* lists multiple studies that document high fertilizer application rates, including both nitrogen and phosphorus, in newly created landscapes in residential and nonresidential land developments. Expansive lawn areas in low density single-family residential subdivisions as well as large office parks - development which has and continues to proliferate in Pennsylvania municipalities - typically receives intensive chemical application, both fertilization and pest control, which can exceed application rates being applied to agricultural fields. Avoidance of this nonpoint pollutant source is an important water quality objective.



Image: Cahill Associates, Inc.

Planting native grasses will save you labor in the garden. Native grasses choke out weeds because they have dense fibrous root systems that discourage weeds from spreading.

Once the landscape is restored, **water quantity benefits** are substantial as well. Typical (i.e. compacted) lawns on gentle slopes can produce almost as much runoff as pavement. In contrast to turf, natural forested soils with similar overall slopes can store up to 50 times more precipitation than neatly graded turf (Arendt, *Growing Greener*, pg. 81). The Landscape Restoration BMP is especially compelling when one considers the many different Trout Creek Watershed examples where home runoff, lacking any other management, is being distributed into existing woodland areas - even on steep slopes - and there is no evidence of erosive flows or adverse runoff conditions resulting. In this large-lot low-density Watershed, distribution of runoff into good quality woodland areas becomes a very successful stormwater management practice.

Native prairie grasses have complex (and extremely deep!) root systems that nourish the plants during the dry season.

Most frontyards in the Watershed are seeded with Kentucky Bluegrass.

Notice how short the root growth of Kentucky Bluegrass is compared to the others!

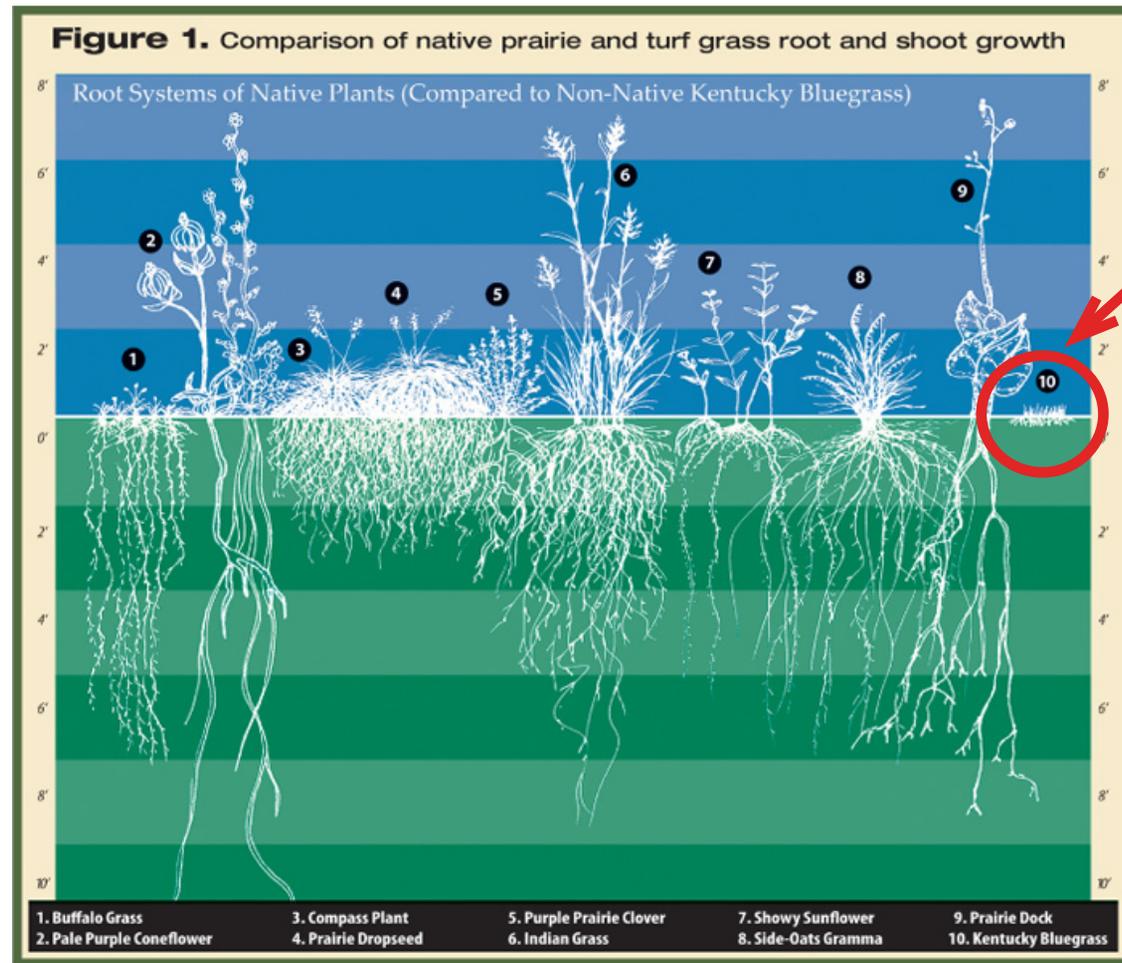


Image: Heidi Natura of the Conservation Research Institute

As the woodland matures, more and more precipitation and runoff from adjacent areas is **infiltrated** into the ground, providing both total volume control and peak rate control for the Watershed.

Cost Considerations

Landscape Restoration construction costs range from minimal for meadow restoration to moderate for woodland restoration, depending upon size of trees being planted. For meadows, seeding for installation of a conventional lawn is likely to be less expensive than planting of a "cover" of native meadow species, although when contrasted with a non-lawn landscape, "natives" often are not more costly than other non-native landscape species.

In terms of woodland restoration, somewhat dated (1997) costs have been provided by the *Chesapeake Bay Riparian Handbook: a Guide for Establishing and Maintaining Riparian Forest Buffers*:

- \$ 860 / acre trees with installation
- \$1,600 / acre tree shelters/tubes and stakes
- \$ 300 / acre for four waterings on average

In current dollars, these values could be considerably higher and these values do assume professional installation with well-established trees. Costs for meadow reestablishment are lower than those for woodland, in part due to the elimination of the need for shelters/tubes.

Cost differentials take on substantially different meaning when longer-term operating and maintenance costs are taken into account. If lawn mowing can be eliminated, or even reduced significantly to a once per year

Costs



Meadows support a higher number of species than many other ecotypes. Lawns usually support only one or two species.



Images: Cahill Associates, Inc.

requirement, substantial maintenance cost savings result. If chemical application (fertilization, pesticides, etc.) can be eliminated, substantial additional savings result with use of native species, woodland or meadow. These reductions in annual maintenance costs resulting from a native landscape re-establishment very quickly outweigh any increased installation costs that are required at project initiation.

Ease of Development/Construction

Specific guidelines for Landscape Restoration are provided in the *Pennsylvania Stormwater BMP Manual* in BMP 6.7.2. As with the Riparian Buffer Restoration BMP discussed in this document, it is essential for successful Landscape Restoration that site conditions are well understood, objectives of the landowner are considered, and the appropriate plants are chosen for the site. A multi-step process is defined in this guidance document which includes: analysis of site soils and natural vegetative features, habitat significance, topography, etc., determination of restoration suitability, and site preparation.

Some additional considerations:

In those sites where soils have been disturbed or determined inadequate for restoration, soil amendments are required. **Soil amendment and restoration** is the process of restoring compromised soils by subsoiling and/or adding a soil amendment, such as compost, for the purpose of reestablishing its long-term capacity for infiltration and pollution removal.

The challenge in restoring woodland and meadow landscapes is a lack of **effective establishment** and maintenance methods. Young trees, understory species, native grasses, and flowers establish more slowly than weeds and turf grass. Therefore, care must be taken when creating woodland and meadow on sites where weed or other vegetative communities are well-established. It may take a year or more to prepare the site and to get weeds under control before planting. Erosion prone sites should be planted with a nurse crop (such as annual rye) for quick vegetation establishment to prevent seed and soil loss. Steep slopes and areas subject to water flow should be stabilized with erosion blankets, selected to mitigate expected runoff volumes and velocities.



Image: Cahill Associates, Inc.

Forest restoration includes planting of appropriate tree species (small saplings) with quick establishment of an appropriate ground cover around the trees in order to stabilize the soil and prevent colonization of invasive species. Re-forestation can be combined with other volume control BMPs such as berming, vegetated

filter strips and vegetated swales. Plant selection should mimic the surrounding native vegetation and expand on the native species composition already at the site or adjacent areas. A mixture of native trees and shrubs is recommended.

The Delaware Department of Natural Resources and Environmental Control's *Conservation Design for Stormwater Management* states, "...a mixture of young trees and shrubs is recommended.... Tree seedlings from 12 to 18 inches in height can be used, with shrubs at 18 to 24 inches. Once a ground cover crop is established (to offset the need for mowing), trees and shrubs should be planted on 8-foot centers, with a total of approximately 430 trees per acre. Trees should be planted with tree shelters to avoid browse damage in areas with high deer populations, and to encourage more rapid growth." (p.3-50).

Conversion of turf grass areas to meadow is relatively simple and turf areas are good candidates for conversion to meadow as they typically have lower density of weed species. The conversion of turf to meadow requires that all turf be killed before planting, and care must be taken to control weed establishment prior to planting. Hydro-seeding is not recommended. Additionally, seed quality is extremely important to successful establishment. There is tremendous variation among seed suppliers, seeds should be chosen with a minimum percent of non-seed plant parts.

Ensure **adequate stabilization** in all Landscape Restoration projects. Adequate stabilization is extremely important as woodland species, native grasses, and meadow flowers establish more slowly than turf. Stabilization can be achieved for forest restoration by establishing a ground cover before planting of trees and shrubs. When creating meadows, it may be necessary to plant a fast growing nurse crop with meadow seeds for quick stabilization. Annual rye can be planted in the fall or spring with meadow seeds and will establish quickly and usually will not present a competitive problem. Erosion prone sites should be planted with a nurse



Image: Cahill Associates, Inc.

crop and covered with weed-free straw mulch, while steep slopes and areas subject to runoff should be stabilized with erosion control blankets suitable for the expected volume and velocity of runoff.

Aesthetics

Though "...beauty is in the eye of the beholder," multiple examples of homes within woodlands existing within the Watershed suggest a very attractive result. Initial phases of Restoration may be less than ideal aesthetically, as trees take time to mature and develop a reasonable canopy; special shorter-term "woodland floor" perennial species can be planted to improve aesthetics as the trees are maturing. Proper maintenance will serve to preserve aesthetics and keep the area being restored from appearing unkempt. Special edging treatment also can be used to define areas being restored and reinforce the intentional nature of the restoration in progress.

Aesthetics



Township Review

No Township review is necessary for a homeowner to undertake this BMP. The Township should be informed of the restoration plan so that Township staff are aware of special maintenance practices being imposed and its intentional nature.

Site Constraints

None. This BMP can be undertaken on private property.



Image: Cahill Associates, Inc.

Variations

There are a variety of different ways to achieve Landscape Restoration:

- Convert turf lawn to native woodland
- Convert turf lawn to native meadow
- Create woodland or meadow buffers between lawn areas, and wetlands or stream corridors
- Replacement of "wet" lawn areas difficult to mow
- Replace any hard to maintain lawns under mature trees into native woodland landscape

The natural vegetative condition of Trout Creek in most areas is woodland cover, such that most appropriate restoration would be back to a woodland condition. Meadow, planted with native species, also is an option.

Maintenance



Maintenance Issues

Meadows and Forests are low maintenance but not "no maintenance". They usually require more frequent maintenance in the first few years immediately following installation. **Forest restoration** areas planted with a proper cover crop can be expected to require annual mowing in order to control invasives. Application of a carefully selected herbicide (Roundup or similar glyphosate herbicide, following directions carefully) around the protective tree shelters/tubes may be necessary, reinforced by selective cutting/manual removal, if necessary.

This initial maintenance routine is necessary for the initial 2 to 3 years of growth and may be necessary for up to 5 years until tree growth and tree canopy begins to form, naturally inhibiting weed growth (once shading is adequate, growth of invasives and other weeds will be naturally prevented, and the woodland becomes self-maintaining). Review of the new woodland should be undertaken intermittently to determine if replacement trees should be provided (some modest rate of planting failure is usual).

Meadow management is somewhat more straightforward; a seasonal mowing or burning may be required, although care must be taken to make sure that any management is coordinated with essential reseeding and other important aspects of meadow reestablishment. In the first year weeds must be carefully controlled and consistently mowed back to 4-6 inches tall when they reach 12 inches in height.

Weeds should not be sprayed with herbicide as the drift from the spray may kill large patches of desirable plants, allowing weeds to move in to these new open areas. In the beginning of the third season, the young meadow should be burned off in mid-spring. If burning is not possible, the meadow should be mowed very closely to the ground instead. The mowed material should be removed from the site to expose the soil to the sun. This helps encourage rapid soil warming which favors the establishment of "warm season" plants over "cool season" weeds.