DRAFT Vegetation Management Plan

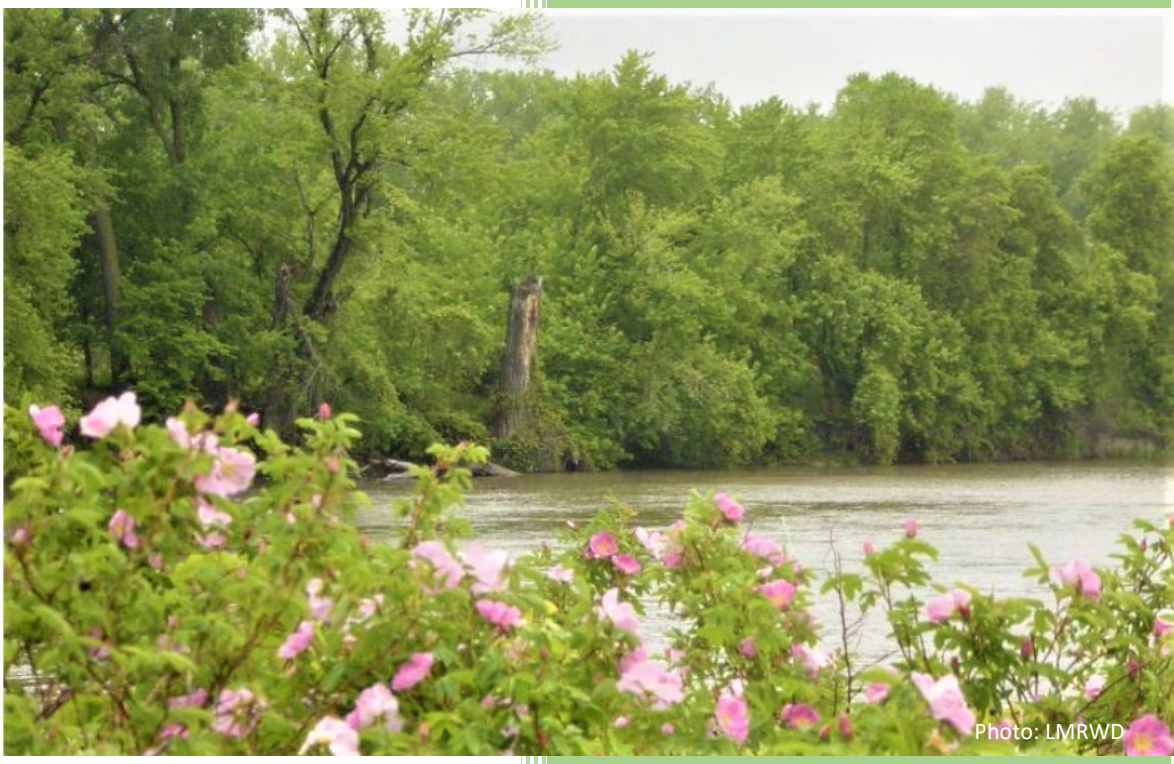
Photo: LMRWD

Lower Minnesota River
Watershed District

January 2019

EXECUTIVE SUMMARY

E1. If You're a Resident!

The Lower Minnesota River Watershed District (District) encompasses both banks of the Minnesota River for approximately 32 river miles. It extends east to the confluence of the Mississippi River and west to the City of Carver and Louisville Township. This area is dominated by a wide floodplain and steep river bluffs and houses several rare and unique habitats and species. Many communities also reside within this space. Plant management within the District greatly influences the integrity of a bluff (and the resilience of structures upon it), the water quality, and the overall health of the environment and its people. This document serves as a means to guide and inform residents on how to manage vegetation while maintaining unique and sensitive natural resources.

Image E-1 1: Map of Lower Minnesota River Watershed District

To manage your site, you must first know what is on it. Identify slopes, water features, and structures and the vegetation that currently exists. Is this area often flooded or does it reside atop a hill? Are there unique natural resources or special concerns? Local resources, such as city or county natural resources staff, can often provide technical assistance when reviewing your site. After identifying what exists, you can then address (1) what is your end goal, and (2) what features need to be protected during management.

Vegetation management is one or more of the following actions: vegetation removal, maintenance, or planting. For each action, there are several methods to choose from. Management objectives, site features, equipment, and timing will heavily influence which method(s) are suitable for your project.

Removing vegetation is done most often through mechanical (e.g., mowing or cutting) or chemical (pesticide application) means. Sites might also be suitable for physical methods such as pulling the vegetation out by hand, grazing, or the use of fire. Biological controls have also proven successful. This method is primarily used in large areas infested with a noxious weed. An insect that prefers this plant is released, inhibiting plant reproduction, the insect reduces the weed population over time.

Residents often desire to add plants to their site. This can be done through the act of planting or natural revegetation. Planting methods include applying seed to a site or planting vegetation directly (seedlings, potted plants, etc.). Natural revegetation involves little or no action. Roots and seeds that currently exist on-site determine what will grow. This method is not recommended for places prone to noxious weeds.

Plants are continually changing. They grow, reproduce, and die at different rates and respond to their environment. Effective vegetation management should include maintenance to account for these changes. Maintenance can be vegetation removal, planting, or a combination of both actions. Examples include pruning trees, pulling weeds, mowing, seeding a new lawn, or planting.

This document will guide you through the many options of managing vegetation on your site. Are there sensitive areas? If so, are there restrictions on what can be done? Detailed illustrations, text, and local resources will assist you in plan development, execution, and maintenance.

E2. If You're a Resource Manager or Industry Professional

The Lower Minnesota River Watershed District (District) encompasses both banks of the Minnesota River for approximately 32 river miles. It extends east to the confluence of the Mississippi River and west to the City of Carver and Louisville Township. This area is dominated by a wide floodplain and steep river bluffs and houses several rare and unique habitats and species. Many communities also reside within this space. Plant management within the District greatly influences the integrity of a bluff (and the resilience of structures upon it), the water quality, and the overall health of the environment and its people. This document serves as a means of guiding and informing residents and resource professionals on how to manage vegetation effectively while maintaining unique and sensitive natural resources.

The first step in vegetative management is to identify the current site conditions. Determine topography, water features, structures, and flora and fauna. Is this area in a floodplain or does it reside atop a river bluff? Are there unique natural resources or special concerns? After identifying what exists, you can then address (1) what is your end objective, (2) what features need to be protected during management, and (3) what state or local regulations apply to your site. Local resources, such as city or county natural resources staff, can often provide technical assistance when reviewing your site.

Vegetation management is one or more of the following actions: vegetation removal, maintenance, or planting. For each action, there are several methods to choose from. Management objectives, site features, equipment, timing, costs, and regulation will heavily influence which method(s) are suitable for your project.

Effective vegetation management should include a vegetative management plan. This document details site conditions, objectives, management practices, maintenance, and sensitive areas or areas of special concern. A vegetation management plan can be used to demonstrate adherence to regulations or ordinances. The submission of this plan may be necessary to receive the required approvals or permits.

This document will guide you through the many options to manage vegetation on your site. Sensitive natural resource areas (bluffs and wetlands) will be highlighted, accompanied by strategies for managing vegetation in these areas. Detailed illustrations, text, and local resources will assist you in plan development, execution, and maintenance.

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DEFINITIONS

Agricultural Activity: The use of land for the growing and/or production of agronomic, horticultural, or silvicultural crops, including nursery stock, sod, fruits, vegetables, flowers, cover crops, grains, Christmas trees, and grazing.

Alteration or Alter: When used in connection with public waters or wetlands, is any activity that will change or diminish the supply, course, current or cross-section, of public waters or wetlands.

Atlas 14: Precipitation frequency estimates released by the National Oceanic and Atmospheric Administration's National Weather Service Hydrometeorological Design Studies Center. The information supersedes precipitation frequency estimates in Technical Paper No. 40 (1961), National Weather Service HYDRO-35 (1977) and Technical Paper No. 49 (1964).

Best Management Practices or BMPs: Structural or non-structural methods used to treat runoff, including such diverse measures as ponding, street sweeping, filtration through a rain garden and infiltration to a gravel trench.

Bioengineering: Various shoreline and streambank stabilization techniques using aquatic vegetation and native upland plants, along with techniques such as willow wattling, brush layering, and willow-posts.

Buffer zone: An area of maintained grassy or woody vegetation adjacent to a waterbody.

Construction activity: Disturbance to the land that results in a change in the topography, existing soil cover (both vegetative and non-vegetative), or existing soil topography that may result in accelerated stormwater runoff, leading to soil erosion, and the movement of sediment into surface waters or drainage systems.

Control: the management or prevention of the maturation and spread of noxious weeds that does not adversely affect the environment.

DBH (Diameter at Breast Height): for the purposes of this VMP, this is defined as the diameter of a tree species at 4.5ft from ground level.

Development: The construction of any public or private improvement project, infrastructure, structure, street, or road, or the subdivision of land.

EAB: Emerald Ash Borer

Erosion: The wearing away of the ground surface as a result of wind, flowing water, ice movement, or land-disturbing activities.

Erosion and Sediment Control: A BMPs or equivalent measures designed to control runoff and erosion and to retain or control sediment on land during the period of land-disturbing activities in accordance with the applicable standard.

Existing conditions: Site conditions at the time of application consideration by the LGU or District, before any of the work has commenced, except that when impervious surfaces have been fully or partially removed from a previously developed parcel, but no intervening use has been legally or practically established, "existing conditions" denotes the previously established, developed use and condition of the parcel.

FEMA: Federal Emergency Management Agency

Fens: Rare and distinctive wetlands characterized by a substrate of non-acidic peat and dependent on a constant supply of cold, oxygen-poor groundwater rich in calcium and magnesium bicarbonates.

Fill: Any rock, soil, gravel, sand, debris, plant cuttings, or other material placed onto land or into water.

Floodplain: The area adjacent to a waterbody that is inundated during a 100-year flood.

Habitat: The natural home or environmental of an animal, plant, or organism.

High Value Resource Area or HVRA: Portion of land (or a watershed) contributing runoff to a trout water and/or fen within the Lower Minnesota River Watershed District.

Impervious Surface: A constructed hard surface that either prevents or retards the entry of water into the soil and causes water to run off the surface in greater quantities and at an increased rate of flow than prior to development. Examples include rooftops, sidewalks, patios, driveways, parking lots, storage areas, and concrete, asphalt, or gravel roads.

Infiltration: A passage of water into the ground through the soils.

Infrastructure: The system of public works for a county, state, or municipality including, but not limited to, structures, roads, bridges, culverts, sidewalks; stormwater management facilities, conveyance systems and pipes; pump stations, sanitary sewers and interceptors, hydraulic structures, permanent erosion control and stream bank protection measures, water lines, gas lines, electrical lines and associated facilities, and phone lines and supporting facilities.

Land-Disturbing Activity: Any change of the land surface to include removing vegetative cover, excavation, fill, grading, stockpiling soil, and the construction of any structure that may cause or contribute to erosion or the movement of sediment into water bodies. The use of land for new and continuing agricultural activities shall not constitute a land-disturbing activity under these standards.

Life cycle: A series of changes in life of an organism, including birth, reproduction, and death.

Local Government Unit (LGU): Local government unit, such as cities and counties.

MDA: Minnesota Department of Agriculture

MnDNR: Minnesota Department of Natural Resources

MnDOT: Minnesota Department of Transportation

MPCA: Minnesota Pollution Control Agency

MPCA General Construction Permit: General Permit Authorization to Discharge Storm Water Associated with Construction Activity under the National Pollutant Discharge Elimination System/State Disposal System Permit Program Permit MN R100001 (NPDES General Construction Permit) issued by the Minnesota Pollution Control Agency, August 1, 2013, and as amended.

Natural Vegetation: Any combination of ground cover, understory, and tree canopy that, while it may have been altered by human activity, continues to stabilize soils, retain and filter runoff, provide habitat, and recharge groundwater.

Noxious Weed: An annual, biennial, or perennial plant that the MN Commissioner of Agriculture designated to be injurious to public health, the environment, public roads, crops, livestock, or property.

NPDES: National Pollutant Discharge Elimination System

NRCS: Natural Resource Conservation Service

Overlay District: A district established by Lower Minnesota River Watershed District standards/regulations that may be more or less restrictive than the primary District's

standards/regulations. Where a property is located within an overlay district, it is subject to the provisions of both the primary standards/regulations and those of the overlay district.

Owner: Any individual, firm, association, partnership, corporation, trust, or any other legal entity having proprietary interest in the land.

Person: Any individual, trustee, partnership, unincorporated association, limited liability company, or corporation.

Propagating Parts: All parts of a plant, including seed, that are capable of producing new plans

Public Drainage System: Any drainage system as defined in Minnesota Statutes Section 103E.005, subdivision 12.

Public Project: Land development or redevelopment or other land-disturbing activities for which a District permit is required that is conducted or sponsored by a federal, state, or local governmental entity.

Public Waters: Any waters as defined in Minnesota Statute 103G.005, subdivision 15.

Qualified Professional: A person, compensated for her/his service, possessing the education, training, experience, or credential to competently perform or deliver the service provided.

Redevelopment: Any construction or improvement performed on sites where the existing land use is commercial, industrial, institutional, or residential.

Rhizomes: A continuously growing horizontal underground stem, which puts out lateral roots (e.g. strawberry).

Runoff: Rainfall, snowmelt, or irrigation water flowing over the ground surface.

Sediment: The solid mineral or organic material that is in suspension, is being transported, or has been moved from its original location by erosion and has been deposited at another location.

Sedimentation: The process or action of depositing sediment.

Seedhead: The part of a plant that produces seed; often the area which flowers or bears fruit.

Sensitive Feature: refers to a type of natural resource that is unique or rare (such as a trout stream or fen) or requires special considerations due to its characteristics (e.g., wetlands, slopes, floodplain).

Shoreland District: Shoreland areas regulated by a local municipal or county Shoreland Ordinance, or by Minnesota Statues Section 103F. Generally, Shoreland District consists of land located within a floodplain, within 1,000 feet of the ordinary high water level of a public water or public waters wetland, or within 300 feet of a stream or river.

Shoreline: The lateral measurement along the contour of the ordinary high water mark of waterbodies other than watercourses, and the top of the bank of the channel of watercourses, and the area waterward thereof.

Site: A contiguous area of land under common ownership, designated and described in official public records and separated from other lands.

Steep slope: A natural topographic feature having average slopes of 18 percent or greater measured over a horizontal distance of 25 feet or more.

Steep Slopes Overlay District. A district containing steep slope areas established by Lower Minnesota River Watershed District standards/regulations and is subject to the provisions of both the primary standards/ regulations and those of the overlay district.

Stormwater: Stormwater runoff, snow melt runoff, and surface runoff and drainage.

Structure: Anything manufactured, constructed, or erected that is normally attached to or positioned on land, including portable structures, earthen structures, water and storage systems, drainage facilities and parking lots.

Surface Water: All streams, lakes, ponds, marshes, wetlands, reservoirs, springs, rivers, drainage systems, waterways, watercourses, and irrigation systems regardless of whether natural or artificial, public or private.

SWCD: Soil and Water Conservation District

Trout waters: Trout lakes or streams that support a population of stocked or naturally produced trout.

U of MN: University of Minnesota

Wetland: Any wetland as defined in Minnesota Statutes Section 103G.005, subdivision 19.

Vegetation: A group of plants in an area.

INTRODUCTION

The Lower Minnesota River Watershed District (District) recently published the 2018–2027 Watershed Management Plan. This document has been updated to include standards protecting steep slopes, high-value resource areas (fens and trout streams), and floodplains. The plan implementation includes the development of programs and plans to protect these unique environmental resources. The Vegetation Management Plan is a part of that initiative.

I1. Why Write a Vegetation Management Plan?

The District has created a vegetation management plan for residents and resource professionals. It is intended to inform and guide readers through management options that accomplish their objectives while also protecting environmentally sensitive areas.

I1–1. EXISTING LAWS AND ORDINANCES

Many communities fall within the District's 80-square-mile boundary, and all have local ordinances that address vegetation in some fashion. A review of both city ordinances and county plans reveal that local government units (LGUs) focus predominately on invasive species, disease, and native plantings and plant communities.

Within city and township areas, tree and/or vegetation ordinances strive to enhance the community through beautification while providing key services such as shade, clean air, soil retention, and pervious surfaces. Local rules frequently prohibit the planting of "nuisance trees," such as Cottonwood, Poplar, and female Gingko. Such species produce vast amounts of seed that can coat entire city thoroughfares. Tree diversity is also a large concern. New plantings within most cities require two or more species of tree per city block. This diversity slows the spread of many invasive species and diseases (e.g., Emerald Ash Borer and Oak Wilt).

Image I- 1: Eastern Cottonwood Seeds. Trees release seeds in early summer and blanket the ground. Often viewed as a "nuisance tree", it fills gutters and AC units in many communities.

In general, larger communities within the District have a more robust set of rules regarding the planting, removal, and transportation of vegetation. County plans and ordinances focus largely on the management of natural areas, shorelands, and weeds. Minnesota state law supports these efforts in several ways. The Minnesota Noxious Weed Law (Minnesota Statutes, sections 18.75–18.91) identifies 42 plant species regulated by the state. Regulations are species-dependent but range from eradication and control enforcement to prohibiting the transportation, propagation, or sale. At the local level, county agricultural inspectors are appointed to assist in the implementation of laws related to seeds, feeds, fertilizers, pesticides, and plant pests.

Local resources: Consult the list below to find your local rules and regulations.

- If you're in a city: Check your city website for ordinances on vegetation. For additional assistance, contact the city clerk or the Parks and Recreation/Public Works Department.
- County: Check your county website for ordinances or contact the Environmental Services Department. (Section 1.2.1 has a full list of contact information.)

I1–2. FILLING THE GAP

The District houses environmentally sensitive areas. They include steep slopes and bluffs, fens and wetland, trout streams, and floodplains. Existing laws and local ordinances do not provide thorough guidance for vegetation management in these areas. This plan was created to fill the gap by providing detailed instructions for residents and resources professionals.

Image I- 2: Bluff Erosion Along Lake Michigan. Without plants to anchor the slope, it erodes quickly (photo credit: Narayan Mahon).

A steep slope will likely fail if all the vegetation is removed. Plants anchor and buffer the ground, keep it intact, and reduce erosion. Once removed, these serves are gone, and the area is exposed. The slope is no longer resilient during heavy seasonal rains, dramatic temperature changes, and human activity. It erodes, compromises structures that sit atop the slope, and influences everything and everyone downslope. This is one example of how poor vegetation management in an environmentally sensitive area can affect local communities. Additionally, it leads to a loss of habitat and increased water pollution. The means and methods outlined in this plan will help you navigate how to manage vegetation in these types of landscapes.

I1–3. PLAN OBJECTIVES

The Lower Minnesota River Watershed District's Vegetation Management Plan shall:

- Identify means and methods of vegetation removal to minimize ground disturbances
- Identify methods of revegetating disturbed areas
- Identify measures to reduce soil disturbance during vegetation removal
- Identify means and methods of vegetation removal and establishment of environmentally sensitive areas: wetlands and slopes

I2. A General Summary of the District

The Lower Minnesota River Watershed District (District) encompasses both banks of the Minnesota River for approximately 32 river miles. It extends east to the confluence of the Mississippi River and west to the City of Carver and Louisville Township. This area is dominated by a wide floodplain and steep river bluffs and houses several rare and unique habitats and species.

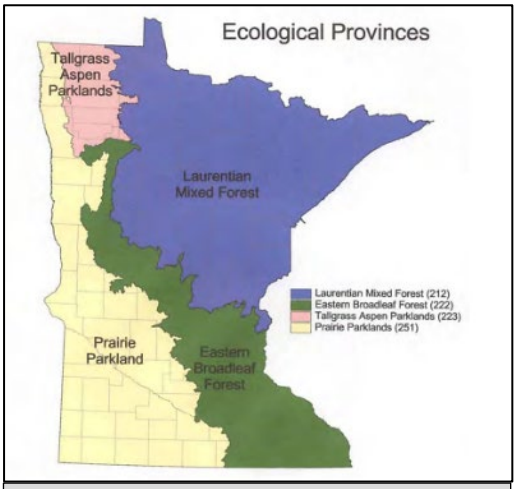


Image I- 3: Ecological Provinces of Minnesota. The District falls within the Eastern Broadleaf Forest (source: MnDNR).

The varied geography and topography of the District are attributed to glacier retreat during the Wisconsin Glacial Age, roughly 11,000 years ago. Elevations are lowest along the Minnesota River and peak at the northern bluffs near the Cities of Eden, Prairie, and Bloomington.

The District contains many surface water features including calcareous fens, wetlands, ponds, lakes, streams, and the Minnesota River. The river serves as a regional groundwater discharge area, routing high-quality water to lakes, wetlands, and streams.

This area of Minnesota falls within the Eastern Broadleaf Forest and supports the critical needs of many wildlife species. The river, floodplain, and bluffs provide a unique combination of habitats resulting in a high occurrence of rare and endangered species. These include the federally endangered Higgins eye pearly mussel and the endangered western prairie fringed orchid. The Minnesota Valley National Wildlife Refuge falls within this space, protecting many of these resources.

The District's natural landscapes are integrated into a thriving metropolitan area. The Minnesota River is used for both commercial and noncommercial navigation. Trails wind their way through bluffs and native plantings to residential neighborhoods. It is home to a diverse community of plants, animals, and people.

1. REVIEWING YOUR SITE

1.1 What Vegetation Is on My Site?

Prior to any action, you must first determine what is on your site. Knowing which plant species currently exist on your project will help determine the most effective control methods. Basic knowledge of a plant's life cycle is critical to timing appropriate treatment. Plants that grow, flower, and die over the span of a few months are treated differently than those that live for many years (e.g., grass versus a tree). See Table 1–1 for a brief overview of plant types and their basic life cycles. It is not necessary to memorize all the information this table presents; however, you should be familiar with the types of plants and general life spans.

Table 1- 1: Plant Types

Plant Groups According to Physical Characteristics	
Grass	 Have a single seed leaf; leaves are narrow and upright. Roots are fibrous and may be either a simple, shallow, annual system, or an extensive perennial system that survives winter, and spreads laterally for many feet.
Broadleaf	Have two seed leaves; generally, have broad leaves with net-like vein pattern, and a coarse root system. May be winter or summer annual, biennials, or perennials. 
Woody plants	 Perennial plants with woody stems, which do not dies over winter. Examples are low growing brush, shrubs, perennial vines, and trees.
Plant Groups According to Life Cycle	
Annuals	Complete their life cycle in one year. **Summer annuals** germinate in spring, grow in the summer, and die in the fall. Control is most effective in the spring when they are seedlings. **Winter annuals** germinate in the fall, begin growing in the winter, and flower in early spring. Seeds are also produced in spring, and the plants die by summer. Control of these plants is most effective in the fall or early spring.

Table 1- 1: Plant Types	
Biennials	Need two years to complete their life cycle. Produce a low-growing rosette plant in the first year, and by the second year, produce a flowering stalk. The plant dies after the seeds have matured in the second year. Control is more effective during the first year of growth.
Perennials	Live indefinitely and reproduce by seed. May also reproduce vegetatively, by rhizomes, tubers, or root sections. Difficult to control because of their extensive root systems. Control most effective by use of systemic herbicides, and when plants are seedlings. For established perennials, control methods should be adapted to the yearly life cycle of the plant. Herbicides applied to foliage during the early part of summer are not very effective because of plant characteristics. Once flowering has begun, characteristics are such that foliar applications of herbicides are most effective, during bud to flower stage, and especially just before flowering. Chemical herbicides are also effective right after plants are cut (on woody plants) and new growth occurs (on herbaceous plants). Application in fall, prior to plants going dormant is effective since the herbicides move with natural energy flow into the roots of the perennial plants. Foliar herbicides are most effective on woody plants when applied in mid- to late summer. Treatment with dormant basal applications can be very effective from late fall through winter as well.
	Source: MnDOT

Image 1–1: Life Cycles is a visual representation of the same information. The annuals depicted include plants such as the common dandelion. We see them pop up in our yards, flower, seed, and then die, rapidly going through an entire life cycle in a matter of weeks. Biennials experience a lifecycle over the course of two years, and perennials many years longer.

Life cycles go hand-in-hand with timing management practices on your site. For example, some treatment methods are most effective when applied before a plant flowers. This time period will vary depending on the plant type and species.

1.2 What Features Are on My Site?

Vegetation aside, there are many other landscape features that can affect your management plans. The following sections provide guidance on how to thoroughly assess your site.

1.2.1 RESIDENTS

Walking through your site is the best way to account for the features on it. The following list will assist when reviewing the area.

- Is there a slope? If a soccer ball were placed on the ground, would it roll away? If so, you have a slope.
- Are there structures?

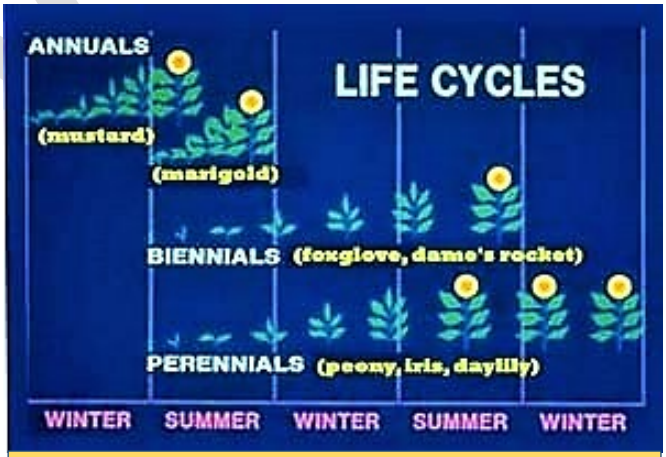


Image 1- 1: Life Cycles. This illustration demonstrates the different life cycle lengths for annuals, biennials, and perennials. Note the small window of time that each plant type flowers. For weed management, treatment prior to flowering is important for population control. Flowers = seeds = more plants.

- Are there hazards?
- Are there features you want to protect?
- Will adjacent land use (e.g., agriculture, lawns, businesses, proximity to animals) influence my site?
- Are there sensitive features (e.g., floodplain, wetlands, slopes, native plant communities, habitat) on my site?

Image 1- 2: Rare Turtle Crossing. This image is an example of a sensitive area. A rare turtle species is known to live here, and it is near a water feature. These characteristics should receive special considerations when planning (photo: USFWS Midwest Region).

The list includes the term "sensitive feature." "What does that mean?", you might ask. In this case, the term refers to a type of natural resource that is unique or rare (such as a trout stream or fen) or requires special considerations due to its characteristics (e.g., wetlands, slopes, floodplain). These can sometimes be difficult to recognize. If you are uncertain, consult the local resources at the end of this section. Both features and vegetation will inform the method(s) selected for managing your site. See Chapter 2: Means and Methods of Vegetation Management for an overview of your options.

City Resources

Environmental Services Department: Some cities have an Environmental Services or Natural Resources department. Staff work and manage environmental areas within the city limits. Visit your city website for details.

County Resources

Soil and Water Conservation District (SWCD): Staff work with county landowners to provide soil and water conservation services and programming. See the SWCD directory to find contact information for your local office: http://www.bwsr.state.mn.us/partners/directories/SWCD_Dir.pdf

County Environmental Services or Natural Resource Department: All counties within the District have staff devoted to environmental management. They provide a wide range of services and programming for county residents.

CARVER COUNTY ENVIRONMENTAL SERVICES
Website: https://www.co.carver.mn.us/departments/public-services/environmental-services
Phone: 952-361-1800
Email: environment@co.carver.mn.us

DAKOTA COUNTY ENVIRONMENTAL RESOURCES
Website: https://www.co.dakota.mn.us/Environment/
Phone: 952-891-7557
Email: environ@co.dakota.mn.us

HENNEPIN COUNTY ENVIRONMENT AND ENERGY
Website: https://www.hennepin.us/residents#environment
Phone: 612-348-3777

RAMSEY COUNTY PARKS AND RECREATION
Website: https://www.ramseycounty.us/residents/environment
Phone: 651-748-2500
Email: goodnature@co.ramsey.mn.us

SCOTT COUNTY ENVIRONMENTAL SERVICES
Website: https://www.scottcountymn.gov/491/Environmental-Services
Phone: 952-496-8177

Watershed Resources

The District has produced several maps that identify sensitive features within the watershed. Note: these maps do not include all types of sensitive features and should only serve as a starting point for site assessment. You may have a slope that does not fall within the Steep Slope Overlay District but is still a sensitive feature. To determine if your property falls within the High Valued Resource Area (HVRA) or Steep Slopes Overlay District, consult Appendix K in the 2018–2027 Watershed Management Plan: http://lowermnriverwd.org/application/files/6615/4212/6020/1._LMRWD_Complete_Plan_2018-2027.pdf

State and Federal Resources

Federal Emergency Management Agency (FEMA): FEMA provides flood map services. To determine if your site is located within a floodplain, click the following link to view current flood maps in your area: https://msc.fema.gov/portal/home

1.2.2 RESOURCE MANAGERS AND INDUSTRY PROFESSIONALS

Prior to selecting the means and methods for managing your project, you must account for both the vegetation and site features. The best method for achieving this is to walk the area. The following list will assist as you begin your review.

- Are there structures?
- Are there hazards?
- Are there features you want to protect?
- Will site use or adjacent land use influence or impact management?
  - Roadways, public areas, agriculture, industrial, and residential
- Are there stormwater conveyance systems or drainage features?
- Are there environmentally sensitive features to consider?
  - Floodplain, wetlands
  - Open water, shoreline, trout streams
  - Steep slopes
  - Native plant communities
  - Rare, threatened, or endangered species
  - Highly erodible soils or concerns about compaction
- Are you working with other permits (e.g., General Construction, MS4)? How will they influence the management of your site?

Additional resources: The following list supplements the resources already stated in Section 1.2.1. Residents.

- Do I need a permit? A database for water and shoreland-related permits on the state and federal level run by the Minnesota Department of Natural Resources (MnDNR): https://www.dnr.state.mn.us/permits/water/needpermit.html
- Do I need a project review from the district? Contact the Lower Minnesota River Watershed District administrator to determine if your project needs to be reviewed: http://lowermnriverwd.org/contact-us
- Minnesota Pollution Control Agency provides guidance and assistance with regulations and permitting: https://www.pca.state.mn.us/regulations/guidance-and-assistance
- Are you working in a shoreland area? Check with your county and city. All counties within the District, and most cities, have shoreland ordinances.

2 MEANS AND METHODS OF VEGETATION MANAGEMENT

Vegetation management is one or more of the following actions: vegetation removal, maintenance, or planting. For each action there are several methods to choose from. This section will serve as a practical guide to site management and highlight commonly used techniques and practices. It will also feature environmentally sensitive features and the approaches best suited for vegetation management in these areas.

2.1 Vegetation Removal

Vegetation removal is the act of removing all or part of a plant from your site. This can be accomplished mechanically, physically, chemically, or biologically.

2.1.1. MECHANICAL AND PHYSICAL REMOVAL

The approaches described in this section represent a large spectrum. Some are more suited to larger sites and require heavy equipment, whereas others simply require physical movement or hand tools. As illustrated in the introduction, plant roots are important to soil health and site stability. During vegetation removal, when feasible, leave plant stumps and root systems in place unless they are diseased, pose a hazard, or are classified as a noxious weed.

Image 2- 1: Lop and Scatter in Wooded Areas. Foresters use this method to improve timber stands. Understory shrubs compete with trees for water and nutrients. When removed, the desired trees have less competition and grow larger faster (photo: USDA).

Lop and scatter: Vegetation is cut and scattered in place. Debris is generally no more than 12 inches long and three inches in diameter. Chipping is a similar method in which debris is sent through a woodchipper before it is spread. Woodchips should be dispersed no deeper than one inch across the site. At this depth, debris does not prevent natural growth from occurring.

Best suited for: Shrub and brush removal.

Equipment: Tools are largely project-dependent and can range from light equipment (ATV, small tractor, woodchipper) to hand tools, such as a chainsaw or a brush saw.

Timing: Equipment can rut and compact soils. Timing work to coincide with frozen or dry conditions can reduce negative impacts to your soils.

Sensitive features: Chipping should not be done on steep slopes, floodplains, wetlands, or water features. Woodchips are lightweight and float, and they can easily be washed offsite and downhill. State law regulates the draining, filling, or excavation of wetlands in Minnesota. Woodchips are considered wetland fill. If you have questions or concerns about your site and its water features, contact your local Wetland Conservation Act (WCA) representative.

Additional considerations: Scattered debris can pose a hazard to foot traffic. Noxious weeds, diseased vegetation, or those infested with invasive species (e.g., Emerald Ash Borer) should not be left on-site as they require special methods of disposal.

Local resources: The Wetland Conservation Act (WCA) is enforced and represented at the local level. Most often, it is a staff member at your county Soil and Water Conservation District office. They can review your plans and site features. For more information about the WCA visit: http://www.bwsr.state.mn.us/wetlands/WCA_factsheet.html

Cutting: The removal of woody plants (trees and shrubs). Unlike lop and scatter or wood chipping, this approach removes all cut vegetation from the site.

TIP: When cutting down a tree, consider using a hand saw. As you cut through the wood fibers and the tree begins to lean, it will fall more slowly. You can hear the fibers break apart and give way. This allows you more time to react and anticipate where the tree will land.

Best suited for: Tree, shrubs, and bushes

Equipment: Tools are largely project-dependent and can range from heavy logging equipment to hand tools, such as a chainsaw or ax. Equipment can rut and compact soils. When feasible, schedule work to coincide with frozen or dry conditions when using large equipment.

Timing: Vegetation can be cut at any time, but certain seasonal conditions may be preferable for working on your site. Cutting is easiest when leaves are absent in the fall and winter months. This allows a better visual of the entire plant (unless it is a conifer). The surrounding vegetation is less likely to mask hazards with their dense leaves. The late winter is when tree sap begins to flow. Cutting trees during this time could be quite sticky, rapidly clogging your tools. If you have sensitive soils, consider cutting during frozen or dry conditions.

Additional considerations: Cutting vegetation at ground level will reduce tripping hazards. If cutting in winter, keep in mind that most cuts will be at snow level, not at ground level. You may want to return after snowmelt to remove stumps. Do not cut down large or hazardous trees if you are not trained to do so.

Trimming and pruning: The removal of part of a plant, generally, a limb or portion of the limb. Trimming and pruning are done for one or more reasons: to achieve a desired shape (plant silhouette), promote new growth, improve plant health, or remove a hazard.

Best suited for: This practice is most commonly done on woody vegetation (trees and shrubs), but all plants can be trimmed or pruned. Flowering annuals often have their dead or dying flowers removed. This stimulates the plant into creating additional blooms.

Equipment: Hand tools (e.g., chainsaws, saws, pruning shears) are used most often.

Timing: Timing your work helps to achieve your desired outcome. Think in terms of both seasons and the life span of the plant. See Table 2–1 for a general guide on planning your work.

How do I prune my plant? It is much easier to prune or trim when a plant is young. The limbs are smaller, leaving a minor wound where the limb was removed. As plants mature, limb removal can become more complicated. See Images 2–2 and 2–3 for step-by-step instructions.

Table 2- 1: When do I Prune?	
Seasonally	
Winter	Plants are dormant during the winter. Pruning done at this time will stimulate growth bursts in the spring. Wait until the coldest part of the winter has passed to begin your work. *Best time for flowering and fruiting trees, shrubs, and vines.*
Spring	Pruning during early spring can stimulate and direct growth as well as correct plant structure. *Best time for evergreens, flowering trees, shrubs, some perennials, and vines.*
Summer	Wait until the plant has completed seasonal growth. Prune to direct tree growth and correct tree structure.
Fall	Do not prune, if possible, during this time. Tree wounds heal very slowly in the fall. Decay fungi and spores are abundant and can easily access tree wounds. *Best time for some perennials.*
Life Span	
Shrubs	Shrubs can be pruned each year to promote healthy growth and maintain their shape. A general rule of thumb: remove one-third of the existing plant via pruning each year.
Young trees and saplings	Prune trees when they are young to ensure minimal pruning wounds. Prune every 2 years.
Mature trees	Prune every 5 years to maintain tree health and correct tree structure.

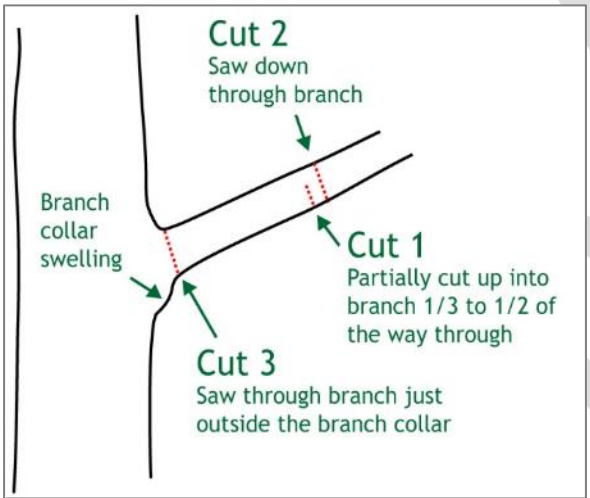


Image 2- 6: How to Cut a Tree Branch. Removing a tree branch can be tricky to cut due the weight it distributes. Cut 1 reduces tension in the tree as Cut 2 is taking place. It also serves as a hinge during the cut, guiding the branch downward. Cut 3 removes the remainder of the branch stub. (photo: U of MN).

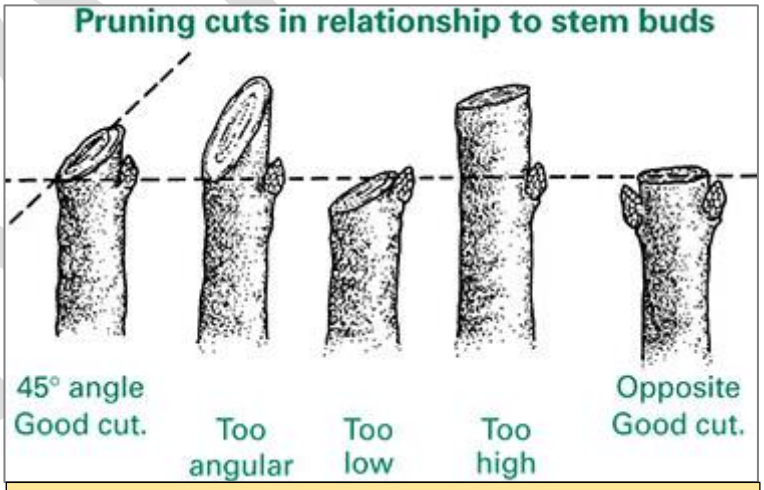


Image 2- 7: How to Prune Stems. When pruning part of a stem, you need to be aware of stem buds. Buds will turn into new growth (leaves, branches, and flowers). Make a clean cut just above the bud (see the "good cut" examples above). The angle creates the smallest wound surface possible. If the cut is too close to the bud, new growth will be affected by the wound. If the cut leaves too much stem above the bud, it could rot and impact any new growth (photo: Rutgers University).

Mowing and hydro-ax: This method cuts vegetation and spreads it in a loose arrangement on your site. Cuts are generally within 12 inches of the ground. Mowing is done for aesthetic reasons, visibility, or species control.

Best suited for: Woody plants, broadleaf plants, and grasses

Equipment: Varies from conventional push and riding lawn mowers to larger equipment, such as the hydro-ax. Not all mowers are designed to accommodate woody vegetation. Most residential mowers are for grass only and cut more evenly. A hydro-ax is intended for woody vegetation. Multiple attachments allow the operator to mow and mulch shrubs and small trees. All equipment should be used according to the manufacturer's instructions.

Timing: The frequency of mowing depends on your objectives and existing vegetation. If the area is largely woody, you might use a hydro-ax annually or every few years. However, broadleaves and grasses are mowed more often. A mowing schedule is most often driven by aesthetics (lawns), visibility (roadways), and/or species control. Mowing is commonly done to manage weeds and should be done prior to seed development. This is best accomplished by cutting vegetation just before flowers start blooming, if not earlier.

Additional considerations: For management of vegetation along roadways, see Minnesota Department of Transportation (MnDOT) guidance documents. Minnesota state law has ROW mowing restrictions to protect ground-nesting birds between July 31st and August 31st. The MnDOT 2008–2020 Best Practices Handbook for Roadside Vegetation Management walks through these regulations, the entities they apply to, and when they apply.

Local resources: The following highlights techniques, regulations, and MnDOT policy for vegetation management.

- The Minnesota Department of Transportation Maintenance Manual: http://www.dot.state.mn.us/maintenance/pdf/manual/ch5.pdf
- The Minnesota Department of Transportation 2008–2020 Best Practices Handbook for Roadside Vegetation Management: https://www.lrrb.org/pdf/200820.pdf

Pulling by hand: The removal of an entire plant by physically pulling it out of the ground.

Best suited for: Removing a small population of herbaceous plants. Successful removal depends upon plant size, species, and soil conditions. Pulling can be labor intensive and time consuming.

Equipment: Gloves.

Timing: Plants are easiest to remove when they are young. Root systems are not fully developed, therefore less effort is required to pull them out of the ground. Many species can regrow via the root system if only the surface vegetation is removed.

TIP: Plants are easier to pull when the ground is soft. If possible, start removing plants within a day or two of a rain event. The added moisture will soften the ground. Waiting a day will keep you from getting too muddy while you work. Watering your work area with a sprinkler or garden hose is another option.

Additional considerations: This is an ideal method for the removal of small populations of herbaceous noxious weeds (when utilizing safe techniques). It is commonly used in sensitive areas (e.g., reestablishing native plant community), where pesticide use is not preferred.

Rotational grazing: The practice of moving grazing animals into different sections of land. This is done to (1) provide food for the animals and/or (2) manage the vegetation on the land. Common grazing animals include goats, sheep, cows, and horses. Animals are introduced to the site as needed or on a rotating schedule.

Image 2- 10: Goat Eating Buckthorn in Minneapolis. In 2017, the Minneapolis Park Board released 80 goats into a six-acre section of Cedar Lake Regional Park. After 10 days of eating, the goats were moved to Wirth Park (photo: Jerry Holt).

Best suited for: Managing areas with small woody vegetation, broadleaves, and grasses. Larger sections of land are generally preferred as they can accommodate more animals. The vegetation on your land will inform what type of animal is best suited to graze there.

Grazing is gaining in popularity as a tool for noxious weed management. Goats have been released in parks around Minnesota to combat invasive species (mainly buckthorn) and reduce labor costs and pesticide use.

Equipment: To introduce grazing animals to your site you will need fencing, the animals, and a source of drinking water.

Timing: Grazing is most effective when done more than once and when seasonally appropriate. Animals are more enticed to eat vegetation when it is green; therefore, avoid the winter and late fall. Assess the vegetation you are trying to control. It is best to introduce animals to your site before plants flower or develop seeds and fruit (see Image 2–5). Animals can forage when vegetation is mature and has seed and fruit; however, the seed may still be viable after it is digested. This disperses unwanted seed across your site with a nutrient-rich material (excrement)—ideal growing conditions for a seed.

Grazing should be done on a rotating basis to be effective long term. This timeline can vary considerably. Some sites are grazed multiple times each year, whereas others introduce animals every 2–5 years as needed. Sites dominated by grass and broadleaves are generally foraged often. Woody vegetation has a longer lull between grazing periods. For example, areas that use goats to manage buckthorn often plan to have the animals grazing once every 2–3 years.

Sensitive features: Most sensitive features are not suited for grazing. Livestock will impact a site and can damage these areas. They should not be used on slopes, in or near wetlands and water features, or floodplains.

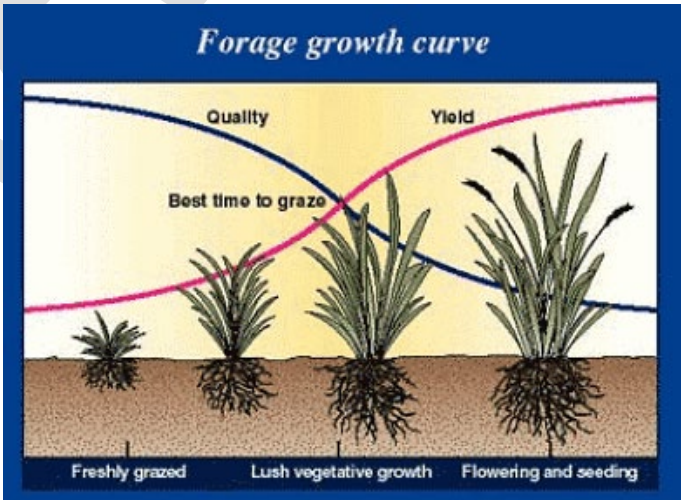


Image 2- 13: The forage growth curve illustrates the ideal time frame for grazing herbaceous vegetation. If you have an abundance of non-woody weeds, grazing prior to flowering and seeding will provide a high-quality food source while eliminating the reproduction of weeds (some species, not all; source: University of Illinois Extension).

Additional considerations: If your site resides within city limits, contact your city before beginning grazing. There may be local ordinances in place that prevent or restrict livestock within city limits. Special permissions and permitting may also be required.

Local resources: Grazing has traditionally been a rural practice. As management techniques evolve in urban areas, it has become more common on city lands. See the following resource list to help you get started.

- If your site is in an urban area, contact your city's Parks and Recreation Department. They may use grazing to manage city land and can provide additional information on local ordinances or permitting requirements.
- County SWCD: Staff work with land managers, farmers, and resource professionals to provide cost sharing opportunities and technical assistance. Your local office may even have a grazing specialist. See the SWCD directory to find contact information for your local office: http://www.bwsr.state.mn.us/partners/directories/SWCD_Dir.pdf
- Natural Resource Conservation Service (NRCS): This is a federal organization that works with landowners, providing financial and technical assistance. Follow the link to find your local field office: http://files.dnr.state.mn.us/assistance/backyard/privatelandsprogram/benefits_prescribed_burning.pdf

Prescribed burning: Intentionally introducing fire on a site to reduce the amount of vegetation (also called fuels). Prescribed burns are planned and regulated.

Image 2- 16: Redhead Waterfowl Production Area Prescribed Burn. USFWS crews conduct a prescribed burn. This area is dominated by grasses, a fuel that burns quickly at a low temperature (woody vegetation burns slower at a higher temperature). It is early spring, and the site has not yet greened up (photo: USFWS Midwest Region).

Best suited for: Woody, broadleaf, and grasses. Ideal locations have few obstacles, structures, or hazards (e.g., homes, electrical boxes, propane tanks). Prescribed burning is often done on brushy sites to reduce the risk of wildland fires (started by accident or naturally, which are not planned). Prairie restorations, pastures, and fields also benefit from this practice. Burning a site can prepare it for planting, add nutrients to the soil, and stimulate many native plants.

Equipment: Prescribed burning uses a variety of tools to ignite, guide, and extinguish a fire. Examples include drip torches, lighters, rakes, shovels, Pulaskis, chainsaws, water or bladder bags, water tanks, and hose. Safety equipment and communication are imperative when conducting a burn. Items include two-way radios, site map and burn plan, weather kit, hard hat, eye and ear and face protection, gloves, boots, and fire-resistant clothing.

Timing: Prescribed burns rely on several factors aligning. These include: (1) a low relative humidity, (2) low winds out of a preferred direction, (3) approval to burn from local authorities, and (4) the ideal time of year. Most burns in Minnesota take place in early spring prior to site vegetation emerging (i.e., before "greening up"). Plant materials on-site are either woody and dormant or the dead plant matter from the past growing season (there are some exceptions, use this as a rule of thumb). Fire will consume the dead plant matter with little impact on vegetation that has not yet emerged from the ground. If this is an ideal method for vegetation management on your site, plan to burn every 2–5 years.

Image 2- 19: Three Days After a Prescribed Burn. When timed appropriately, a site can green up quickly after a prescribed burn (photo: USFWS Midwest Region).

Additional considerations: Smoke produced by your burn should be considered. If winds are low, it can hang over a site and neighboring roadways, significantly reducing visibility. On the day of your burn, contact the local DNR office, fire department, and area law enforcement.

Local resources: Prescribed burning can be hazardous. To protect yourself, local resources, and public safety, local approval is required. All burns must obtain a state burn permit (unless otherwise indicated). It can be issued from your local DNR Forestry office or your local fire chief or warden.

- A general overview of prescribed burning for private landowners: http://files.dnr.state.mn.us/assistance/backyard/privatelandsprogram/benefits_prescribed_burning.pdf
- If your burn is less than one acre, you can apply online for an open burn permit: https://webapps15.dnr.state.mn.us/burning-permits/
- Your local DNR Forestry office can answer questions, help develop your burn plan, identify local resources (trained persons and equipment), and issue a state burn permit. To find your county burn permit contact: https://webapps15.dnr.state.mn.us/burning-permits/admin_areas
- Need equipment and people to assist with your burn? Contact your local fire department. Crews may be able to help or identify other resources in your area.

Additional Considerations for Sensitive Features:

Timing: If you have sensitive features on your project site, timing is of the utmost importance to reduce unnecessary impact. If you have questions or concerns, consult the local resources cited throughout this document.

Slopes: Widespread clearing should be avoided on large slopes when at all possible. If necessary, clearing should be done selectively and leave adequate herbaceous or shrub cover to minimize potential erosion. Selective removal is the removal of isolated individual trees or shrubs. This method does not substantially change the canopy or the site's understory conditions. Low-impact equipment should be used, preferably hand tools, to minimize soil disturbance.

Slopes can pose a hazard due to their slanted orientation. Uneven surfaces increase the likelihood of rolling equipment. Exercise caution when working in these areas.

Wetlands, floodplains, and shoreline: Consult your local WCA authority prior to beginning work in areas. A review of possible impacts may be required. Clearing activities should be done in a manner that minimizes site disturbance to the greatest extent possible. Practices include clearing by hand, using low-ground-pressure equipment (when feasible), and using temporary construction mats. Time work when soils are frozen, to the greatest extent possible. Tree and shrub removal in these conditions limit soil disturbance and compaction.

2.1.2. CHEMICAL REMOVAL: PESTICIDE APPLICATION

Chemicals are another tool for vegetation management. The chemicals used for eliminating unwanted pests are called pesticides. There are many types of pesticides; those most often used for vegetation management are called insecticides and herbicides. As the name implies, insecticides are used on insects, whereas herbicides are used on plants. This section will focus on herbicide application.

Means and Methods of Application:

There are many ways to apply pesticides, including before (pre) and after (post) plants emerge from the soil. Preemergent pesticides are distributed on-site *before* the unwanted vegetation emerges from the soil. This type of herbicide is commonly used on a lawn, in which you desire grasses and don't want broadleaves (e.g., dandelions). In this example, the preemergent targets and eliminates broadleaves before they are even visible. Caution should be taken when using these types of chemicals, as they are easy to over use. If you cannot see the "pest," how do you know it is there? Many preemergents are also indiscriminate. In the lawn example, dandelions were the targeted pest. An overzealous application of broadleaf preemergent could eliminate both desired (flowers, hostas, etc.) and unwanted (dandelions) broadleaves from your yard.

Another alternative is to apply the herbicide after the plant has emerged. This is a more targeted approach. It allows you time to identify what pests you have on-site and where they are located. Postemergent herbicide is then directed to these areas.

Broadcast versus spot spray: The location and abundance of unwanted plants on your site will inform how you apply herbicide. Broadcast spraying can be used pre- or postemergence, when there are many targeted plants in proximity. This technique uses a wide-angle nozzle to spray a large area with herbicide. Spot spraying is done postemergence. A narrow nozzle is used to direct herbicide onto individual plants, rather than many at once.

Soil and foliar or foliage versus basal: Preemergent herbicides are applied directly to the soil, in a granular or liquid form. Postemergents are applied to living plant tissue and "ingested" by the plant. Some herbicides are quite specialized. To be effective, they must be absorbed by the plant in a specific place. This is generally (1) foliar (leaves), or (2) basal, or the base of the plant.

Image 2- 22: Basal Herbicide Treatment. The operator is using a narrow nozzle to direct herbicide to the base (basal) of an unwanted tree (photo: University of Florida Northwest Extension Office).

Treatment Recommendations:

The following are examples of treatments commonly used in Minnesota for vegetation management. This is not all-inclusive;;

rather, it provides a general idea of how herbicides are applied to certain cover types. Chemical treatments are often combined with mechanical methods to eliminate unwanted vegetation.

Brush: In areas that have continuous brushy cover, it is difficult to access and treat individual plants. Use a brush saw or mower to cut down the brush and remove it from the site. This will improve visibility and access to each plant stump. Then, (1) within a week, treat all stumps with an herbicide or (2) wait until stumps resprout for a foliar herbicide application.

Trees and shrubs: If the tree or shrub is less than 6 feet tall, use a basal herbicide treatment (see Image 2–8). If the plant is greater than 6 feet tall, cut it down, and then apply a basal stump treatment.

Image 2- 25: Hack and Squirt Herbicide Treatment (photo: North Carolina State University Extension).

For larger trees, a technique called *hack and squirt* is often used. It is ideal for situations when cutting down a tree is hazardous. Bark serves as a protective coating. This method hacks through the bark and into the vascular tissue. Once the cut is made, the herbicide is applied to the exposed sapwood. It is transported, via the vascular tissues, throughout the tree, slowly killing it.

Herbaceous: This cover type includes grasses and broadleaves. They are most commonly managed by applying a preemergent to a known problem area or by foliar application after the plants have emerged.

Timing:

Follow the manufacturer's instructions for specifics on how to safely handle and apply the treatment. Herbicide brands and types vary in concentration, timing, and application method.

Preemergent: Treatment should be applied to your site prior to germination and seedling development.

Postemergent: When feasible, apply chemical treatments prior to the maturation of blooms and/or seedheads. Doing so afterward will kill the parent plant, but its seeds are still likely viable. Some species have short life cycles that allow for a follow-up spray later in the growing season. Fall spraying is ideal for several weedy species because they direct more energy into root systems at that time and carry herbicide into the roots. This will kill the above and belowground plant tissue.

Herbicide Selection, Resources, and Regulation:

Pesticides can be purchased at your local hardware or landscape supply store, and there are dozens of options to choose from. How do you select the right chemical for your site? Contact your local University of Minnesota Extension office for the recommended pesticides and their application rates.

- Find your local Extension office: https://www3.extension.umn.edu/local/
- Pesticide safety and environmental education: http://apps.extension.umn.edu/agriculture/pesticide-safety/
- Control options for common Minnesota lawn and landscape weeds: https://apps.extension.umn.edu/garden/diagnose/weed/idlist.html
- Diagnose a problem (e.g., is this plant a weed?): https://apps.extension.umn.edu/garden/diagnose/

- Get certified! Commercial, noncommercial, and structural pesticide applicators: https://extension.umn.edu/pesticide-safety-and-certification/commercial-noncommercial-and-structural-pesticide-applicators

It is illegal to use a pesticide in a manner that does not follow the manufacturer's instructions. Herbicides should be used in accordance with label recommendations and local and state regulations. All pesticides are registered and approved for use at the federal level by the Environmental Protection Agency (EPA). In Minnesota, the Department of Agriculture (MDA) regulates agricultural pesticides and issues licenses for commercial, noncommercial, structural, and private pesticide applicators. Communities may also prohibit or restrict pesticide use in your area. See the list of resources below for more information.

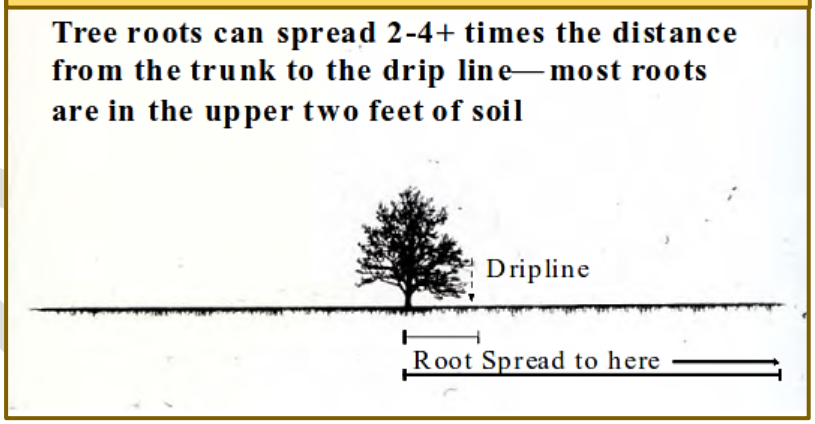
- Contact your city and/or review local ordinances to see if pesticide restrictions apply to your site
- Pesticide applicator licensing: https://www.mda.state.mn.us/pesticide-fertilizer/pesticide-applicator-licensing
- MDA regulation, inspection, and enforcement information: https://www.mda.state.mn.us/pesticide-fertilizer/regulation-inspection-enforcement

Pesticides in Sensitive Areas:

Slopes: When feasible, spot spray instead of broadcast to avoid the elimination of non-weed or nontargeted vegetation.

Wetlands, water features, and shoreline: Some chemical combinations are sensitive to water, others are not. There is a category of herbicides intended for application in or near water. All other kinds of herbicides should not be used. They are not intended for this type of application and can have a severe environmental impact. If you have questions, contact your local University of Minnesota Extension office for guidance.

Image 2- 28. Tree Roots. Adhere to herbicide labels for application guidance. Not following recommendations could damage nontargeted vegetation like trees through horizontal root absorption (source: MnDOT).



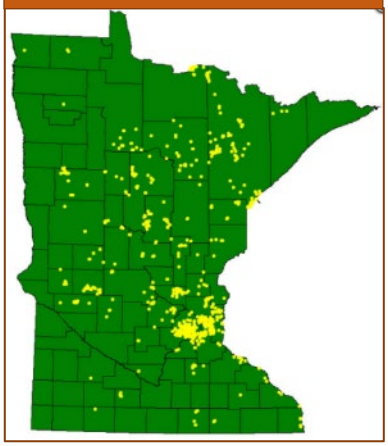
Nontargeted vegetation: Be aware of where and what you are spraying and how it will impact nontargeted vegetation. Trees can be unintentionally harmed when their root systems are not accounted for. Read labels carefully before applying any treatments. They often warn if there is a potential for harming trees.

Desired plants can be protected in many ways. Do not apply herbicides if weather conditions are not suitable. Wind can easily drift herbicide to unintended areas. If nontargeted plants are small, cover them with a garbage can or cardboard box. If you are close to sensitive areas, choose a more precise method of treatment (spot spray or basal stem application).

2.1.3. BIOLOGICAL CONTROLS

This method of vegetation removal uses insects to control a plant population. It is most suited for large infestations of noxious weeds or invasive species. An insect species is released into a weed infestation. The insects damage and/or feed upon the plant, preventing it from spreading. Over time, the plant population is dramatically reduced. For example, spotted knapweed is controlled by seedhead and root weevils. Seedhead weevils feed upon the seedhead of spotted knapweed; meanwhile, the root boring weevil larvae damage the plant's root systems. This is a natural, two-pronged approach to ensuring the weeds die back.

Image 2- 31: Insect release sites in MN for Biological Control (source: Mn DNR).



This is a selective control and can be a safe, long-term, sustainable, and cost-effective management option. The State of Minnesota has a biological control program for leafy spurge and spotted knapweed. Both programs have proven to be highly successful in managing infestations.

Additional considerations: If you are interested in introducing a biological control, first make an inventory of all other vegetation management activities done on your site. Other practices, such as herbicides or prescribed burning, may not be compatible with a biological control. Site features should also be considered. Disturbed sites (e.g., active gravel pit) and mowed areas are not suitable for this treatment method. See the local resources list for more information on programs to determine if your site is a good fit.

Local resources: See the list below for contact information and biological control programs that residents, resource managers, or industry professionals can participate in.

- Not sure if you have an infestation? Contact your local county agriculture inspector for a site review. They can provide information on local biocontrol opportunities: https://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/cailist/caibkgrnd
- MDA Leafy Spurge Program: http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/leafyspurge/leafyspurge
- MDA Spotted Knapweed Program: http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/spottedknapweed/knapweed

Image 2- 34: Successful Biological Control of Leafy Spurge Using Beetles. Left image: field prior to insect introduction. Right image: after insects have been released. With the introduction of a biological control, this field is now a healthy pasture (source: MDA).

2.1.4. COMBINATION TREATMENTS

On many sites, one control method is not enough to adequately achieve your vegetation management goals. However, a combination of approaches would likely produce the desired outcome. Below is a list of examples that illustrate common treatment combinations.

Physical Removal and Chemical Treatment

Woody vegetation: Cut and remove the woody vegetation from your site. Shortly thereafter (one week or less), apply a basal stump treatment (herbicide). While cutting and removing the vegetation eliminates the current plant material, stumps can easily regrow and produce stump suckers. The herbicide treatment greatly reduces the chances of regrowth, but it must be applied while the stump "wound" is fresh.

Biennials and perennials: This treatment is species specific and dependent upon the life cycle. It is suitable for plants if the first year of growth does not produce propagating parts (e.g., works well for garlic mustard). Pull and remove the first year of growth from your site. When plants are small and root systems are not completely developed, they should be easier to remove from the ground. Apply a foliar application of herbicide to plants that are in their second year or older before seedheads develop. At this age, the plants have developed a stronger root system and can reproduce. Pulling may not remove all of the plant material, and it could regrow.

Image 2- 37: Stump Suckers. Buckthorn stump one year after cutting, with no herbicide application. Stump suckers have grown quickly. Make sure you treat after you cut (source: City of Burnsville, MN).

Biological and Mechanical Treatment

To maintain natural areas: There are many natural areas that have been overwhelmed with invasive species. These places are not always ideal for herbicide application. Introducing an

insect biocontrol is an option for managing the unwanted species with little resource investment (time, labor, money, etc.). Prescribed burns can be incorporated into this management regime to increase native plant competition. Burns should not be conducted while the adult biocontrol is present. Generally, burning a site prior to green up will eliminate concerns for impacting the biocontrol population.

2.1.5. NOXIOUS WEED REMOVAL

Why should manage invasive species and noxious weeds?

These plants are not historically found in Minnesota. They were introduced from other environments, most often by transportation or industrial activities. They take over Minnesota landscapes by producing lots of seed in a short period of time. They infest natural areas, decreasing wildlife habitat, diversity, and the overall quality of our natural resources. These weeds creep into agricultural areas, reduce crop production, increase pesticide use, and influence our economy.

Image 2- 40: Wild Parsnip (photo: MnDOT).

Encountering some noxious weeds can also pose a health risk. Wild parsnip dominates the ditches of southern Minnesota. The plant sap is phototoxic. If your skin encounters the sap and is exposed to sunlight, it will react like a chemical burn. We manage noxious weeds and invasive species to keep our communities healthy, diverse, and resilient.

State and County Noxious Weed Management

The State of Minnesota has developed a law to protect its residents, natural resources, and industry from the detrimental impacts of noxious weeds. It states the following:

> *Noxious Weed Law, MN Statues, sections 18.75–18.91: The Minnesota Noxious Weed Law defines a noxious weed as an annual, biannual, or perennial plant that the Commissioner of Agriculture designates to be injurious to public health, the environment, public roads, crops, livestock, or other property. The purpose of the law is to protect residents of the state from the injurious effects of noxious weeds.*

Regulation efforts are species-specific. Currently, 42 plant species have been identified and labeled noxious. These plants are divided into three categories: prohibited noxious weeds, restricted noxious weeds, and specially regulated weeds. Control ranges from eradication and control enforcement to prohibiting the transportation, propagation, or sale. Each county updates its noxious weeds list annually. Species on these lists are enforced as prohibited noxious weeds by the county.

Local resources:

- View the 2018 Noxious Weeds List: https://www.mda.state.mn.us/sites/default/files/inline-files/noxiousweeds2018.pdf
- Questions? Contact your county agricultural inspector. https://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/cailist

Are There Noxious Weeds on My Site?

Many beneficial native plants have a similar appearance to noxious or invasive weeds. Golden Alexanders is a native Minnesota prairie plant that looks strikingly like the noxious Wild Parsnip. Minnesota boasts a diverse array of native plants, including Flodman's thistle. It too, resembles a regulated noxious weed: Canadian thistle.

Photo: Emmet J. Judziewicz

Image 2- 44: Native versus Noxious. The image on the right is of the native Flodman's thistle. The image on the left is the noxious Canada thistle.

Source: Online Virtual Flora of Wisconsin.

Photo: Paul Drobot

Local resources: Plants can be difficult to identify accurately. The following resources provide general guidance on how to distinguish what is growing on your site.

- Search for plants based on flower color, month they bloom, soil type, name, and so on. This site provides helpful hints, clear descriptions, and many color photos: https://www.minnesotawildflowers.info/
- Mn DNR invasive species of Minnesota (terrestrial and aquatic): https://www.dnr.state.mn.us/invasives/index.html
- Need expert assistance? Contact the Mn DNR's invasive species coordinators for questions on identification, prevention, and management: https://www.dnr.state.mn.us/invasives/terrestrial/contacts.html
- MDA Noxious and Invasive Weed Program information: https://www.mda.state.mn.us/plants-insects/noxious-and-invasive-weed-program
- Minnesota Invasive Species Advisory Council: https://www.mninvasives.org/
- Contact your county agricultural inspector: https://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/cailist

Noxious Weed Removal Methods:

The MDA provides two general guidelines for dealing with noxious weeds on your property:

1. *Kill but do not remove weeds from an infested area when possible.*
2. *If removal of weed plant materials from an infested site is necessary, properly contain and transport the materials to an approved site.*

The objective of the Minnesota Noxious Weed Law is to prevent the growth and spread of these species to new areas. The following list highlights options for management on your site.

Herbicide applications: When dealing with large populations, herbicides can be a great tool to kill noxious weeds. An established colony will likely have a large seedbank (viable weed seeds

in the soil). The initial herbicide treatment will kill the existing plants but not the seedbank. Subsequent treatments are recommended to eradicate the seeds once they have germinated. Broadcast spray a 15-foot perimeter around the noxious populations to limit spread into unaffected areas.

Biocontrol: This method of control uses other organisms to control weed populations. Weeds are prevented from reproducing, which will reduce the colony size over time. Biocontrols trigger a much slower weed response. This approach is effective, but it can take several years to see the full impact of the insects.

Burning: A prescribed burn will control weeds and stimulate native vegetation. Before you burn your site or weed pile, verify what species you are eliminating. Noxious weeds, such as poison ivy and Grecian foxglove, contain chemicals that are very harmful to breathe. Check for local ordinances and approvals before burning in your area.

Cutting with herbicide application: Woody noxious weeds are often prone to stump suckers. A combination of cutting and herbicide treatment, or the *hack and spurt* method, is quite effective for managing species like buckthorn.

Mowing: Can be highly effective when done in accordance with the plant life cycle. Mowing prior to seed maturity (see Table 2–2) can prevent a large invasive seedbank from forming. The act of mowing can move viable propagating weed parts and should be done prior to the formation of viable seed.

Table 2- 2: When to Mow Common Noxious Weeds

Approximate mowing schedule per weed species to avoid seed maturity

WEED	May	June	July	Aug	Sept	Oct
Leafy spurge	X		x	x		
Wild parsnip		x	x			
Thistle			x	x		
Spotted knapweed			x	x		

Source: Mille Lacs County

Disposal:

The best way to prevent the spread of noxious weeds throughout the state is to leave them where they are and prevent their reproduction. This can pose a problem when managing a site. Below is a list of options for disposing of unwanted noxious weeds.

Removing weeds from your site: The transportation of noxious weed propagating parts requires a written permit from a weed inspector or county-designated employee *unless* they are transported for the sole purpose of disposal at a disposal site approved by the MDA (Minn Stat. 2018, §18.82 subd. 1).

- Get a permit! To contact your local weed inspector and request a permit: https://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/cailist. To view the permit form: https://www.mda.state.mn.us/sites/default/files/inline-files/ag00179x-transportpermit%20%281%29.pdf

- Find an approved disposal site. To determine the closest disposal site for your noxious weeds, contact your county agricultural inspector: https://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/cailist

Burning: When done responsibly and in accordance with local ordinances, burning can be a cost-effective method for eliminating plants without the hassle of transporting them off site.

Composting: Designate a corner of your site for composting noxious weeds. They can be piled or incorporated with soil to speed up decomposition. When using this method, it is best to pull or cut weeds prior to flower or seedhead development. This will limit regrowth and germination at your composting site.

2.1.6. DISEASED OR INFESTED VEGETATION

Occasionally, we come across plants that don't appear healthy. They may be discolored, have an exceptionally flawed appearance, or die back rapidly. This may be attributed to a plant disease or insect infestation. If you suspect vegetation on your site is unhealthy, it will influence your management.

Diagnose the problem: Minnesota has several resources to assist in plant health to limit the spread of diseases and infestations. Contact a local professional to help determine what is occurring on your site. The U of M Extension and MDA have developed tools and devoted staff to assist you with plant health:

- University of Minnesota plant diseases: https://extension.umn.edu/solve-problem/plant-diseases
- Submit a plant sample to the Plant Disease Clinic for assessment: https://pdc.umn.edu/
- What's wrong with my plant? Online diagnostic tool: http://apps.extension.umn.edu/garden/diagnose/plant/
- Contact your local U of MN Extension office: https://extension.umn.edu/about-us/contact-us
- Arrest the pest! https://www.mda.state.mn.us/plants-insects/arrest-pest
- Insect pests and diseases index: https://www.mda.state.mn.us/plant-pests-diseases-index

Prevent further spread: Once you have identified what is affecting your site, take steps to avoid further spread. This is often disease or species specific (see local resource lists for guidance). The follow list is a general guide to preventing further spread while you await diagnosis.

1. Clean all tools thoroughly when working on your site
2. Limit traffic (foot, vehicle, ATV, etc.)
3. Limit site disturbance in and around the affected vegetation
4. Do not remove any vegetation from your site until you receive a diagnosis

How to remove it from your site: Consult with a certified arborist or local extension staff for guidance. Each disease or insect infestation is managed differently and may have unique disposal restrictions. For example, the Emerald Ash Borer is present in the metro area. Counties with known infestations are quarantined, with strict regulations on hardwood.

- Reach out to your county environmental services department for information on local restrictions and disposal methods

- Are you in an Emerald Ash Borer (EAB) quarantined area? Check the map to find out: https://mnag.maps.arcgis.com/apps/webappviewer/index.html?id=63ebb977e2924d27b9ef0787ecedf6e9
- Contact your local U of MN Extension office: https://extension.umn.edu/about-us/contact-us

2.2 Planting and Site Revegetation

2.2.1 PLANTING AND REVEGETATION OF A SITE

Before planting begins, check with your local city and county ordinances. Familiarize yourself with any prohibited species and regulations.

Assessment of Site:

There are many features that will influence the means and methods you choose to add vegetation your site. The first step is to take a mental inventory of what currently exists and how it might influence what types of plants are incorporated into the site. A version of this was presented in Section 1.2 of this plan to assess features. This section applies that same general principle when considering vegetation. As you move through this section and review the methods of revegetation, consider the following: What are the location, topography, and sensitive flora and fauna communities? What wetlands or water features are adjacent to the property? What land use takes place here? Will some vegetation management options conflict with that use?

If you're a resident

- Will you let the site naturally revegetate or plant or seed a specific species?
- What types of plants do I want on my site (lawn, native planting, trees and shrubs, garden)?
- Are there slopes where I want to plant vegetation?
- What types of activities take place on my site?
- Is wildlife a consideration? If yes, how so?

If you're a resource manager or industry professional

- Will you let the site naturally revegetate or plant or seed a specific species?
- What types of plants do you want on-site (lawn, native planting, timber, gardens, trees and shrubs)?
- What is the overall management objective?
- Is wildlife management an objective?
- Are there steep slopes or erosion prone areas?
- What is the soil type?
- Will you be working in or near water? *If so*, do you have the appropriate approvals and have permissions been obtained (e.g., WCA)?
- What type of activities take place on the site?
- Are there permitting requirements related to site planting and stabilization?

2.2.2 SELECTING A METHOD

The methods for incorporating vegetation vary in the amount of time and resources they require. They include no action, seeding, or planting on a site.

No Action:

This approach is often recommended when there is a large native plant population present, indicative of a strong native seedbank. It is preferred for wetland revegetation when dominated by native species with rhizomes.

Image 2- 46: Seedbed Prep. Raking a site is an excellent way to prepare it for seed germination (photo: Bruce Mars).

Seeding:

This method is recommended when removing the existing vegetation from a site, establishing a new plant community, or working with a large section of land. Seeding is one of the most cost-effective methods for revegetation, aside from no action. Site preparation is recommended to achieve high seed germination rates.

Step 1. Seedbed preparation: Working the soil lightly prior to seeding increases the soil-to-seed contact. This contact is critical to seed germination.

If undesirable vegetation remains on the site, either (1) apply an herbicide or (2) cultivate the land to destroy the existing weeds. When the ground is rid of unwanted weeds, till the soil to a minimum depth of four inches, breaking up large clumps of dirt. The soil should be soft enough for seed penetration and the anchoring of mulch but firm enough for soil stability. In smaller or sensitive areas, use rakes to prepare the seedbed.

Step 2. Seeding: Apply the seed to your site. A diverse seed mix is recommended for establishing a new type of plant community. If you anticipate the seed taking a while to grow (e.g., native seed mixes), consider using a cover crop to temporarily stabilize your site. See the following list for seeding methods:

- **Broadcast seeding**: Disperse seed by hand or with a handheld broadcaster. This method can spread seed unevenly if precautions are not taken. This is ideal for sandy soils.
- **Seed drill**: A small seed drill is attached to an ATV or a tractor. The equipment slowly drills the seeds into the soil and the designated depth. It is commonly used for large native plantings or in heavy soils (clay, loam). It is not suitable for sandy soils—the drill sinks and plants seed too deep for germination.
- **Hydroseeding**: This is generally a large piece of equipment that incorporates seed into a mixture of fibers, tackifier, fertilizer, and water. The mix is then sprayed onto open soil. The tackifier helps the slurry adhere to the soil. A hydroseeder should not traverse on soft soils or slopes.

Image 2- 49: Hydroseeding. At this site you can clearly see the soil was raked and smoothed in preparation for the hydromulch (photo: clarkslandscape.com).

- **Dormant seeding**: This is a cool-season approach, with seeds expected to grow the following year. Plant seeds in the fall prior to the ground freezing to allow for natural stratification over the winter and early spring. This process occurs as weather cools and heats the site. The seeds slowly inch their way into the soil. Seeds should be covered in a 1–2-inch layer of mulch, leaves, or plant debris. This will allow for moisture retention and will reduce wildlife predation of the seeds.
- **Interseeding**: This method seeds in and around existing desirable vegetation. Examples include cover crops, interseeded among corn or soybeans, and native areas that seed around established vegetation (herbaceous natives seeded around established trees).

Timing: In Minnesota, there is a general window of time for seeding cover crops and permanent seed mixes. For expected growth that same year, the seed should be planted between April 1st and June 30th, or when the soil temperature is approximately 55 degrees Fahrenheit. Planting outside of the recommended dates or soil temperature can result in seed loss.

Step 3. Soil contact and surfacing packing: Seeds will grow if the ideal site conditions are present. This includes, but is not limited to, moisture and temperature. When a seed is incorporated into soil, the soil serves as a growing matrix. It can easily retain soil and temperature, providing additional nutrients and a protective environment for seeds to germinate and establish roots.

These ideal circumstances can be achieved on your site by working seeds into the ground and packing the soil firmly. Some planting tools have done this step for you. A seed drill pushes seeds into the soil, while a small wheel packs that area. Hydromulch or hydroseeding is a growing matrix slurry with a tackifier to ensure soil contact. Step 3 can be omitted for these two methods of seeding. In some cases, interseeding will not require this step.

Image 2- 52: Interseeding a Lawn. When seeding a lawn with existing grass, it can be difficult to achieve soil-to-seed contact. A small rake is the perfect tool. It lightly works the soil without pulling up existing grass (photo: Gilmour.com).

As a general rule, if you can see the seed lying atop your soil, it needs to be raked in and tamped down. On smaller sites, this is done by lightly raking the seeded area to work the seed into the top inch of soil. Walking around the site or using a small roller will tamp down the "fluffed" soil. This will increase seed-to-soil contact.

Step 4. Stabilization: One of the most important factors to ensure seedling growth is soil stability. The soil encapsulates, nourishes, and protects seeds. The soil environment is pivotal to the

success of vegetation of your site. Stabilization of the ground will arm it against erosion (wind, water) and disturbance.

Planting:

Planting is the act of incorporating a living plant into a landscape. This is the best option for immediate vegetation of your project. Prior to purchasing plants, ensure they are suitable for your site conditions (sun exposure, soil type, and moisture).

Potted plants: These are also referred to as container plants. They can be purchased at numerous retailers throughout the state and include annuals, biennials, and perennials.

Rooted stock: Planting rooted stock is an alternative to seeding. The term generally refers to woody vegetation. These plants have robust root systems that allow them to quickly establish but may exhibit small aboveground growth. Plant nurseries offer root stock as an alternative to larger plants or seeding options. This is often a great way of purchasing a large quantity of shrubs or trees.

- The County SWCD often has plant sales each spring. Visit your local SWCD website for details. They generally offer a wide variety of rootstock trees and shrubs and perennials.
- The Minnesota State Forest Nursery: https://www.dnr.state.mn.us/forestry/nursery/index.html

Image 2- 55: Rootstock (photo: https://gilbysorchard.com/products/bare-root/).

Ball and burlap trees: Also called B&B, these plants are at or near maturity. They are ideally suited for those who seek large trees or shade and do not wish to wait for smaller options to grow. Trees are several years old with very large root systems.

2.2.3 STABILIZATION TECHNIQUES

In the previous section stabilization was emphasized when seeding as the act of seeding can cause great soil disturbance. However, all revegetation methods should incorporate site stabilization techniques. A stable site is more resilient to intense weathering and reduces maintenance needs in the future.

Mulch:

Using plant matter to anchor your site is an easy and natural method of stabilization. The term mulch is used to describe many different forms of debris, including wood mulch, straw mulch, leaf mulch, and a combination of available plant matter that already exists on your site (twigs, sticks, leaves, grass, and clippings). Mulch should be evenly distributed across your site, with over 90% coverage on exposed soil. In Minnesota, certified weed-free forage is available.

On large sites with little existing vegetation, two tons of mulch per acre is recommended at a minimum length of 8 inches to facilitate anchoring and crimped to a depth of 2–3 inches. Crimping and liquid tackifier can be used to maintain the mulch-to-soil contact. It is a common practice at large site restorations and in forestry and construction projects.

Best suited for: A site with little to no slope.

Equipment and tools: The tools required depend on the site size and type of mulch. Yards and smaller areas may only require hand tools. Large sites that employ crimping will require larger equipment.

Sensitive features: Mulch should not be used in wetlands, along shoreline, areas prone to flooding, or slopes.

Image 2- 58: Jute ESC Blanket. After seeding the area and surface packing, the Jute blanket was installed. The grasses have germinated and grown through the loose weave (photo: CA DOT).

Blanket or Fabric:

Erosion and sediment control (ESC) blanket comes in many forms. It is commonly made from biodegradable plastic, jute, natural plant fibers, or straw. The material is woven together and buffers the soil from weathering. The weave allows seeds to grow through it, then it eventually decomposes. If you are planting vegetation, the blanket can be installed first, then cut to accommodate the hole of the new plant.

Best suited for: Most types of sites, with little existing vegetation to work around.

Equipment: Blanket, knife for cutting, hammer, anchor (e.g., nails, metal staples, wooden stakes).

Sensitive features: ESC blanket is well-suited for stabilizing sloped areas, shorelines, and disturbed soils that receive waterflow or traffic. It can be used adjacent to other sensitive features. For example, a blanket is difficult to install in a wetland, but it can be installed on disturbed soils near the wetland. When heavy rains come, the blanket keeps the nearby soil from washing into the wetland.

Wildlife have become tangled in an ESC blanket. If this is a concern on your project, look for materials that are labeled wildlife friendly. These typically have a loose weave and/or biodegrade at a faster rate.

Additional considerations: The weave of a blanket is important. A steep slope is protected more when the blanket has a tighter weave. If you have a relatively flat site with little traffic, a loose weave (see Image 2–20) is appropriate.

Temporary Cover Crops:

While seeding your desired plant mix, you can also incorporate a cover crop. These are short-lived annuals that grow quickly. They anchor the soil with roots offering stabilization. Their leaves provide surface soil protection from weathering and predators. Cover crops range in species, but generally live for 2–5 months. As your other seeds grow and establish, the cover crop recedes. Crops are generally expected to be successful when planted April 1st – Sept 30th. Outside of this time frame, they are unlikely to germinate and adequately fulfill their intended role. The exception is when the cover crop is dormant-seeded for intended growth the following year.

Best suited for: all methods of revegetation.

Equipment: Varies depending on seeding method (broadcast, etc.). Large projects and agriculture often utilize aerial seeding methods.

Sensitive features: Cover crops are a great option for most sensitive areas but may require another form of stabilization. For example, a slope might require an ESC blanket in addition to the cover crop.

2.2.4. SENSITIVE FEATURES

There are likely parts of your project that require special consideration. These often fall within the sensitive features category. This section will detail sensitive features common in the District, and how they should be approached when introducing vegetation to a site.

Slopes:

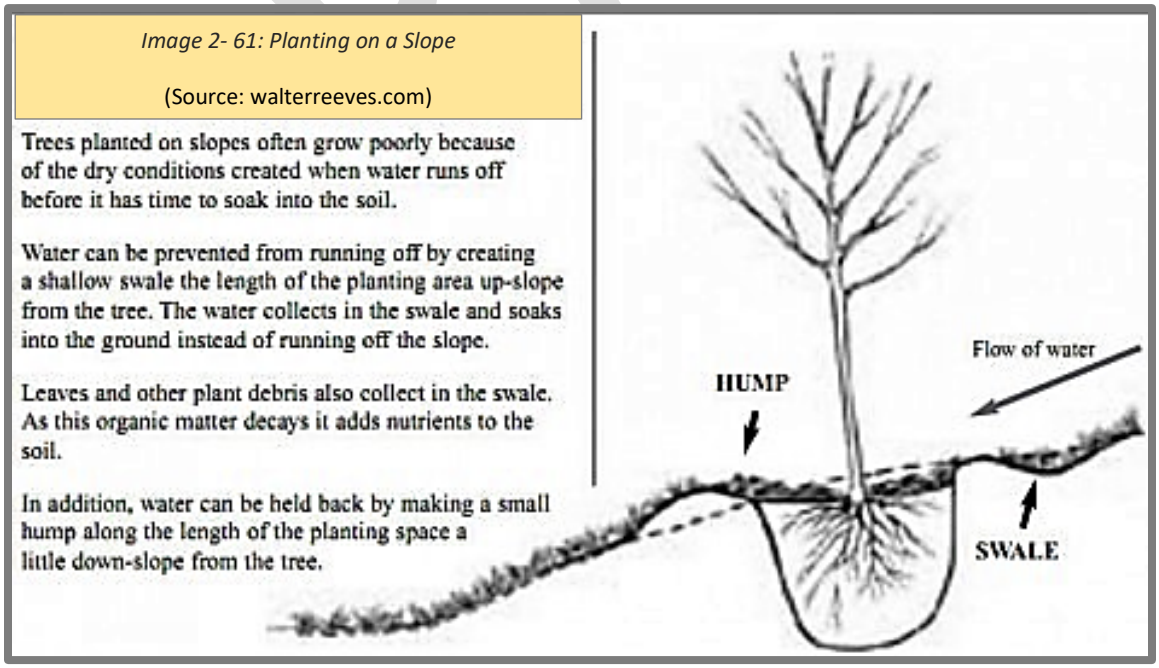
If you can place a ball on your site and it rolls away, you have some sort of a slope. Rarely is a site completely flat. Most have subtle changes in elevation or grade. A slope is considered a sensitive feature when it has the potential to impact site management—for example, equipment cannot safely navigate that area, difficulty walking, potential for things to roll downhill, prone to erosion, large volume of stormwater flowing offsite, etc.

No action: If vegetation has been removed from a slope, the area is more vulnerable to weathering and erosion. It is not recommended to remove plants without an intent for revegetation. No action involves the site revegetating itself. Not all slopes are able to do this effectively because of their steep angles and inability to retain soils. If this method is chosen, stabilization practices should be used, including a temporary cover crop.

Seeding: This method has been used on slopes when coupled with stabilization methods. For example: hydromulch includes a strong tackier that adheres it to the soil. Seeding, in conjunction with ESC blanket installation, is a common technique. If stabilization practices are not used, seeding should not be done.

Image 2- 61: Planting on a Slope

(Source: walterreeves.com)



Planting: Adding living vegetation to your site is a quick way to anchor and stabilize a slope. Woody vegetation is recommended for many gradients. It tends to have more root mass and is longer lived than most herbaceous plants. Minnesota natives can also be incorporated. They have robust root systems, can withstand our weather, and provide many important environmental services (see Image 2–22, comparing Kentucky Blue Grass [common lawn grass] to Minnesota native plants).

Stabilization: Site managers are strongly encouraged to use more than one stabilization technique on their slopes. This can include, but is not limited to, incorporating native plants, ESC blanket, cover crops, and other best management practices.

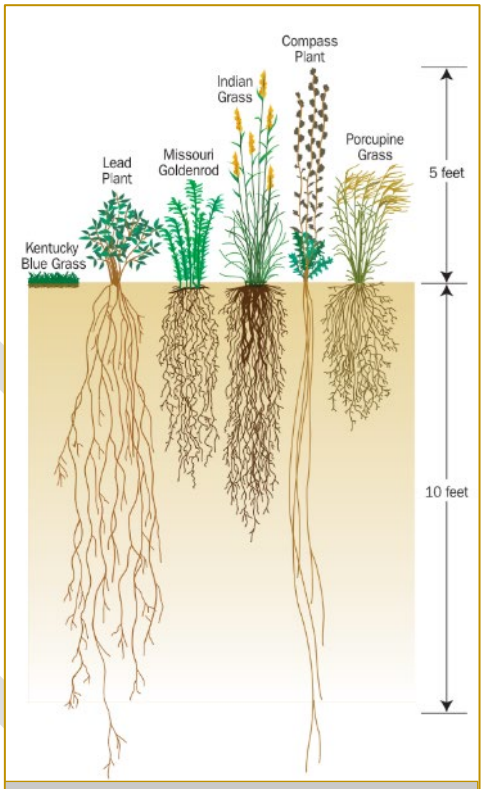


Image 2- 64: The Roots of MN Natives vs. Grass (photo: FEMA).

Wetlands, Shorelines, Floodplains, and Waterways:

These areas exhibit unique characteristics due to their relationship with water. This also makes them susceptible to negative impacts through poor site management.

No action: Vegetation should not be removed from a site without some form of stabilization to replace it.

Seeding and planting: Due to the presence of water on these sites, specific seed mixes and plants are recommended. See the local resources list for more information on the appropriate techniques and species.

Stabilization: Water systems and their structure vary widely, as will the techniques for stabilization. Methods should be durable and withstand characteristic water behavior. It is common practice to employ two or more stabilization methods (e.g., cover crop and ESC blanket) on these types of features.

Fertilizer and Salt:

The presence of road salt should be considered when planning site vegetation. High-trafficked sites and adjacent land use will influence how vegetation grows on your project. If you think salt could be a problem, incorporate plants that can establish successfully in high-salt environments.

Table 2- 3: Natives Successfully Established in High-Salt Areas	
Native Grasses	Canadian wild rye, Indian grass, little bluestem, blue grama, side oats grama
Wildflowers	Black-eyed Susan, purple prairie clover, yarrow, bush clover
	Source: MnDOT

Fertilizers are often added to soils or seed mixes unnecessarily. Before spreading fertilizer across your site, review local city and county ordinances. Many areas have restricted the use of phosphorus due to impacts on local water resources. Consider using native plants instead, as many are highly efficient in fixing their own nutrients. An unnecessary application of fertilizer can negatively influence your new vegetation and surrounding natural resources. For example, applying nitrogen increases the ability for

weed seeds to thrive and compete with desired species. This creates additional maintenance work for years to come.

2.2.5 LOCAL RESOURCES FOR VEGETATING YOUR SITE

General Information on Methods for Vegetating a Site

- What's working: Insights from area professionals, research, and field trials: http://www.bwsr.state.mn.us/native_vegetation/planting-maintenence-recs.pdf

Resources for Sensitive Features

- Landowner's guide to wetland restoration techniques: http://www.dnr.state.mi.us/publications/pdfs/huntingwildlifehabitat/Landowners_Guide/Habitat_Mgmt/Wetland/Wetland_Restoration_Techniques.htm
- Planting and maintenance recommendations for wetland restoration and buffer projects: http://www.bwsr.state.mn.us/native_vegetation/planting-maintenence-recs.pdf
- Plants for stormwater design: https://www.pca.state.mn.us/water/plants-stormwater-design
- Protecting your shoreline: https://www.dnr.state.mn.us/rys/sl/shoreline.html
- Restore your shore: https://www.dnr.state.mn.us/rys/index.html
- State seed mixes including native plants and cover crops: www.bwsr.state.mn.us/native_vegetation/seed_mixes/index.html
- Wetland restoration and creation: https://water.usgs.gov/nwsum/WSP2425/restoration.html
- Wetland restoration guide: http://bwsr.state.mn.us/restoration/

What to Plant

- The Native Plant Encyclopedia—An interactive site design that allows users to enter their site features. The encyclopedia will then generate a list of native Minnesota species suitable for their conditions: https://webapps8.dnr.state.mn.us/restoreyourshore/search
- Plant selector: Choosing vegetation suited for roadside planting: http://dotapp7.dot.state.mn.us/plant/

2.3 Maintenance and Planning

The most important factor before starting your vegetation management activities is the creation of a plan. How will you manage your site? And subsequently, how will you maintain it? Begin by developing a site plan addressing your means, methods, and objectives.

Developing a Site Vegetation Management Plan:

If you're a resident:

This document has presented many options for vegetation management. How do you know which ones to choose? Begin by developing a site plan. Include the following:

- Objectives
- Site features
- Existing vegetation
- Other factors: budget, time constraints, labor, etc.

Once these considerations are outlined, revisit the sections on site vegetation removal and revegetation. Select a list of options that will achieve your objectives while factoring in site features. As you work through this information, contact local resources to further enhance your knowledge on local ordinances and approvals and to receive any required technical assistance.

Be sure to allow for unexpected changes. This plan should be a general approach to guiding vegetation on your site, with enough flexibility that it can be adapted. A key element to include is the maintenance plan. How will you maintain your site over the course of the next 1, 5, or 10 years? Will it require a budget and additional labor? As you begin on-the-ground work, you will learn the methods that do or do not work on your site. Update your plan accordingly.

If you're a resource manager or industry professional:

It is likely you have already developed some sort of management plan for your project. Permits and local approvals often necessitate such a document. Topics addressed within this plan should include the following:

- Site map and objectives
- Inventory of existing site features and vegetation
- Description of project and the time line for completion
- Methods of vegetation management and how they will be applied to your site
- Applicable permits and approvals
- Maintenance plan

Allow for unexpected changes. This plan should be a detailed approach to how the site vegetation will be managed but instill flexibility so it can be adapted. Permits and approvals may take time to acquire. That variable should be accounted for in the project time line because it could delay on-the-ground activities. Keep notations on treatment methods. Were they effective? If not, will your management plan account for this?

2.4 Programming and Cost-Share Opportunities

Throughout the District, there are opportunities and programming for vegetation management. These vary widely, but include cost-shares, access to resources, and technical assistance.

<u>County Programming</u>

- Contact your local SWCD! SWCDs have many cost-share programs and financial assistance programs related to vegetation management.
- Contact your county environmental services department for cost-share programs and opportunities.

- Hennepin County natural resources grants: https://www.hennepin.us/residents/environment/natural-resources-funding#natural-resources-grants

State Programming

- MnDNR grant page—This site has a list of all grant opportunities for landowners in Minnesota: https://www.dnr.state.mn.us/grants/index.html
- MnDNR Forest Stewardship Program for individuals who own 20–1,000 acres of forestland: https://www.dnr.state.mn.us/foreststewardship/index.html
- The Conservation Partners Legacy Grant Program: https://www.dnr.state.mn.us/grants/index.html
- Noxious Weed and Invasive Plant Grant from the MDA: https://www.dnr.state.mn.us/foreststewardship/index.html
- Minnesota NRCS programs include those for conservation, financial assistance, and wetlands: https://www.nrcs.usda.gov/wps/portal/nrcs/mn/programs/
- Environmental Quality Incentives Program (EQIP): https://www.nrcs.usda.gov/wps/portal/nrcs/mn/programs/

Federal Programming

- US Fish and Wildlife Service, Partners for Fish and Wildlife Program: https://www.fws.gov/partners/

3 Conclusion

The Lower Minnesota River Watershed District is a distinctive landscape that merges natural resources and urban communities. This vegetation management plan is a guide to navigate these entities. It serves to balance the objectives of the people and the environment. As the District grows and evolves, we must adapt our management strategies. Creative and mindful approaches to vegetation management will help maintain our prized natural resources for generations to come.

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