



Warwick Township

(Lancaster County, PA)

Open Space and Management Plan Guidelines



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WARWICK TOWNSHIP

315 Clay Road
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(Lancaster County)

Warwick Township Open Space and Management Plan Guidelines

The primary goal of the management plan is to protect and enhance the existing and proposed native vegetation features and protecting the water quality of the Lititz Run Watershed. The management of the open space and sustainable landscape features typically changes from the design and permitting phase, through construction and then long-term monitoring. These guidelines are designed to be used during each phase, to ensure consistency, by the Current Landowner as defined below.

The Open Space and Management Plan guidelines will supplement the Cluster Development Ordinance, Conservation Easement, Stormwater Easement, Woodland Protection Easement and the Riparian Buffer Easement.

Definitions:

Sustainable Landscapes: Planting disturbed areas or management of existing natural areas to promote and establish native plant communities.

Sustainable Landscape Contractor: An approved landscape contractor with a Chesapeake Bay Landscape Professional (CBLP) Level II and/or Pennsylvania Landscape & Nursery Association (PLNA) Sustainable Landscape Certification (SLC) along with 5 years experience in the installation of upland native grass and wildflower meadow; floodplain and wetland; reforestation and buffers and stormwater BMP's such as bioswales and rain gardens.

Sustainable Maintenance Contractor: an approved landscape maintenance contractor with a Chesapeake Bay Landscape Professional (CBLP) Level II and/or Pennsylvania Landscape & Nursery Association (PLNA) Sustainable Landscape Certification (SLC) along with 5 years experience in the maintenance of forest or upland native grass and wildflower meadows; floodplain and wetland; reforestation and buffers and stormwater BMP's such as bioswales and rain gardens.

Completion of Construction: Stormwater facilities will be considered complete when the Lancaster County Conservation District issues the Notice of Termination of the NPDES permit.

Fully Established Vegetation: Vegetation will be considered fully established when 75% of the site is established and certified by the Township Engineer.



Monitoring and Inspection: The property owner, or HOA, is responsible for providing an annual report which is used to report to EPA. If the owner does not provide the annual report the township will have the right to contract with a consultant to prepare the report and seek reimbursement.

Post Construction Stormwater Management Plan (PCSM Plan): Plan sheets that locate and identify the stormwater management features of a land development and details the individual BMP's.

Operations and Maintenance Notes: notes included as part of the Post Construction Stormwater Management plan (PCSM Plan) for land development that call out specific maintenance that needs to occur for an individual stormwater management facility or Best Management Practice (BMP).

Invasive Plant Species: Plants that were introduced into an environment where they did not evolve and have no natural enemies to limit their reproduction and spread. These plants produce significant changes to vegetation, composition, structure, or ecosystem function. DCNR Invasive Plant List, latest copy. <https://www.dcnr.pa.gov/Conservation/WildPlants/InvasivePlants/Pages/default.aspx>

Noxious Weed Species: Competitive, persistent, and pernicious plants designated by a Federal, State or county government as injurious to public health, agriculture, recreation, wildlife or property.

Homeowners Association (HOA): Entity created by Articles of Incorporation and Declaration of Planned Community that is responsible for ownership and maintenance of common areas, stormwater improvements and other improvements identified in the HOA documents.

Current Owner: Landowner or property owner responsible for implementing the Open Space and Management Guidelines. In many cases, this is the community HOA.

Inspections:

Warwick Township staff, or appointed consultant, inspects open space features and provides an annual report which is used to report to EPA. A monitoring report or letter is sent to the Current Landowner documenting the findings. Additional inspections may be required based upon the findings and in accordance with the Homeowner's Guide to Best Management Practices, Operations and Maintenance Manual.

Open Space Management - Planting or Disturbed Area Establishment

Implementation: Sustainable Landscape Contractor shall install the planting and seeding in accordance with the approved Landscape Plan for all proposed landscape improvements or features.

Implementation through Stabilization: Sustainable Landscape Contractor shall provide continued maintenance and monitoring in accordance with applicable maintenance standards until plantings are fully established. Areas of vegetation which die or fail to germinate and grow shall be either removed and replaced or reseeded during appropriate seeding windows in accordance with the Warwick Township Seed Mix Templates.

Fully Established Vegetation: Vegetation will be considered fully established when 75% of the site is established and certified by the Township Engineer.

Protection: Care shall be taken not to damage the existing vegetation and remaining structures/piping within the facility, during the maintenance operations.



Long Term Maintenance: Long term maintenance begins when the Township verifies the vegetation is fully established. The current landowner is responsible for long term maintenance and the Township must be notified when responsibility for maintenance is other than the current landowner.

Open Space Management – Existing Conditions

Forest Area - Areas within the property site that consist of stands of varying age and condition tree species with a shaded, canopied, understory.

Management Goal

- Maintain the existing tree canopy
- Protect and enhance the existing native plant communities
- Minimize the spread of invasive plants, particularly vines growing into canopy trees
- Minimize erosion from stormwater impacts

Management Issues and Strategies

The forested areas shall be left in their natural state and maintained to protect and enhance the function, health, and stability of the vegetation.

Invasive plants – Sustainable Maintenance Contractor shall identify and treatment and / or remove the invasive as needed to protect and enhance native vegetation. Invasive species determined to be threatening the overall health of the forested area should be removed annually or a management plan provided that identifies how the invasive species will be suppressed or managed. Check for and treat invasive species in accordance with industry standard treatments for the identified species. Pesticide application shall only be performed by a trained and certified applicator.

Dead or Diseased Trees – Live or dead trees shall not be cut down unless they are considered a safety hazard to the public or adjoining homeowners. If necessary, trees shall be cut down and laid in the forested area for wildlife habitat purposes. If a disease is observed, the qualified professional shall determine recommendations. Fallen trees shall remain within the forested area unless otherwise directed by the qualified professional. Relocate fallen trees from open space access locations, sanitary or storm sewer lines, and areas that may cause any significant drainage pattern alterations or create any other type of hazard.

Planting schedule – no supplemental plantings are proposed for the forested area.

Non-Forested Areas - The non-forest areas within the open space are generally characterized as open canopy, turf grass or meadow areas.

Management Goal

- Protect the existing and proposed native plant communities

Management Issues and Strategies

Invasive plants – The Sustainable Maintenance Contractor shall identify upland, non-forested, meadow areas for invasive shrubs, trees, perennials and vines. Treatment and / or removal of the



invasive species shall be performed as necessary to ensure overall health of the non-forested areas.

Turf grass area - The areas with or without trees which may be used by the residents for a variety of purposes shall be mowed regularly to allow for passive recreational use.

- Maintenance - turf grass areas shall be mowed and maintained with good vegetative cover in accordance with acceptable landscape standards. Grassed areas adjacent to roads, parking areas and residential units may be mowed more frequently, at the discretion of the Current Owner. The frequency of the mowing shall vary depending on the season and weather conditions. Expansive lawn areas located where reduced mowing aesthetic is acceptable shall be mowed a minimum of once every two months during the growing season to control invasive species and woody material.
- Lawn area maintenance may require the application of fertilizer, herbicide, or pesticide on a regular basis throughout the growing season. Chemical applications shall be applied only per manufacturer recommendations under the guidance of a qualified professional.

Grass and wildflower meadow area

- Field signage for designation of wildflower areas shall be posted
- The area of natural vegetation undisturbed during construction or replanted; such areas may contain trails. Meadows shall be maintained as such. Maintenance may be minimal but shall prevent the proliferation of undesirable plants. Managing weeds is preferred to be addressed with hand pulling weeds and spraying. Mowing is permitted if weeds become out of control in the first years of establishment.
- Maintenance - meadow areas shall be actively managed as meadow grass and forbs. The areas shall be mowed annually in late winter or early spring to a height of no less than 6". No mowing shall occur during the nesting season of May 1 - July 15, except as needed for time-sensitive control of invasive plants if deemed appropriate by a qualified professional. HOA shall notify the Township if mowing is to occur during the May 1 - July 15 timeframe. Notification shall include specific details regarding invasive plant management that is to be addressed with the mowing. One (1) additional mowing per year (or use of herbicides) should only occur with approval of a qualified professional to address invasive plant species.
- No mowing shall occur within 25' of the stream banks.
- At the direction of a qualified professional, supplemental native species seeding shall be considered to fill dead gaps, compete with dominant invasive species, and improve overall meadow diversity.

Riparian Buffer - Newly planted riparian buffer plantings in accordance with the Riparian Buffer ordinance. Areas proposed for riparian buffer planting shall be managed in accordance with the suggested open space management for the existing conditions, as outlined above, prior to planting riparian buffer trees. A variety of trees and shrubs are recommended to enhance the canopy cover in this critical area for water quality.



Management Goals

- Provide long term growth success of newly established plant material to developed forest canopy
- Encourage successional growth of native plant communities within the buffer area

Management Issues and Strategies

Critical Management period

The first 3-5 years of establishing a Riparian Buffer are the most critical to the long-term success of the planting. Replanting and reseeding are important maintenance practices within the first few years. The following outlines the recommended timeline and procedure for maintaining a newly planted riparian buffer during the first 5 years:

Yearly in winter (years 1-5)

- Straighten and/or replace stakes and shelters as needed.
- Check for invasive species and weed out of tree shelters during growing season.
- Check for dead plant material and mark for replacement when appropriate.
- Remove bird nets from trees that will reach the top of the tubes during the coming growing season, generally 18" from the top or less.
- Remove any debris or nests from the shelters that may cause damage to the tree or shrub
- Remove or cut shelters when trees are 2" diameter or more at the top of the tubes. Remove non-wooden stakes.

Yearly in Spring (Years 1-3)

- Replace dead plant material as required.
- If mowing is not planned as part of maintenance of the planted area, spray a 4'-6' ring of herbicide around shelters to suppress voles and vegetation competition.
- If mowing is planned as part of maintenance to suppress voles and vegetation competition, spray 4'-6' wide strips of herbicide centered on tree shelters.
- Pesticide application shall be performed by a trained and certified applicator.

Yearly in Summer (Years 1-3)

- Manage vegetation that was not treated with broad herbicide application.
- Focus efforts on aggressive noxious and invasive species and treat as necessary per species requirements.
- Mow between shelters to control weed and voles, avoid bumping shelters.

Yearly in Fall (Years 1-3)

- If mowing is not planned as part of maintenance of the planted area, spray a 4'-6' ring of herbicide around shelters to suppress voles and vegetation competition.
- If mowing is planned as part of maintenance to suppress voles and vegetation competition, spray 4'-6' wide strips of herbicide centered on tree shelters.

- If vole damage is present late fall mowing is recommended to reduce cover for voles and increase predation.

As Needed (Years 1-5+)

- Check for tree and shelter damage after storms and flooding events.
- Check for and treat invasive species using herbicide spot treatment or mowing/cutting.
- In years 5+ yearly inspections should be performed to observe and treat high priority invasive species as necessary.
- Once all tree tubes have been removed per recommendations, the management practice of the riparian buffer shall follow “**Open Space – Forested Area**” management guidelines.

Stormwater Facilities and BMP's - Within the Open Space or within Stormwater easements, there are various surface and subsurface stormwater facilities to manage and direct stormwater on the property. These include stormwater conveyance structures (inlets, piping, and outlets), vegetated swales, surface stormwater basins, and subsurface infiltration beds. The Current Owner is responsible for maintaining stormwater Best Management Practices (BMP's). Refer to the SWM Operation and Maintenance Agreements.

Management Goal

- Maintain the facilities to meet the intent of the stormwater design including
- Promote groundwater recharge
- Improve water quality
- Provide peak rate detention

Management Issues and Strategies

The Current Owner shall be responsible for maintaining the stormwater management facilities located in the open space areas in good, clean, unobstructed, and proper operating condition, in accordance with the subdivision and land development plan documents. The stormwater management facilities located within open space areas shall be maintained by the Current Owner with tall native grasses and plant species capable of tolerating wet/dry conditions as designed. The aforesaid maintenance obligations shall include normal and routine surface maintenance, mowing of grass and removal of debris, as well as any structural maintenance which may be required for proper operation and performance of the stormwater management facilities per the Stormwater Management Operation and Maintenance Agreement.

Typical Management Practices

Vegetation within and over the BMP's, Roadway vegetative swales along greenways and open space, and vegetative swales in Greenway areas

- Areas shall not be subject to grading or movement of existing soil.
- Inspect open basin areas for excess sediment and remove promptly.
- Inspect vegetation to evaluate health.



- Existing vegetation in a healthy condition may not be removed.
- Invasive non-native vegetation may be removed.
- Pruning or other required maintenance of vegetation is permitted.
- Additional planting is permitted to replace unhealthy plantings.
- Areas shall be protected and delineated in the field.
- Pruning or other required maintenance of vegetation is permitted.
- Any bare spots in surface vegetation shall be revegetated as soon as possible.
- Vehicles are prohibited from parking and/or driving over the stormwater facilities as to avoid compaction. Use of permeable turf reinforcement on the BMP access ways is recommended.
- The areas not subject to grading are also delineated on the Post Construction Stormwater Management Plan. If any future grading or disturbance of these areas occurs, subsequent stormwater management must be provided to address disturbance.

LONG TERM BMP OPERATIONS AND MAINTENANCE PROCEDURES:

- The responsible parties shall be responsible for the proper construction, operation, and maintenance of Post Construction Stormwater Management BMPs.
- All inspections of the post construction stormwater management BMPs shall be performed by the appointed representative of the responsible parties.
- If any deficient conditions are found during the inspection a plan for addressing them shall be prepared within two months and the plan shall be carried out within six months.
- The responsible parties shall make records of the installation, and of all inspections, maintenance, and repairs of all BMPs, and shall retain the records for at least fifteen years. These records shall be submitted to the municipality, if requested.
- Until the site is stabilized, and during construction activities, all BMPs must be maintained properly by the contractor. All permanent maintenance procedures shall be performed by the appropriate responsible parties.

DISPOSAL

- Material removed from the BMPs that serve “hot spots” such as fueling stations that receive a large amount of debris should be handled according to DEP regulations for that type of solid waste, such as a landfill that is approved by DEP to accept solid waste.
- BMPs that primarily catch sediment and detritus from areas such as lawns may reuse the waste on site.
- The Operation and Maintenance requirements for the PCSWM BMPs will include the following:

BMP 6.4.3 SUBSURFACE INFILTRATION BEDS - Beds shall be inspected quarterly and within 48 hours after every major storm events (> 1 inch rainfall depth) to ensure that they are working properly and that debris and/or sediment has not entered the system.



- If the inspection reveals that the infiltration bed has been contaminated with silt, the system shall be repaired or replaced.
- Accumulated silt and debris that has deposited in the bottom of all inlets within the system will be removed on a quarterly basis.
- The isolation rows shall be cleaned using a vacuum truck on an annual basis and/or after major storm events (greater than 3 inches).
- Inflow and outflow points into infiltration systems should be kept clear of leaves and other debris. any leaves or debris will negatively impact the performance of these systems.
- All downspouts and overflow pipes should be kept in good working order.
- All catch basins and inlets should be inspected and cleaned.
- The overlying vegetation of subsurface infiltration features should be maintained in good condition, and any bare spots revegetated as soon as possible.
- Vehicular access on subsurface infiltration areas should be prohibited, and care should be taken to avoid excessive compaction by mowers. if access is needed, use of permeable, turf reinforcement should be considered.

BMP 6.4.5 RAIN GARDENS - Maintenance activities to be done biannually and within 48 hours after every major storm event (>1 inch rainfall depth):

- While vegetation is being established, pruning, watering, and weeding are required. close mow or trim perennial material to allow proper germination and to control invasive species (to be done in late fall, winter or early spring). water vegetation at the end of each day for two weeks after planting is completed.
- Remove trash and/or debris before mowing and/or trimming/cutting.
- Remove detritus vegetation every year.
- Perennial plantings may be cut down at end of growing season.
- Mulch should be respread when erosion is evident and replenished as needed. replenish the entire mulched area every 2 to 3 years. the entire area may require mulch replacement.
- Rain gardens shall be inspected at least two times a year for sediment buildup, erosion, vegetative conditions, trash debris, etc.
- Remove excess sediment and debris immediately.
- Vegetation shall be watered during periods of extended drought. inspect health of trees and shrubs twice per year.

BMP 6.4.8 VEGETATED SWALES - Maintenance activities to be done annually and within 48 hours after every major storm event (>1 inch rainfall depth):

- Inspect and correct erosion problems, damage to vegetation, and sediment and debris accumulation (address when > 3 inches at any spot or covering vegetation)
- Inspect vegetation on side slopes for erosion and formation of rills or gullies, correct as needed
- Inspect for pools of standing water; dewater and discharge to an approved location and restore to design grade.
- Mow and trim vegetation to ensure safety, aesthetics, proper swale operation, or to suppress weeds and invasive vegetation; dispose of cuttings in a local composting facility; mow only when swale is dry to avoid rutting.



- Inspect for litter; remove prior to mowing.
- Inspect for uniformity in cross-section and longitudinal slope, correct as needed.
- Inspect swale inlet (curb cuts, pipes, etc.) and outlet for signs of erosion or blockage, correct as needed.

MAINTENANCE ACTIVITIES TO BE DONE AS NEEDED:

- Plant alternative grass species in the event of unsuccessful establishment.
- Reseed bare areas; install appropriate erosion control measures when native soil is exposed, or erosion channels are forming.
- Rototill and replant swale if draw down time is more than 48 hours.
- Inspect and correct check dams when signs of altered water flow (channelization, obstructions, erosion, etc.) are identified.
- Water during dry periods, fertilize, and apply pesticide only when absolutely necessary.

*Swales along lot frontages to be maintained by the homeowner whether or not it is within the road right-of-way.

BMP 6.4.10 INFILTRATION BERM & RETENTIVE GRADING – Maintenance activities to be done annually and within 48 hours after every major storm event (>1 Inch rainfall depth):

- Periodically monitor drawdown time to make sure it is draining within 72 hours after a major storm event.
- Inspect any structural components such as inlet structures to ensure proper functionality.
- If planted in turf grass, maintain by mowing. Other vegetation will require less maintenance. Trees and shrubs may require annual mulching, while meadow planting requires annual mowing and clippings removal.
- Avoid running heavy equipment over the infiltration area at the base of the berms. the crest of the berm may be used as access for heavy equipment when necessary to limit disturbance.
- While vegetation is being established, pruning, watering, and weeding are required. water vegetation at the end of the day for two weeks after planting is completed. close mow or trim perennial material to allow proper germination and to control invasive species (to be done once in late fall, winter, or early spring).
- Remove trash and/or debris before mowing and/or trimming / cutting.
- Remove detritus vegetation every year. perennial plantings may be cut down at the end of the growing season.
- Inspect for signs of flow channelization; restore level gradient immediately after deficiencies are observed.
- Mulch should be re-spread when erosion is evident and be replenished as needed. once every 2 to 3 years the entire area may require mulch replacement.
- Retention areas should be inspected at least two times per year for sediment buildup, erosion, vegetative conditions, trash, debris, etc. remove excess sediment and debris and restore level gradient immediately after deficiencies are observed.
- During periods of extended drought, retention areas may require watering.

- Inspect health of trees and shrubs twice per year.

BMP 6.6.4 WATER QUALITY FILTERS - water quality filters should be inspected one time per year and after every rain event of 3" or greater.

- Filters shall be inspected regularly for excess debris, sediment and trash, and any damage to the structure. the debris shall be removed promptly. The filter shall be washed with hose water and reset. if the filter is damaged, it must be replaced.
- During the routine inspections, the filter media shall be cleaned.
- One regular change and disposal of the filter media shall occur during the calendar year as well.
- Water quality inlet inserts shall be checked to ensure they are securely fastened during each inspection.
- Recommended maintenance is performed including removal and disposal of the filter media or excess material by personnel.
- Any damaged filters must be replaced promptly.
- Check lawn and/or meadow cover in drainage area of the inlets for stable condition. Replant lawn and/or meadow as needed.

UNDERDRAIN CAP OPERATION

- If standing water remains in the facility for 72 hours following the end of a rainfall event:
 - a. Notify the design engineer or other professional engineer to investigate the situation and suggest maintenance or corrective action if needed.
 - b. Report finding to Warwick Township.
- No modification of the underdrain may be made by the operator without prior approval from the township and/or conservation district.

BMP 6.8.1 LEVEL SPREADERS - Maintenance activities to be done quarterly and within 48 hours after every major storm event (>1 inch rainfall depth):

- If the inspection reveals that the level spreader has been contaminated with silt, the spreader shall be repaired or replaced.
- Accumulated silt and debris that has deposited at the bottom of the level spreader (in the perforated pipe) will be removed on a yearly basis.
- The vegetation along the surface of the level spreader should be maintained in good condition, and any bare spots re-vegetated as soon as possible.
- Any accumulated sediment should be removed and disposed of immediately.
- Vehicles should not be parked or driven over the level spreader, and care should be taken to avoid excessive compaction by mowers.
- Downstream flow paths shall be monitored for erosion and immediately stabilized with additional plantings.

RIPRAP APRONS - Maintenance activities to be done quarterly and within 48 hours after every major storm event (>1 inch rainfall depth):

- Any accumulated sediment should be removed and disposed of immediately.



- If the inspection reveals that riprap has been contaminated with silt, the apron shall be repaired or replaced.
- Accumulated silt and debris that has deposited at the apron shall be removed.
- Replace displaced riprap.

Individual Lot Owners - There are certain areas on the property where stormwater management drainage swales exist both in the roadway rights-of-way and partially upon some privately owned lots. Drainage swales, whether in the roadway rights-of-way or partially on any lot, are an integral part of the stormwater management system affecting the entire property and must be properly maintained at all times. Each owner of a lot having all or any part of a drainage swale located upon such lot shall maintain such drainage swale in a proper and reasonable manner and shall be restricted from taking or permitting any action upon the lot which would in any way interfere with the proper function of any such drainage swale. In the event any owner shall fail to perform any obligation of maintenance or repair of a stormwater management facility located on such owner's lot, as required herein, the Township shall make such repairs or perform such maintenance in order to preserve the value of surrounding properties and to promote and protect the public safety and welfare.

Vegetative Swales and Driveway Culverts along lot frontages

- Inspect inlet and outlet ends of culvert; remove any litter or debris. Keep pipe free of material which would restrict flow through pipe. Replace rock stabilization as required.
- Inspect and correct erosion problems, damage to vegetation, and sediment and debris accumulation. Remove sediment when depth accumulates to >3 inches.
- Inspect vegetation on side slopes for erosion and formation of rills or gullies, correct as needed.
- Inspect for pools of standing water; dewater and discharge to an approved location and restore to design grade.
- Mow and trim vegetation to ensure safety, aesthetics, proper swale operation, or to suppress weeds and invasive vegetation; dispose of cuttings in a local composting facility; mow only when swale is dry to avoid rutting.
- Inspect for litter; remove prior to mowing.
- Inspect for uniformity in cross-section and longitudinal slope, correct as needed. Plant alternative grass species in the event of unsuccessful establishment.
- Reseed bare areas; install appropriate erosion control measures when native soil is exposed, or erosion channels are forming.
- Rototill and replant swale if draw down time is more than 48 hours.

Roof leader Disconnection

- The vegetated area downstream of the downspout discharge should be maintained in good condition.
- Mow the lawn at the same interval the rest of the lawn is mowed. Mowing should be done only when the soil is dry, in order to prevent tracking damage to vegetation, soil compaction and flow concentrations.
- Unwanted or invasive growth should be removed on an annual basis.
- Vegetative cover should be sustained. Reseed bare spots when necessary.
- Keep splash guard or rocks at end of downspout free of debris.
- Clean Gutters at least twice per year.



Dry Sun

Full sun tolerant grass meadow with seasonal interest wildflowers.

Use: detention basin side slopes and open, upland areas

Grass and Wildflower Seed Mix - Warm season grasses and hardy sedges make up this grass mix for tough, dry sites. The sedges provide reliable, early season cover, while the warm season grasses retain their structure and fall color through the winter months. Wildflowers (forbs) provided are reliable and tolerant of most upland conditions. This mix does well in harsh conditions and dry, shallow soils. If weed seed is prevalent, use the Grasses only, without the wildflowers, during the establishment period.

Specifications:

Site Conditions: 6.2 -7.2 - Silt Loam to Sandy Loam
 Rate: 29 lbs. of seed/acre
 Total seeds per sq ft = 200

Plant Ratio:

13 Wildflowers (forbs)
 9 Grasses (graminoides)
 22 Total Species



Carex vulpinoidea



Andropogon ternarius



Carex bicknellii



Bouteloua curtipendula



Schizachyrium scoparium

Dry Sun Grass Seed Mix (graminoides)					
Botanical name	Common Name	Qty (oz)	Height	Season/color	Notes
<i>Andropogon ternarius</i>	Split-Beard Bluestem	12.94	2 - 4'	Warm	Flowers, taller, nicer than blue stem, provides additional warm season grass coverage.
<i>Bouteloua curtipendula</i>	Sideoats Grama	73.33	1 - 3'	Warm	Attractive, warm season grass, very reliable from seed.
<i>Carex bicknellii</i>	Prairie Sedge	7.76	1 - 3'	Cool	
<i>Carex brevior</i>	Plains Oval Sedge	4.55	1 - 4'	Cool	Upland sedge, flops in spring, tall
<i>Carex projecta</i>	Loose-headed Oval Sedge	2.13	1 - 2'	Cool	
<i>Carex vulpinoidea</i>	Fox Sedge	3.52	1 - 3'	Cool	Reseeds well
<i>Elymus virginicus</i>	Virginia Rye	83.81	2 - 4'	Cool	
<i>Juncus tenuis</i>	Path Rush	0.22	1'	Cool	Tolerates a wide range of conditions, reliable.
<i>Schizachyrium scoparium</i>	Little Bluestem	117.33	2 - 3'	Warm	Reliable warm season grass



Allium cernuum



Echinacea pallida



Penstemon digitalis



Pycnanthemum tenuifolium



Zizia aurea

Dry Sun Wildflowers Seed Mix (Forbs)					
<i>Botanical name</i>	Common Name	Qty (oz)	Height	Season/color	Notes
<i>Allium cernuum</i>	Nodding Pink Onion	17.37	1 - 2'	Summer	Reliable, summer blooming.
<i>Asclepias tuberosa</i>	Butterfly Weed	10.23	1 - 3'	Summer	
<i>Coreopsis lanceolata</i>	Tickseed	11	2 - 3'	Spring	Reliable short term species, good indicator of germination success
<i>Echinacea pallida</i>	Pale Purple Coneflower	50.77	2 - 4'	Summer	Hot and dry
<i>Eupatorium coelestinum</i> (<i>Conoclinium</i>)	Mistflower	1.51	1 - 3'	Fall	Salt tolerant
<i>Mondarda punctata</i>	Horsemint	4.89	1 - 2'	Summer	Reliable, biennial
<i>Penstemon digitalis</i>	White Beardtongue	6.77	2 - 4'	Spring	Hardy
<i>Pycnanthemum tenuifolium</i>	Slender Mountain Mint	1.16	2 - 3'	Summer	Lacy in garden setting, finer, can use broad leaf herbicide, reliable, tolerates a wide range of conditions (pollinator species)
<i>Rudbeckia hirta</i>	Black Eyed Susan	2.87	1 - 3'	Summer	Reliable short term species, good indicator of germination success.
<i>Solidago nemoralis</i>	Gray Goldenrod	1.76	1 - 3'	Fall	Reliable, fall flowering
<i>Tradescantia ohioensis</i>	Ohio Spiderwort	11	2 - 4'	Spring	Reliable, tolerates drier conditions than <i>T.virginiana</i>
<i>Verbena stricta</i>	Hoary Vervain	12.57	2 - 4'	Summer	Increase diversity, tolerant of dry, rocky conditions
<i>Zizia aurea</i>	Golden Alexander	20	1 - 3'	Spring	Full sun

Nurse Crop Seeding Rates:

- Spring Seeding: Spring Oats (*Avena sativa*): 20 lb/acre
- Early Spring to Later Summer Seeding: Grain Rye (*Secale cereale*): 30 lb/acre
- Fall Seeding: Cereal Rye (*Secale cereale*): 30 lb/acre

Seed Sources:

Prairie Moon Nursery – info@prairiemoon.com, 866-417-8156
Ernst Conservation Seed - sales@ernstseed.com, (800) 873-3321

Rain Garden

Base seed mix with selective wildflowers added in plug / quart size containers for seasonal interest.

Use: Rain Gardens and bio-retention areas

Grass Seed Mix and Wildflower Plugs - grass seed mix comprised of sedges and rushes that provides quick cover and reliable cover in tough, rain garden conditions. Live perennial wildflower plants are added into the seed bed in plug or quart size depending on the need for quick cover and budget.

Specifications:

Site Conditions: 6.2 -7.2 - Silt Loam to Sandy Loam
 Rate: 22 lbs. of seed/acre
 Area in sq ft = 1000
 Total seeds per sq ft = 200

Plant Ratio

6 Grasses (graminoides)
 6 Total species



Carex brevior



Chelone lyonii Pink



Asclepias incarnata



Eupatorium coelestinum



Zizia aurea

Rain Garden Grass Seed Mix (graminoides)					
Botanical name	Common Name	Qty (oz)	Height	Season/color	Notes
Carex annectens xanthocarpa	Small Yellow Fox Sedge	0.16	1 - 5'	Cool	Reliable, tolerates a wide range of conditions
Carex brevior	Plains Oval Sedge	0.55	1 - 3'	Cool	Very reliable, tolerates a wide range of conditions
Carex vulpinoidea	Fox Sedge	0.7	1 - 3'	Cool	
Elymus virginicus	Virginia Rye	6.67	2 - 4'	Cool	
Juncus effusus	Common Rush	0.03	2 - 5'	Cool	
Juncus tenuis	Path Rush	0.02	1'	Cool	Reliable, low height matrix

Nurse Crop Seeding Rates:

- Spring Seeding: Spring Oats (Avena sativa): 20 lb/acre
- Early Spring to Later Summer Seeding: Grain Rye (Secale cereale): 30 lb/acre
- Fall Seeding: Cereal Rye (Secale cereale): 30 lb/acre

Notes:

1. Use the following Ecotypes if available: North East - PA, NY, NJ, CT, MD
2. Grass only seed mix to be supplemented with perennial live plants, see below.

Seed Sources:

Prairie Moon Nursery – info@prairiemoon.com, 866-417-8156
 Ernst Conservation Seed - sales@ernstseed.com, (800) 873-3321

Wildflower Planting – add the following species in plug or quart size, 12” to 18” on center, to areas pre-seeded with the Rain Garden Grass Seed Mix above.

<i>Botanical name</i>	Common Name	Qty	Size	Install notes	Height	Bloom time	Notes
<i>Amsonia tabernaemontana</i>	Blue Star Flower	15	1 QT	Plant in groups of 3	3 - 4'	May - Jun	Tolerates mesic-wet conditions, early flowering
<i>Asclepias incarnata</i>	Swamp Milkweed	50	PLUG	Plant at lowest grade in rain garden	2 - 4'	Jun - Aug	
<i>Aster novi-belgii</i>	New York Aster	6	1 QT		3 - 4'	Aug - Oct	
<i>Chelone lyonii Pink</i>	Turtlehead	50	PLUG		3'	Aug - Sept	Tolerates drier conditions than <i>C.glabra</i>
<i>Eupatorium coelestinum</i>	Mistflower	50	PLUG		2 - 3'	Sept - Oct	Tolerates a wide range of conditions, self seeding.
<i>Eupatorium dubium</i>	Three Nerved Joe Pye Weed	9	1 QT	Plant in groups of 3	2 - 5'	Jul - Sept	Tolerates most conditions, tall accent.
<i>Liatris spicata</i>	Blazing Star	45	1 QT	Plant in groups of 3 - 5	2 - 4'	Jul - Aug	Tolerates most conditions, reliable
<i>Lobelia cardinalis</i>	Cardinal Flower	50	PLUG	Plant in groups of 5 - 7	2 - 4'	Aug - Sept	
<i>Penstemon digitalis</i>	White Beardtongue	50	PLUG		2 - 4'	Jun - Jul	Reliable, tolerates a wide variety of conditions
<i>Physostegia virginiana</i>	Obediant Plant	15	1 QT		2 - 5'	Jul - Oct	Clonal, reliable
<i>Pycnanthemum tenuifolium</i>	Slender Mountain Mint	50	PLUG		2 - 3'	Jun - Sept	Pollinator value, clonal, reliable
<i>Rudbeckia laciniata</i>	Green Head Coneflower	5	1 QT		3 - 6'	July - Oct	Later season color variation
<i>Zizia aurea</i>	Golden Alexander	50	PLUG		1 - 3'	May - Jun	Early season color variation

Part Shade

Shade and part shade tolerant grass and wildflower mix groundcover with seasonal interest

Use: riparian buffer, understory or tree planting areas

Specifications:

Site Conditions: 6.2 -7.2 - Silt Loam to Sandy Loam
 Rate: 29 Total lbs. seed/acre
 Total seeds per sq ft = 200

Planting Ratio:

5 Grasses (graminoides)
 13 Wildflowers (forb)
 18 Total species



Carex brevior



Carex vulpinoidea



Zizia aurea



Rudbeckia hirta



Salvia lyrata

Grass Seed Mix					
<i>Botanical name</i>	Common Name	Qty (oz)	Height	Season/color	Notes
<i>Bouteloua curtipendula</i>	Sideoats Grama	256.67	1 - 3'	Warm	Can take partial shade, high germination success, useful in early planting prior to actual shade conditions.
<i>Carex brevior</i>	Plains Oval Sedge	12.14	1 - 3'	Cool	Very reliable, tolerates a wide range of conditions
<i>Carex normalis</i>	Spreading Oval Sedge	7.04	1 - 3'	Cool	Fine textured, reliable
<i>Carex vulpinoidea</i>	Fox Sedge	11	1 - 3'	Cool	
<i>Deschampsia caespitosa</i>	Tufted Hairgrass	13.11	10"	Cool	Cool season graminoid with warm season characteristics

Wildflowers – These selections provide showy flowers during the growing season while tolerating tough, dry and full sun conditions. Wildflowers can be seeded with the grass mix or added after the first few years of management to control pre-existing weed and invasive species.



Aster divaricatus



Coreopsis lanceolata



Penstemon digitalis



Mondarda punctata



Echinacea purpurea

Wildflowers (Forbs) Seed Mix					
<i>Botanical name</i>	Common Name	Qty (oz)	Height	Season/color	Notes
<i>Aster divaricatus</i> (<i>Eurybia</i>)	White Wood Aster	10.48	1 - 2'	Fall	
<i>Coreopsis lanceolata</i>	Tickseed	11	2 - 3'	Spring	Reliable short term species, good indicator of germination success
<i>Echinacea purpurea</i>	Purple Coneflower	80	3 - 5'	Summer	
<i>Eupatorium coelestinum</i> (<i>Conoclinium</i>)	Mistflower	1.26	1 - 3'	Fall	
<i>Mondarda punctata</i>	Horsemint	3.91	1 - 2'	Summer	Reliable, biennial
<i>Penstemon digitalis</i>	White Beardtongue	5.08	2 - 4'	Spring	
<i>Penstemon hirsutus</i>	Hairy Beardtongue	1.24	1 - 2'	Spring	
<i>Pycnanthemum pilosum</i>	Hairy Mountain Mint	1.9	2 - 3'	Summer	Shade tolerant, reliable.
<i>Rudbeckia hirta</i>	Black Eyed Susan	2.39	1 - 3'	Summer	Early season, provides indication of germination success
<i>Salvia lyrata</i>	Lyre Leaved Sage	5.87	1'	Spring	Reliable, early flowering, color interest
<i>Solidago caesia</i>	Wreath Goldenrod	5.24	1 - 2'	Fall	Fall flowering
<i>Tradescantia virginiana</i>	Virginia Spiderwort	12.22	1 - 3'	Spring	Spring flowering, reliable
<i>Zizia aurea</i>	Golden Alexander	24	3-Jan	Spring	Reliable

Nurse Crop Seeding Rates:

- Spring Seeding: Spring Oats (*Avena sativa*): 20 lb/acre
- Early Spring to Later Summer Seeding: Grain Rye (*Secale cereale*): 30 lb/acre
- Fall Seeding: Cereal Rye (*Secale cereale*): 30 lb/acre

Seed Sources:

Prairie Moon Nursery – info@prairiemoon.com, 866-417-8156
 Ernst Conservation Seed - sales@ernstseed.com, (800) 873-3321

Steep Slope

Steep slopes are challenging conditions to establish plant material. Typically, the sites are very dry with poor soils and full sun. It is also important to establish plant cover quickly to reduce erosion. It is also important to use erosion control matting that encourages plant growth. We recommend a heavy core matting (spec) or high performance hydro-mulch sprayed over the seed.

Specifications:

Site Conditions: 6.2 -7.2 - Silt Loam to Sandy Loam
 Rate: 41 lbs. of seed/acre
 Total seeds per sq ft = 200

Plant Ratio:

8 Grasses (graminoides)
 17 Wildflowers (forbs)
 25 Total species



Carex vulpinoidea



Echinacea purpurea



Eryngium yuccifolium



Helianthus divaricatus



Andropogon ternarius

Grasses – hardy, taller grasses with good cover and that take full sun, dry conditions are prioritized in this mix.

Steep Slope Grass Seed Mix (<i>graminoides</i>)					
<i>Botanical name</i>	Common Name	Qty (oz)	Height	Season/color	Notes
<i>Andropogon gerardii</i>	Big Blue Stem	10.56	4 – 8'	Warm	
<i>Bouteloua curtipendula</i>	Sideoats Grama	132	1 - 3'	Warm	
<i>Carex bicknellii</i>	Copper Oval Sedge	9.32	2 – 3'	Cool	Grows anywhere
<i>Carex brevior</i>	Plains Oval Sedge	9.1	1 – 3'	Cool	Upland sedge, flops in spring, tall
<i>Carex vulpinoidea</i>	Fox Sedge	7.92	1 – 3'	Cool	Reseeds well
<i>Elymus virginicus</i>	Virginia Rye	125.71	2 - 4'	Cool	
<i>Tridens flavus</i>	Purpletop	18.66	2 - 5'	Warm	
<i>Schizachyrium scoparium</i>	Little Bluestem	140.8	2 – 3'	Warm	Sun

Wildflowers – The selections listed below provide showy flowers during the growing season while tolerating tough, dry and full sun conditions. Wildflowers can be seeded with the grass mix or added after the first few years of management to control pre-existing weed and invasive species.

Wildflowers (Forbs) Seed Mix					
<i>Botanical name</i>	Common Name	Qty (oz)	Height	Season/color	Notes
<i>Asclepias tuberosa</i>	Butterfly Weed	8.19	1- 3'	Summer	Reliable, early summer flowering
<i>Aster laevis</i> (<i>Symphiotrichum</i>)	Smooth Aster	6.4	2 - 5'	Fall	Reliable, fall flowering, tall
<i>Echinacea purpurea</i>	Purple Coneflower	42.67	3 - 5'	Summer	
<i>Echinacea pallida</i> Pale	Purple Coneflower	33.85	2 - 4'	Summer	Reliable, tolerates sunny - mesic to dry conditions
<i>Eryngium yuccifolium</i>	Rattlesnake Master	46.93	4 - 5'	Summer	
<i>Helenium flexuosum</i>	Helen's Flower	0.88	1 - 3'	Fall	Very reliable
<i>Hypericum punctatum</i>	Dotted St. John's Wort	0.61	1 - 2'	Summer	Reliable, early flowering, lower matrix
<i>Lespedeza capitata</i>	Round-headed Bush Clover	8.8	2 - 4'	Summer	Reliable, winter interest
<i>Monarda fistulosa</i>	Wild Bergamot	1.41	2 - 4'	Summer	Extremely reliable
<i>Parthenium integrifolium</i>	Wild Quinine	15.09	2 - 5'	Spring	Tall, summer flowering
<i>Penstemon digitalis</i>	White Beardtongue	4.06	2 - 4'	Spring	Reliable, early season
<i>Ratibida pinnata</i>	Yellow Coneflower	2.35	3 - 6'	Summer	
<i>Rudbeckia hirta</i>	Black Eyed Susan	1.91	1 - 3'	Summer	Early season, provides indication of germination success
<i>Rudbeckia triloba</i>	Thin-leaf Coneflower	3.11	2 - 5'	Fall	Fall flowering, reliable species
<i>Solidago juncea</i>	Early Goldenrod	2.46	1 - 3'	Summer	Early flowering goldenrod
<i>Solidago rigida</i> (<i>Oligoneuron</i>)	Stiff Goldenrod	6.87	1 - 5'	Fall	Tall, very reliable, showy flowers, pollinator value.
<i>Zizia aurea</i> Golden Alexander	Golden Alexander	16	1 - 3'	Spring	Early season, reliable cover.

Nurse Crop Seeding Rates:

- Spring Seeding: Spring Oats (*Avena sativa*): 20 lb/acre
- Early Spring to Later Summer Seeding: Grain Rye (*Secale cereale*): 30 lb/acre
- Fall Seeding: Cereal Rye (*Secale cereale*): 30 lb/acre

Seed Sources:

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Ernst Conservation Seed - sales@ernstseed.com, (800) 873-3321

Rain Garden

Base seed mix with selective wildflowers added in plug / quart size containers for seasonal interest.

Use: Rain Gardens and bio-retention areas

Grass Seed Mix and Wildflower Plugs - grass seed mix comprised of sedges and rushes that provides quick cover and reliable cover in tough, rain garden conditions. Live perennial wildflower plants are added into the seed bed in plug or quart size depending on the need for quick cover and budget.

Specifications:

Site Conditions: 6.2 -7.2 - Silt Loam to Sandy Loam
 Rate: 22 lbs. of seed/acre
 Area in sq ft = 1000
 Total seeds per sq ft = 200

Plant Ratio

6 Grasses (graminoides)
 6 Total species



Carex brevior



Chelone lyonii Pink



Asclepias incarnata



Eupatorium coelestinum



Zizia aurea

Rain Garden Grass Seed Mix (graminoides)					
Botanical name	Common Name	Qty (oz)	Height	Season/color	Notes
Carex annectens xanthocarpa	Small Yellow Fox Sedge	0.16	1 - 5'	Cool	Reliable, tolerates a wide range of conditions
Carex brevior	Plains Oval Sedge	0.55	1 - 3'	Cool	Very reliable, tolerates a wide range of conditions
Carex vulpinoidea	Fox Sedge	0.7	1 - 3'	Cool	
Elymus virginicus	Virginia Rye	6.67	2 - 4'	Cool	
Juncus effusus	Common Rush	0.03	2 - 5'	Cool	
Juncus tenuis	Path Rush	0.02	1'	Cool	Reliable, low height matrix

Nurse Crop Seeding Rates:

- Spring Seeding: Spring Oats (Avena sativa): 20 lb/acre
- Early Spring to Later Summer Seeding: Grain Rye (Secale cereale): 30 lb/acre
- Fall Seeding: Cereal Rye (Secale cereale): 30 lb/acre

Notes:

1. Use the following Ecotypes if available: North East - PA, NY, NJ, CT, MD
2. Grass only seed mix to be supplemented with perennial live plants, see below.

Seed Sources:

Prairie Moon Nursery – info@prairiemoon.com, 866-417-8156
 Ernst Conservation Seed - sales@ernstseed.com, (800) 873-3321

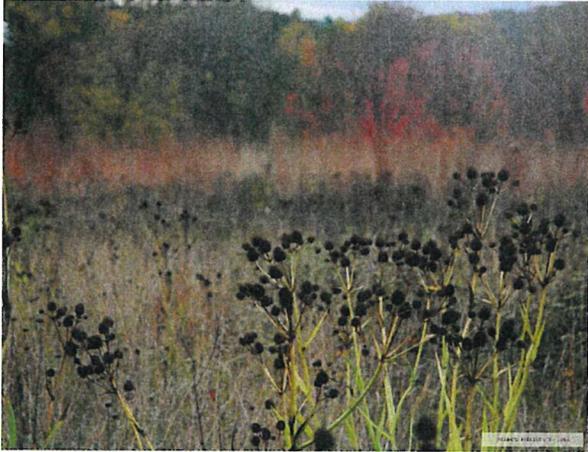
Wildflower Planting – add the following species in plug or quart size, 12” to 18” on center, to areas pre-seeded with the Rain Garden Grass Seed Mix above.

<i>Botanical name</i>	Common Name	Qty	Size	Install notes	Height	Bloom time	Notes
<i>Amsonia tabernaemontana</i>	Blue Star Flower	15	1 QT	Plant in groups of 3	3 - 4'	May - Jun	Tolerates mesic-wet conditions, early flowering
<i>Asclepias incarnata</i>	Swamp Milkweed	50	PLUG	Plant at lowest grade in rain garden	2 - 4'	Jun - Aug	
<i>Aster novi-belgii</i>	New York Aster	6	1 QT		3 - 4'	Aug - Oct	
<i>Chelone lyonii Pink</i>	Turtlehead	50	PLUG		3'	Aug - Sept	Tolerates drier conditions than <i>C.glabra</i>
<i>Eupatorium coelestinum</i>	Mistflower	50	PLUG		2 - 3'	Sept - Oct	Tolerates a wide range of conditions, self seeding.
<i>Eupatorium dubium</i>	Three Nerved Joe Pye Weed	9	1 QT	Plant in groups of 3	2 - 5'	Jul - Sept	Tolerates most conditions, tall accent.
<i>Liatris spicata</i>	Blazing Star	45	1 QT	Plant in groups of 3 - 5	2 - 4'	Jul - Aug	Tolerates most conditions, reliable
<i>Lobelia cardinalis</i>	Cardinal Flower	50	PLUG	Plant in groups of 5 - 7	2 - 4'	Aug - Sept	
<i>Penstemon digitalis</i>	White Beardtongue	50	PLUG		2 - 4'	Jun - Jul	Reliable, tolerates a wide variety of conditions
<i>Physostegia virginiana</i>	Obediant Plant	15	1 QT		2 - 5'	Jul - Oct	Clonal, reliable
<i>Pycnanthemum tenuifolium</i>	Slender Mountain Mint	50	PLUG		2 - 3'	Jun - Sept	Pollinator value, clonal, reliable
<i>Rudbeckia laciniata</i>	Green Head Coneflower	5	1 QT		3 - 6'	July - Oct	Later season color variation
<i>Zizia aurea</i>	Golden Alexander	50	PLUG		1 - 3'	May - Jun	Early season color variation

Example Meadow Images







Recommended Seed Mix Alternatives

Alternative seed mix options to the custom seed mixes shown above

Use: These alternative seed mixes can be used in the specified areas. Ernst mixes can simplify the procurement, but soil properties should be verified before mix selection and installation. Ernst seed mix formulations may change, so it is important to review the species in the current mix to verify the desired outcomes. For more information each of the seed mixes listed below refer to ernstseed.com.

Dry Sun:

- Ernst Mix 105: Mesic to Dry Pollinator Mix
- Ernst Mix 153: Showy Northeast Native Wildflower and Grass Mix

Wet Sun:

- Ernst Mix 120: OBL-FACW Perennial Food and Cover Wetland Mix
- Ernst Mix 122: FACW Wetland Meadow Mix
- Ernst Mix 131: OBL Wetland Mix
- Ernst Mix 137: Specialized Wetland Mix for Shaded OBL-FACW Areas

Rain Garden:

- Ernst Mix 180: Rain Garden Mix
- Ernst Mix 183: Native Detention Area Mix (no forbs)

Steep Slope:

- Ernst Mix 181: Native Steep Slope Mix w/ Annual Ryegrass or Oats

Part Shade:

- Ernst Mix 137: Specialized Wetland Mix for Shaded OBL-FACW Areas
- Ernst Mix 140: Partially Shaded Area Roadside Mix

Additional Seeding Information

Erosion Control Blanket:

Erosion control matting is vital to success of seeding, specifically in areas where higher levels of erosion is expected (i.e. swales, steep slopes, flooding areas). A qualified professional should be consulted to identify the correct matting type for the specific site, seed and project. Biodegradable matting provides a multitude of benefits and is recommended.

Soil Testing:

Soil testing should be performed prior to seed mix selection to best determine the survivability of species on a given site. The seed mix should be tailored to meet the existing soil conditions. For soil testing information refer to the Penn State Extension.

Penn State Agricultural Analytical Services Lab: agsci.psu.edu

<https://agsci.psu.edu/aasl/soil-testing/fertility>

Seeding Window:

The seeding window depends on a lot of factors including species type, application method and weather conditions. The seeding window will be determined by a combination of these factors and coordinated with a qualified professional for best results, but generally spring or fall seeding is recommended. There are a number of pros and cons to seeding in different seasons. For more information to help guide the seeding window, refer to Ernst Seed planting guide resource below.

<https://www.ernstseed.com/resources/planting-guides/spring-vs-fall-seeding/>