

VEGETATION MANAGEMENT IN STORMWATER PRACTICES

GUIDANCE FOR PRIVATE OWNERS



LAND & WATER
RESOURCES
DEPARTMENT

THE IMPACT OF VEGETATION

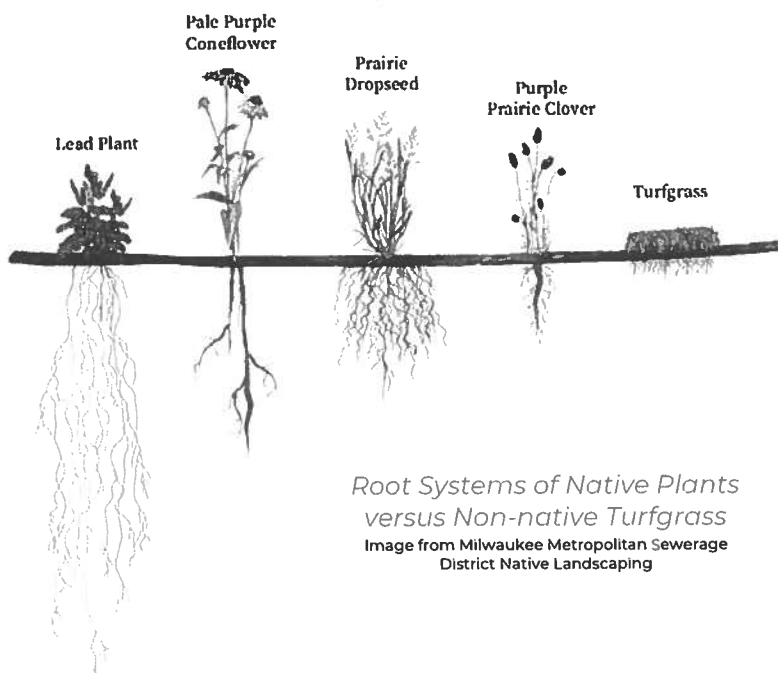
Almost all stormwater management practices incorporate some form of vegetation into their design, whether it's a swale with turfgrass or a bioretention basin with natives plants. Vegetation can provide a wide range of benefits that help mitigate the negative impacts of stormwater runoff, such as:

- **Infiltration:** Vegetation promotes infiltration of stormwater into the soil. Roots, especially the deep roots of native plants, create channels and spaces in the soil, allowing water to penetrate deeper and recharge groundwater aquifers, which helps reduce runoff volume and prevent flooding.
- **Filtration and Treatment:** Vegetation acts as a natural filter, trapping sediments, nutrients, and pollutants carried by stormwater runoff. The root systems of plants can also absorb and metabolize some pollutants, improving water quality.
- **Erosion Control:** The root systems of plants bind soil particles together, reducing soil erosion and sedimentation of water bodies.
- **Temperature Regulation:** Vegetation provides shade and helps regulate surface temperatures, reducing the thermal impact of stormwater runoff on downstream water bodies. Cooler water temperatures support healthier aquatic ecosystems and reduce the risk of thermal pollution.
- **Habitat Creation:** Vegetated areas created as part of stormwater management practices provide habitat for wildlife, including birds, insects, and aquatic organisms, improving biodiversity and ecological resilience.
- **Aesthetic and Recreational Value:** Vegetated stormwater management practices can enhance the aesthetic appeal of urban and suburban areas, providing green spaces for recreation, relaxation, and community engagement.



Pale Purple Coneflower

Vegetation plays a multifaceted role in stormwater management, providing ecological, social, and economic benefits. Integrating vegetation into stormwater management practices helps create sustainable and resilient landscapes that support healthy ecosystems and communities. Vegetation maintenance therefore plays a crucial role in ensuring long-term function of stormwater management practices



*Root Systems of Native Plants
versus Non-native Turfgrass*
Image from Milwaukee Metropolitan Sewerage
District Native Landscaping

NATIVE VEGETATION

Native vegetation refers to plant species that naturally occur and have evolved in a specific region or ecosystem over a long period of time, without human introduction or interference.

These plants are adapted to the local climate, soil conditions, and ecological processes of their native habitat. Native vegetation plays a crucial role in maintaining biodiversity, supporting wildlife habitats, and providing ecosystem services such as soil stabilization, water filtration, and carbon sequestration.

In the context of stormwater management, using native vegetation in green infrastructure projects can enhance the effectiveness and sustainability of these practices by maximizing ecological benefits and minimizing maintenance requirements.

WEEDS & INVASIVE SPECIES

In Wisconsin, the proliferation of weeds and invasive plants poses a persistent challenge to the state's ecosystems and biodiversity.

Weeds are generally plants that grow where they are not wanted, often competing with cultivated plants or native vegetation. They are typically fast-growing, prolific seed producers, and adaptable to various environmental conditions. Some examples of common weeds include dandelions, crabgrass, thistles, and bindweed.

Invasive plants are non-native species that proliferate aggressively in new environments, often outcompeting native vegetation and disrupting ecosystems. Non-native species like garlic mustard, buckthorn, and purple loosestrife disrupt the balance of native flora by outcompeting them for resources and space. These invaders often spread aggressively, colonizing diverse habitats ranging from forests to wetlands.

Invasive plants can quickly out-compete native species because they are often tolerant of a variety of environmental conditions, especially disturbed soils, grow and reproduce rapidly, and lack natural enemies or pests. When invasive plants take over an area, they degrade habitat by decreasing diversity and severing the food web.

Efforts to manage these invasive species involve a combination of prevention, early detection, and control measures.



Garlic Mustard,
an NR40 Restricted Plant

Many invasive plants were introduced for medicinal or culinary purposes, or their visual appeal, but can wreak havoc on native ecosystems

NR 40: INVASIVE SPECIES RULE

The invasive species rule creates a comprehensive, science-based system with criteria to classify invasive species into two categories: "prohibited" and "restricted." With certain exceptions, the transport, possession, transfer and introduction of prohibited species is banned.

Restricted species are also subject to a ban on transport, transfer and introduction, but possession is allowed.

For more information, visit:

<https://dnr.wisconsin.gov/topic/Invasives>

For a complete list of all regulated species, visit:

<https://dnr.wisconsin.gov/topic/Invasives/RegulatedSpecies>



Purple Loosestrife,
an NR40 Restricted plant

HOW DO WEEDS AND INVASIVES SPREAD?

- Seeds attach to footwear, car or bike tire treads, construction equipment, or animal fur
- Mowing along roadsides
- Moving firewood from one area to another
- Moving watercrafts and fishing gear from waterbody to waterbody
- Seeds are carried by the wind or water
- Transport of topsoil

Management of invasive species and weeds is not only important within stormwater facilities, but management in surrounding areas can help prevent the introduction of weeds and invasives to your facilities.

BENEFITS OF NATIVE PLANTS

- **Biodiversity Support:** Native plants provide habitat and food for local wildlife, supporting biodiversity and ecosystem health.
- **Adaptation to Local Conditions:** They are adapted to local climate, soil, and environmental conditions, requiring less water, fertilizer, and maintenance.
- **Water Conservation:** Native plants often have deep root systems that help prevent soil erosion and require little to no irrigation once established.
- **Reduced Maintenance:** They generally require less upkeep, such as mowing and pest control, compared to non-native species.
- **Pollinator Support:** Many native plants attract and support pollinators like bees and butterflies, essential for agriculture and ecosystem functions.
- **Resilience to Climate Change:** They can be more resilient to local climate variations and extremes compared to non-native plants.
- **Cost Savings:** Over time, using native plants can reduce landscaping costs due to their lower maintenance requirements and reduced need for inputs.



VEGETATION MAINTENANCE

In the first few years after stormwater facility construction, establishing at least 90% native plant cover and continuing to perform maintenance is critical to ensuring long-term functionality of your facilities. As vegetation matures, weeding demands will lessen.

Keeping up with general maintenance requirements also helps reduce future costs for fixing problems which may arise from failing to establish vegetation or from letting other problems go unchecked. In addition to increased costs, poorly maintained facilities do not remove pollutants as intended, sending polluted water downstream to your local lakes, rivers, and streams.

The maintenance chart below contains common requirements for maintaining vegetation in your stormwater facilities.

| Activity | Frequency | Maintenance Notes |
|----------------------------------|---|--|
| Weeding | At least three times per year | Weed at least three times during the growing season around late May, early July, and early September. Perform spot weeding, removing weeds and invasive species that are not a part of your vegetation plan, and remove dead plant litter. Removal of dead plant litter in the spring rather than fall can provide winter habitat for insects and birds! |
| Remove Woody Vegetation & Shrubs | As needed | Remove (pull, cut, or cut and treat with herbicide) all woody-stemmed vegetation and tree seedlings from within or around a facility or component. Plants like Japanese Knotweed - a shrub-like, semi-woody perennial - not only crowd out native plants, but can also cause structural damage with their strong roots. |
| Plant Upkeep | Every 2-3 days for the first 1-2 months; then as needed | Water plants regularly during the first planting season. If drought conditions exist after establishment, plants may need occasional watering. Within the first year, it can be common for up to 10 percent of plants to die. Regularly check plant health, fill in bare spots, and replace native vegetation as needed. |
| Mowing | 1-12 times per year | Frequency depends on location, management practice, and desired aesthetic appeal. Refer to your approved plan for details. Generally, mowing in buffer areas around stormwater ponds should be minimized. If needed, mow no shorter than 6 inches. Allow grass clippings to decompose in place. |

MAINTENANCE FAQs

I can't do the maintenance myself, can someone help me?
Garden maintenance and landscaping companies may be able to assist with vegetation management in your stormwater facilities. Contact a company near you, and ask if they have experience with native vegetation.

How do I identify bad plants? How do I identify good plants?
Differentiating between native and non-native plants can be difficult. Using Weed ID sheets, such as the ones further down in this document, or free plant identifiers can be helpful. There are also many plant ID phone apps which can be helpful.

What should I plant to fill bare spots in my facility?
If available, follow your vegetation plan. It may be a good idea to add more of a species that have established well already. You could also use plants listed under a Native Vegetation link on the resources page.

Can I use fertilizers or pesticides?
Fertilizers and pesticides can lead to groundwater contamination and should not be used in stormwater facilities that are designed for infiltration (such as bioretention basins and infiltration basins).

Can I use herbicides?
Herbicides may be needed to manage certain weeds or invasive species in your facilities, but should be used sparingly. Always follow application directions and adhere to warnings stated on each specific herbicide label.

Should I remove the vegetation around or in my wet pond?
Woody vegetation, weeds, and invasives should be removed, but establishing a native vegetated buffer around your wet pond can be beneficial and provide additional safety. If vegetation is growing far into the center of your wet pond, it may be a sign that too much sediment has accumulated and your pond should be dredged.

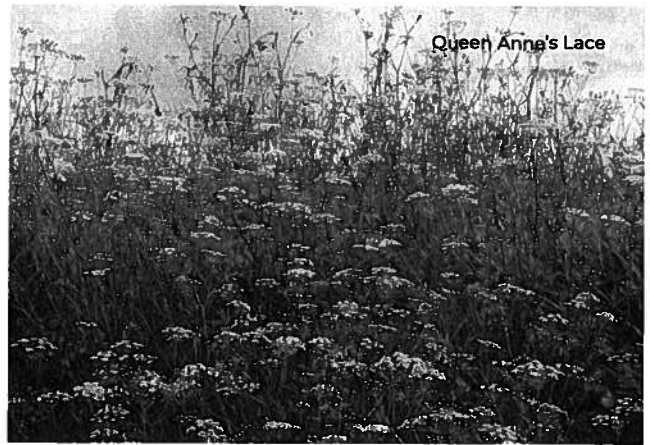
When should I remove plants?
Recommended timing may depend on the specific plant, but generally weeds and invasives should be removed before they go to seed. See the recommended timing control chart further down in the document for more information.

Can I leave turfgrass in my bioretention basin?
Turfgrass should be removed from the bottom of bioretention basins. If possible, it's best to prevent turfgrass from entering the bottom of your bioretention basin as it can compete with native grasses. Planting the sideslopes of your basin with native plants can help prevent creep and eliminate the need to mow steep sideslopes.

Are there other resources I can use?
The final page of this document contains a non-exhaustive list of resources that private owners may find helpful for properly maintaining vegetation in their stormwater facilities.

CONTROLLING WEEDS & INVASIVES

Manual removal of weeds and invasive species is a labor-intensive but effective method to control their spread, especially in sensitive environments like stormwater management facilities. Here are some tips for effectively manually removing weeds and invasives:



- **Identify Target Species:** Learn to identify the weeds and invasive species present in the area. Correct identification ensures you're targeting the right plants.
- **Timing:** Remove weeds and invasives before they set seed or spread further. Early spring and late summer/early fall are often optimal times for removal.
- **Tools and Equipment:** Use appropriate tools such as hand pruners, digging tools (e.g., hand trowel, shovel), and gloves. Tools should be suitable for the size and depth of the roots.
- **Dispose Responsibly:** Collect removed weeds and invasives in a bag or container to prevent seeds or fragments from spreading. Dispose of them properly according to local regulations. Invasive species can be bagged in clear bags and disposed of in the trash.
- **Minimize Soil Disturbance:** Avoid excessive digging or disturbance of the soil to prevent erosion and disruption to beneficial organisms and native plants, and reduce the possibility of bringing new weed seeds up to the surface.
- **Safety Precautions:** Wear appropriate clothing, including long sleeves and gloves, to protect yourself from thorns, allergens, and potential irritants.
- **Monitor and Follow-Up:** Regularly monitor the area for regrowth and promptly remove any new shoots or plants that emerge. Follow-up treatments may be necessary to ensure complete eradication.
- **Work Strategically:** Start from the outer edges and work inward to prevent trampling on remaining vegetation. Focus on one area at a time to ensure thorough removal.
- **Record Keeping:** Keep records of the species removed, methods used, and areas treated. Documentation helps track progress and inform future management decisions.

SUGGESTED TIMING OF CONTROL FOR SELECT SPECIES IN SOUTHERN WISCONSIN

| Species | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Canada thistle | | | | | | | | | | | | |
| Crown vetch & Bird's foot trefoil | | | | | | | | | | | | |
| Garlic mustard & Dame's rocket | | | | | | | | | | | | |
| Japanese knotweed | | | | | | | | | | | | |
| Leafy spurge | | | | | | | | | | | | |
| Phragmites | | | | | | | | | | | | |
| Plumeless & Musk thistles | | | | | | | | | | | | |
| Purple loosestrife | | | | | | | | | | | | |
| Reed canary grass | | | | | | | | | | | | |
| Spotted knapweed | | | | | | | | | | | | |
| Sweet clovers | | | | | | | | | | | | |
| Tanay | | | | | | | | | | | | |
| Teasels | | | | | | | | | | | | |
| Wild parsnip | | | | | | | | | | | | |
| Woody Shrubs | | | | | | | | | | | | |

flowering
 spray foliar herbicide
 burn
 hand-pull, dig
 apply herbicide to cut stems

Note: These times become later as you move north or for areas near the Great Lakes.

Chart from [Portage UW-Extension](#)

KNOW BEFORE YOU PULL

Many weeds, like garlic mustard, continue to develop seeds once they have been pulled from the ground.

For plants like this, effective control means that you must bag and remove the flowering plants from the site to keep the seed from spreading.

Allowing the plants to dry out and burning them is an option in some rural areas, but landowners should be aware that there are frequent restrictions or permit requirements for open-air burning.

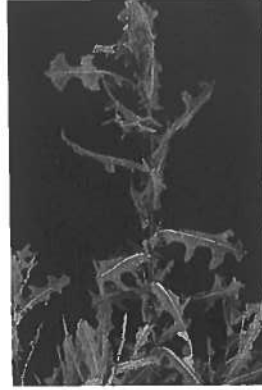
IDENTIFICATION OF COMMON WEEDS AND INVASIVES IN WISCONSIN



CURLY DOCK



LAMB'S QUARTER



PRICKLY LETTUCE



SWEET CLOVER



PURPLE LOOSESTRIFE*



WHITE CAMPION



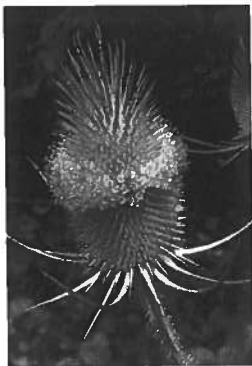
FOXTAIL GRASS



DAME'S ROCKET*



PHRAGMITES*



TEASEL*



BIRD'S-FOOT TREFOIL



BULL THISTLE



REED CANARY GRASS*?



GARLIC MUSTARD*



GIANT RAGWEED



SPOTTED KNAPWEED*



CANADA THISTLE*

*NR40 Restricted or Prohibited species

IDENTIFICATION OF COMMON WEEDS AND INVASIVES IN WISCONSIN - CONTINUED



CROWN VETCH*



RED CLOVER



LEAFY SPURGE*



BUSH HONEYSUCKLE*



NIGHTSHADE



COMMON BUCKTHORN*



JAPANESE KNOTWEED*



COMMON BURDOCK



BLACK LOCUST*



WILD PARSNIP*

Wild Parsnip can commonly be mistaken for Golden Alexanders, which is usually 2-3 feet high, whereas wild parsnip is usually 3-5 feet high.

Golden Alexanders also blooms earlier than wild parsnip, which doesn't usually bloom until July.

Golden Alexander is a host plant for the black swallowtail butterfly, and should be left in stormwater facilities.

Use caution when removing wild parsnip. When skin comes in contact with plant sap in the presence of sunlight, it can cause severe rashes, blisters, and discoloration of skin. Appropriate protective clothing including gloves, long sleeves, and long pants should be worn and direct contact with the plant should be avoided.



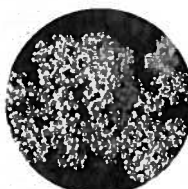
GOLDEN ALEXANDERS



QUEEN ANNE'S LACE

Queen Anne's Lace may be mistaken for Yarrow, a native plant.

Yarrow has several stems with visible hairy leaves leading to clusters of flowers, whereas Queen Anne's Lace has flowers that are clustered in flat, dense umbrels, and does not have leaves on the stem.



YARROW



JAPANESE HEDGE PARSLEY*

*NR40 Restricted or Prohibited species

VEGETATION MANAGEMENT RESOURCES

Below are resources from across the web that property owners may find beneficial in assisting with vegetation management in stormwater facilities.

PLANT ID

Community Groundworks
Identification of Common
Wisconsin Weeds

<https://www.communitygroundworks.org/sites/default/files/identification%20of%20Common%20Wisconsin%20Weeds.pdf>

Good Oak Weed ID Sheets

<https://www.goodoak.com/info/weeds/index.php>

Weed ID App: Seek by
iNaturalist

https://www.inaturalist.org/pages/seek_app

Invasives Quick Reference
Guide

https://sewisc.org/images/managers/document_manager_folders/resources/reference-guidance-and-funding-sources/Invasives_Quick_Reference_Guide_2012.pdf

PlantNet ID

<https://identify.plantnet.org/>

Online Virtual Flora of
Wisconsin

<https://wisflora.herbarium.wisc.edu/index.php>

UW Weed Science Video
Series

<https://www.youtube.com/playlist?list=PLF35785BFF9AE7921>

Invasive Species Master
Resource Table

<https://renzweedscience.cals.wisc.edu/nr-40-master-resource-table/>

NATIVE VEGETATION

Dane County Stormwater
Manual Native Plants

[https://danecountystormwatermanual.com/doku.php?id=native_plants&s\[\]=native](https://danecountystormwatermanual.com/doku.php?id=native_plants&s[]=native)

City of Madison Rain Garden
Plant List

<https://www.cityofmadison.com/engineering/stormwater/programs-initiatives/rain-gardens/rain-garden-plant-list>

Wisconsin DNR Native Plants

<https://dnr.wisconsin.gov/topic/endangeredresources/nativeplants>

Wisconsin DNR's List of
Native Plant Nurseries

<https://widnr.widen.net/view/pdf/bwd5nihege/NH0698.pdf?t.download=true&u=kkadwx>

UW-Madison Arboretum -
Gardening with Native Plants

<https://arboretum.wisc.edu/news/arboretum-news/gardening-with-native-plants-fall-practices-and-perspective/>

DID YOU KNOW?

ECOLOGICAL LANDSCAPES

Wisconsin has 16 identified ecological landscapes, and Dane County contains portions of 4 different landscapes. The majority of the County is located in the Southeast Glacial Plains landscape, which in the mid-1800's contained a mixture of upland forest, oak openings, prairie, and various wetlands.

For more information, visit:
<https://dnr.wisconsin.gov/topic/lands/EcologicalLandscapes>

PLANT MANAGEMENT

WDNR Invasive Control
Methods

<https://dnr.wisconsin.gov/topic/Invasives/control>

Wisconsin's Urban Forestry
Best Management Practices
for Preventing the

Introduction and Spread of
Invasive Species

https://wisconsinforestry.org/files/invasiveBMPs/UF-BMP-ConsolidatedManual_090811.pdf

UW-Extension Managing
Invasive Species

<https://fyi.extension.wisc.edu/wifdn/learn/managing-invasive-species/>

Dane County Volunteer

Herbicide Recommendations
<https://www.danecountyparks.com/documents/PDFs/volunteer/Herbicide-Recommendations.pdf>

Herbicide Effectiveness

<https://learningstore.extension.wisc.edu/products/herbicide-effectiveness-on-invasive-plants-in-wisconsin2013-p1376>

Wisconsin Invasive Species
Calendar

<https://public.tableau.com/app/profile/wi.first.detector.network/viz/InvasiveSpeciesCalendar/WisconsinInvasiveSpeciesCalendar>

Blue Thumb: Managing
Weeds in Pollinator Gardens

<https://bluethumb.org/managing-weeds-in-pollinator-gardens/>

Dane County Land & Water

Water Resources Engineering
5201 Fen Oak Drive, Rm 208
Madison, WI 53718
lwr.danecounty.gov

For more information regarding
Stormwater Management in Dane
County, scan the QR code or visit us at
danecountystormwatermanual.com



