

# HEIFORT HILLS ESTATES BUFFER MANAGEMENT PLAN

June 2023



Figure 1. Management Unit overview. Note: Buffer and wetland boundaries represent approximate extents and are not intended to replace surveyed legal boundaries.

## Introduction:

The Heifort Hills Estates Buffer is a 0.85-acre site situated between the single-family residential lots located on the south side of Neal Court North and Heifort Pond to the south. The purpose of the buffer is to intercept, filter, and infiltrate stormwater routed from upstream BMPs located throughout the development before entering Heifort Pond.

The buffer area is divided into management units to facilitate long-term maintenance and establishment of native vegetation throughout the site. A description of current conditions is included in each management unit section, along with suggested short-term and long-term action items for native vegetation establishment, enhancement, and non-indigenous species management using Integrated Pest Management (IPM) strategies.

Note: IPM is an approach to managing non-indigenous species that considers a suite of management options, including biological control (e.g. introduction of a biocontrol agent), mechanical control (e.g. mowing or pulling), or chemical control (e.g. herbicide application). In order to minimize the use of chemicals and the harm to non-target organisms, IPM strategy uses the biology of the life cycle of the invasive species to determine the best course of action. If using herbicides, Always refer to the product label before mixing, handling, storing, or applying.

### Management Unit 1:

#### Wet Meadow Buffer (0.30 acres)

Management Unit 1 measures approximately 0.3 acres and is located within the northeast corner of the buffer. This unit was originally seeded to native wet meadow vegetation in 2021 using State Seed Mix 34-261 (Exhibit A). Non-native cool season grasses such as reed canary grass (*Phalaris arundinacea*), smooth brome (*Bromus inermis*), and timothy (*Phleum pretense*) are abundant throughout the unit with sparse patches of desirable native species throughout. Examples of desirable native species include fox sedge (*Carex vulpinoidea*), path rush (*Juncus tenuis*), and fowl manna grass (*Glyceria striata*).

#### Objectives—Maintenance and Enhancement:

- Reduce percent cover of non-native cool season grasses including reed canary grass, smooth brome, pasture grasses (e.g. timothy, orchard grass), and turf species (e.g. Kentucky blue grass).
- Enhance floristic diversity and percent cover of native wet meadow grasses, sedges, and forbs.

#### Short-term Action Items:

1. Mow and spot-treat isolated stands of reed canary grass and smooth brome. Spot treat reed canary grass and other non-native cool season grasses with glyphosate at label recommended rate. Ensure the glyphosate formulation is rated for aquatic use by referring to the product label. Refer to the Minnesota Dept. of Agriculture or [Midwest Invasive Plant Network](#) for more information on safe and appropriate herbicide use.
2. Mow stands of non-native pasture grasses (e.g. timothy) and replace with native grasses, sedges, rushes and forbs via interseeding or interplanting. Refer to Board of Water & Soil Resources guidelines for interseeding into non-native grass stands (Appendix A) and enhance with species components present in the original seed mix: State Seed Mix 34-261 (Exhibit A).



#### Long-term Action Items:

1. Mow repeatedly (weekly or bi-weekly) during the first two years after interseeding to aid in seedling establishment. For best results, maintain vegetation height at 6-8 inches for two growing seasons. If possible, spot-mow around well-established desirable vegetation.
2. Monitor and provide follow-up treatment on the regrowth of non-native cool season grasses through foliar herbicide application and/or mowing.
3. Monitor for and manage populations of invasive species such as reed canary grass, Canada thistle, yellow iris, and others likely to invade wetland habitats.

## Management Unit 2

### Mixed Wet Meadow–Deciduous Buffer (0.35 acres)

Management Unit 2 measures approximately 0.35 acres and is located within the southwest corner of the buffer, extending along the northern edge to meet Unit 1. This unit was originally seeded to a custom native seed mix (Exhibit B) in 2021. Non-native cool season grasses such as reed canary grass (*Phalaris arundinacea*), smooth brome (*Bromus inermis*), and timothy (*Phleum pratense*) are abundant throughout the unit. Native and non-native forbs such as red clover (*Trifolium pratense*) and Canada goldenrod (*Solidago canadensis*) are also abundant with occasional woody volunteers such as green ash, buckthorn, and aspen interspersed.

#### Objectives—*Maintenance and Enhancement*:

- Reduce percent cover of non-native cool season grasses and forbs including reed canary grass, red clover, smooth brome, pasture grasses (e.g. timothy, orchard grass), and turf species (e.g. Kentucky blue grass).
- Enhance floristic diversity and percent cover of native wet meadow grasses, sedges, and forbs.

#### Short-term Action Items:

1. Mow and/or spot-treat isolated stands of reed canary grass and replace with native grasses, sedges, rushes, and forbs via interseeding or interplanting (Appendix A and B). Spot treat reed canary grass and other non-native cool season grasses with glyphosate mixed at the label recommended rate. Ensure the glyphosate formulation is rated for aquatic use by referring to the product label.
2. Interseed and/or interplant with native grasses, sedges, rushes and forbs. Refer to Board of Water & Soil Resources guidelines for interseeding into non-native grass stands (Appendix A) and enhance with species components present in the original seed mix: MNL Custom Seed Mix (Exhibit B).

#### Long-term Action Items:

1. Mow repeatedly (weekly or bi-weekly) during the first two years after interseeding to aid in seedling establishment. For best results, maintain vegetation height at 6-8 inches for two growing seasons. If possible, spot-mow around well-established desirable vegetation.

2. Monitor and provide follow-up treatment on the regrowth of invasive species through foliar herbicide application, cut-stump herbicide application, mowing and/or hand-pulling.

### Management Unit 3

#### Mixed Coniferous Buffer (0.21 acres)

Management Unit 2 measures approximately 0.21 acres and is located within the center of the buffer. This unit was originally planted with a mix of native and hybrid/cultivar forbs, ferns, and shrubs underneath the existing pines in 2021 and 2022 (Exhibit C). The understory is sparse to patchy with common buckthorn (*Rhamnus cathartica*) resprouts and seedlings present in some areas.



Figure 3. Management Unit 3.

#### Objectives—Maintenance and Enhancement:

- Remove non-native woody species such as common buckthorn and tartarian honeysuckle.
- Enhance floristic diversity and percent cover of native wet meadow grasses, sedges, and forbs.

#### Enhancement Action Items:

1. Mow and/or spot-treat buckthorn seedlings and resprouts where present. Herbicides containing the active ingredient *triclopyr* may be used to control of broad-leaf weeds. Always confirm that the formulation is rated for aquatic use by referring to the product label.
2. Seed or plant native grasses, sedges, forbs, or shrubs such as American hazelnut (*Corylus Americana*), gray dogwood (*Cornus recemosa*), red-berried elder (*Sambucus racemosa*), dwarf-bush honeysuckle (*Diervilla lonicera*), large-leaf aster (*Eurybia macrophylla*), shining bedstraw (*Galium concinnum*), and others.

#### Maintenance Action Items:

1. Monitor and provide follow-up treatment on the regrowth of the woody invasive species through foliar herbicide application, cut-stump herbicide application, mowing and/or hand-pulling.

Common Name	Scientific Name	Rate (kg/ha)	Rate (lb/ac)	% of Mix (% by wt)	Seeds/ sq ft
American slough grass	<i>Beckmannia syzigachne</i>	1.52	1.36	4.30%	24.90
riverbank wild rye	<i>Elymus riparius</i>	0.56	0.50	1.58%	0.53
Virginia wild rye	<i>Elymus virginicus</i>	1.96	1.75	5.56%	2.70
tall manna grass	<i>Glyceria grandis</i>	0.28	0.25	0.80%	6.50
fowl manna grass	<i>Glyceria striata</i>	0.10	0.09	0.29%	3.00
rice cut grass	<i>Leersia oryzoides</i>	0.18	0.16	0.51%	2.00
fowl bluegrass	<i>Poa palustris</i>	0.94	0.84	2.66%	40.00
prairie cordgrass	<i>Spartina pectinata</i>	0.34	0.30	0.96%	0.74
	Total Grasses	5.88	5.25	16.66%	80.37
tussock sedge	<i>Carex stricta</i>	0.04	0.04	0.13%	0.80
pointed broom sedge	<i>Carex scoparia</i>	0.07	0.06	0.21%	2.00
fox sedge	<i>Carex vulpinoidea</i>	0.22	0.20	0.65%	7.50
path rush	<i>Juncus tenuis</i>	0.03	0.03	0.09%	10.00
dark green bulrush	<i>Scirpus atrovirens</i>	0.13	0.12	0.38%	20.00
woolgrass	<i>Scirpus cyperinus</i>	0.06	0.05	0.15%	30.00
	Total Sedges and Rushes	0.56	0.50	1.61%	70.30
marsh milkweed	<i>Asclepias incarnata</i>	0.13	0.12	0.38%	0.21
common boneset	<i>Eupatorium perfoliatum</i>	0.03	0.03	0.11%	2.00
spotted Joe pye weed	<i>Eutrochium maculatum</i>	0.07	0.06	0.18%	2.00
autumn sneezeweed	<i>Helenium autumnale</i>	0.06	0.05	0.17%	2.50
giant sunflower	<i>Helianthus giganteus</i>	0.08	0.07	0.22%	0.25
spotted touch-me-not	<i>Impatiens capensis</i>	0.06	0.05	0.17%	0.08
great lobelia	<i>Lobelia siphilitica</i>	0.03	0.03	0.09%	5.00
blue monkey flower	<i>Mimulus ringens</i>	0.01	0.01	0.02%	5.07
Virginia mountain mint	<i>Pycnanthemum virginianum</i>	0.06	0.05	0.16%	4.00
tall coneflower	<i>Rudbeckia laciniata</i>	0.06	0.05	0.15%	0.25
giant goldenrod	<i>Solidago gigantea</i>	0.02	0.02	0.07%	2.00
blue vervain	<i>Verbena hastata</i>	0.17	0.15	0.46%	5.00
bunched Ironweed	<i>Vernonia fasciculata</i>	0.07	0.06	0.18%	0.50
	Total Forbs	0.84	0.75	2.36%	28.86
Oats	<i>Avena sativa</i>	28.02	25.00	79.37%	11.14
	Total Cover Crop	28.02	25.00	79.37%	11.14
	Totals:	35.31	31.50	100.00%	190.66
Purpose:	Native riparian and floodplain plantings for wetland mitigation, ecological restoration, or general permanent cover after culvert or bridge work. Tolerates partial shade.				
Planting Area:	Tallgrass Aspen Parklands, Prairie Parkland, and Eastern Broadleaf Forest Provinces. Mn/DOT Districts 2(west), 3B, 4, Metro, 6, 7 & 8.				



8740 77th Street NE Otsego, MN 55362

## Todd Ganz Custom Seed Mix

PLS lbs:	1.25
Bulk lbs:	1.46
Lot Number:	MNLGAN2001

Scientific Name	Common Name	Genetic Origin/ Variety	Pure Seed %	Germ %	Hard or Dormant %	TZ %	Total Viable %	PLS %	PLS lbs	Bulk lbs
<i>Panicum virgatum</i>	Switchgrass	Houston Co. MN	10.69	4.00	92.00	0.00	96.00	95.6	0.15	0.16
<i>Glyceria striata</i>	Fowl Manna Grass	Madison Co. IA	10.47	78.00	20.00	0.00	98.00	97.88	0.15	0.15
<i>Bromus kalmii</i>	Prairie Brome	Ottertail Co. MN	13.82	97.00	2.00	0.00	99.00	95.33	0.20	0.21
<i>Elymus hystrix</i>	Bottlebrush Grass	Benton/Wright Co. MN	14.55	31.00	63.00	0.00	94.00	82.91	0.20	0.24
<i>Calamagrostis canadensis</i>	Blue-Joint Grass	Benton Co. MN	3.60	91.00	4.00	0.00	95.00	93.39	0.05	0.05
<i>Carex blanda</i>	Common Wood Sedge	Rice Co. MN	3.60	0.00	95.00	0.00	95.00	94.6	0.05	0.05
<i>Carex vulpinoidea</i>	Fox Sedge	Rice Co. MN	3.53	27.00	70.00	0.00	97.00	95.83	0.05	0.05
<i>Carex brevior</i>	Plains Oval Sedge	Polk Co. MN	3.80	51.00	39.00	0.00	90.00	85.59	0.05	0.06
<i>Carex stipata</i>	Common Fox Sedge	Benton Co. MN	3.93	7.00	80.00	0.00	87.00	86.64	0.05	0.06
<i>Carex bebbii</i>	Bebb's Oval Sedge	Rice Co. MN	5.26	0.00	0.00	65.00	65.00	61	0.05	0.08
<i>Agastache foeniculum</i>	Fragrant Giant Hyssop	Benton Co. MN	3.34	29.00	12.00	0.00	41.00	25.03	0.02	0.08
<i>Asclepias incarnata</i>	Marsh Milkweed	Houston Co. MN	3.68	46.00	47.00	0.00	93.00	90.62	0.05	0.06
<i>Campanula americana</i>	Tall Bellflower	Fillmore Co. MN	1.07	4.00	92.00	0.00	96.00	95.92	0.02	0.02
<i>Chamerion angustifolium</i>	Fireweed	Mille Lacs Co. MN	1.32	0.00	0.00	65.00	65.00	54.68	0.01	0.02
<i>Eupatorium perfoliatum</i>	Boneset	Benton Co. MN	0.92	50.00	43.00	0.00	93.00	74.76	0.01	0.02
<i>Helenium autumnale</i>	Sneezeweed	Morrison Co. MN	1.26	48.00	47.00	0.00	95.00	78.74	0.02	0.02
<i>Lobelia siphilitica</i>	Great Blue Lobelia	Vernon Co. WI	0.91	0.00	94.00	0.00	94.00	93.07	0.01	0.01
<i>Monarda fistulosa</i>	Wild Bergamot	Madison Co. IA	1.55	96.00	3.00	0.00	99.00	98.9	0.02	0.02
<i>Penstemon digitalis</i>	Foxglove Beardtongue	WI	1.49	4.00	88.00	0.00	92.00	89.07	0.02	0.02
<i>Rudbeckia laciniata</i>	Wild Golden Glow	Allamakee Co. IA	1.21	0.00	0.00	99.00	99.00	90.52	0.02	0.02
<i>Symphyotrichum oolentangiense</i>	Sky Blue Aster	Ottertail Co. MN	2.25	99.00	0.00	0.00	99.00	98.88	0.03	0.03
<i>Zizia aurea</i>	Golden Alexanders	Dakota Co. MN	1.42	0.00	84.00	0.00	84.00	83.77	0.02	0.02

Purity:	93.65
Inert:	6.30
Other Crop:	0.03
Weed Seed:	0.02
Noxious Weeds/lb:	3 Giant Foxtail
Test Date:	9/6/2019
AMS #:	7932

1.25 1.46

# ABRAHAMSON NURSERIES

200021 St Croix Tr N  
Scandia, MN  
651-433-2431

Ticket #101-1020065 User: CRAIG  
Station: 101 Sales Rep POS  
8/23/2021 2:51:02 PM

Item Description	Qty	Price	Total
30631 #3 Galaxy Snowberry	2	42.00	84.00
30402 #3 Jim Dandy Winterberry (male)	1	42.00	42.00
30403 #3 Red Sprite Winterberry (fem)	3	42.00	126.00

JLD HHE

# ABRAHAMSON NURSERIES

2100 TOWER DR  
STILLWATER, MN  
651-439-2140

Ticket #202-1023486 User: LAUR  
Station: 202 Sales Rep POS  
8/23/2021 1:12:02 PM

Item Description	Qty	Price	Total
30631 #3 Galaxy Snowberry	1	42.00	42.00
30668 #3 Low Scape Mound Chokeberry	2	42.00	84.00
30426 #5 Redwing American Cranberry	5	46.00	230.00
30664 #3 Lenox Lace Elderberry	2	42.00	84.00

3/2021

Shrub Varieties PNG

**SHRUBS:**  
#1 min; can be larger size pots if desired; plant in spaces between gl  
\*\* Deep Shade tolerant species; other varieties are partial shade sp  
(minimum 6 species)

Alnus incana subsp. rugosa	Speckled Alder	4/20
Aronia melanocarpa (6) 2 = (8)	Black Chokeberry	2/28
Cornus alternifolia (4)	Pagoda Dogwood**	4/25
Ilex verticillata (4) (4)	Winterberry Holly**	10/27 Yes
Sambucus canadensis (4) 2 = (6)	White Elderberry**	12/20 Yes
Sambucus racemosa	Red Elderberry**	10/27
Staphylea trifolia	Bladdernut**	10/27
Symphoricarpos albus (1) + 1 + 2 = (4)	Snowberry**	10/27 Yes
Viburnum trilobum (5) (3)	American Cranberrybush	4/23

6 @ 15.95 Aronia Chokeberry  
\$ @ 49.95 Pagoda Dogwood Tree

4 @ 21.95 Sambucus Instant Karma

1 @ 26.95 Galaxy Snowberry

THE GREEN HOUSE

THE GREEN HOUSE  
9 COUNTRY HOUSE LN  
MC GREGOR MN  
218-755-4483

12:50	08-21-2021	3100
MC NO. 0000		016.95
6x NURSURY		\$95.7011
4x NURSURY		\$21.95
4x NURSURY		\$87.8011
6x NURSURY		\$26.9511
6x NURSURY		\$49.95
6x NURSURY		\$199.8011
SUBTOTAL		\$410.25
DISCOUNT		25.00
TOTAL		\$-102.56
SUBTOTAL		\$307.69
TAX		\$21.15
TOTAL-TAX		\$286.54
TOTAL		\$307.69
CHANGE		\$21.15

HAVE A NICE DAY  
PLEASE COME AGAIN

**The Green House**  
**NURSERY STOCK GUARANTEE**

NURSERY STOCK IS GUARANTEED FOR ONE YEAR FROM DATE OF PURCHASE ON A 50% REPLACEMENT. IF STOCK SHOULD FAIL TO GROW, THEN 50% OF THE ORIGINAL PURCHASE PRICE WILL BE CREDITED TOWARD THE PURCHASE OF A REPLACEMENT OF ANY KIND.

SO WE WILL BE ABLE TO STAND BEHIND OUR MERCHANDISE, YOUR CASH REGISTER RECEIPT MUST BE BROUGHT IN WITH THE PLANT AS PROOF OF PURCHASE, AMOUNT PAID & DATE OF PURCHASE.

PLEASE DO NOT ASK FOR AN EXCEPTION TO THIS POLICY.

## Appendix

DRAFT





## GUIDELINES FOR INTER-SEEDING GRASSLANDS TO RESTORE OR ENHANCE NATIVE SPECIES DIVERSITY

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Inter-seeding is a practice that is used to increase species diversity in existing remnant or planted prairies.

### INTER-SEEDING GUIDELINES

- **Stand Requirements** – Inter-seeding is most effective in stands where grass is not overly dominant, it generally does not work well in monoculture stands of switchgrass or reed canary grass or in Kentucky bluegrass sod.
- **Seed/Species** - Forbs and grasses can be inter-seeded. Forbs are generally broadcast seeded while grasses are typically drilled. Individual species should be chosen based on specific site needs and project goals. Seeding rates should be based on pure live seed and project diversity goals.
- **Site Preparation** – Site preparation generally involves the removal of thatch through burning or haying to provide light for seedlings; weed removal through herbicide treatment to decrease competition and open areas for establishment; Multiple years of site preparation may be needed before seeding if weeds are dominant.
- **Inter-seeding into Non-native Grasslands** – Most restoration efforts involving the conversion of upland old fields entail cropping for a year or two or combinations of tilling and herbicide applications. In some cases inter-seeding can be successful without tilling particularly when existing vegetation is not vigorous due to sandy soils or other factors. Fields are typically burned to remove thatch and then treated with herbicide as vegetation reaches around 6-inches. Several herbicide applications may be conducted before seeding occurs. Grazing is sometimes used to decrease the abundance of cool-season grass species to allow native forbs to establish. Grazing should be limited to early spring and late fall to minimize native seedling disturbance. Repeated mowing during the first two years can be important to aid seedling establishment.
- **Inter-seeding into Restored/Reconstructed Native Prairie** - In native stands inter-seeding is most commonly conducted after a prescribed burn. Forbs are commonly broadcast in the fall or late winter. Species with larger seed such as grasses can be drilled. Repeated mowing (weekly or bi-weekly if possible) to 6-8 inches is recommended during the first year to allow light for seedlings. Mowing into the second season may also be beneficial.
- **Inter-seeding into Remnant Prairie Communities** – Inter-seeding into remnant communities should be planned by an experienced resource manager. In most cases, only seed collected from the remnant is used. Seed from outside a remnant is sometimes used but only if it is from a local source. Seeding after prescribed fire is the most common method of inter-seeding remnants. Disking or other soil disturbance should not be used in remnants as a means of incorporating seed.
- **Timing**- Seeding should be timed to correspond to site preparation methods. The installation of forb seed is commonly conducted in late fall or late winter. Seeding during these times of year provides time for forb seeds to be stratified. Late winter seeding is generally conducted when there is less than a foot of snow and temperatures are around freezing or slightly higher. An



advantage of seeding in late winter is that freeze thaw action can help incorporate seed into the soil. Inter-seeding can be conducted in spring or early summer but some type of packing or dragging is beneficial. A potential strategy is to broadcast forb seed followed by seeding grasses with a seed drill that is equipped with a roller that can enhance establishment by promoting seed to soil contact.

- **Seedling Care** – During the first two years after inter-seeding burning should be avoided to prevent damage to seedlings. Mowing is an important method to promote seedling establishment and growth after seeding. Frequent mowing (weekly or bi-weekly if possible) to a plant height of 6-8 inches is recommended for two seasons in non-native grasslands and restored/reconstructed native prairie.
- **Monitoring** - Monitoring the success of inter-seeding efforts is recommended to better understand the effectiveness of methods and to guide future efforts.
- **Resources**
  - Broadcast Update, Detroit Lakes WMD, Larry Hanson, US Fish and Wildlife Service
  - Effects of Frequent Mowing on Survival and Persistence of Forbs Seeded into a Species-Poor Grassland, Williams, W. D., Jackson L.L., Smith D.D.
  - Establishing Tallgrass Prairie on Grazed Permanent Pasture in the Upper Midwest, Jackson, L.
  - Forb and Legume Inter-seeding for Wildlife (645) Biology Job Sheet #13, USDA, NRCS
  - Getting Started in Prairie Revegetation, A Recipe for Success, USDA, NRCS, 2005.
  - Increasing Diversity in Prairie Restorations – Why and How, Chris, H., Packard, S.
  - The Tallgrass Restoration Handbook, for Prairies, Savannas and woodlands, Packard, S., Mutel, C.



# Planting Date Guidance for Restoration & BMP Projects

9-14-12

## Seeding - Recommended Dates/Vegetation Type

Seed Type	Spring/Early Summer	Mid-Summer	Early Fall	Mid-Fall	Late Fall (Dormant Seeding)	Snow Seeding
	(see date below)	Jun 30 - Aug 1	Aug 1 - Sep 10	Sep 10 - Oct 15	North: Oct 15 - Frozen Soil South: Nov 1 - Frozen Soil	Feb 15 - April 7
Cool-season Prairie	Apr 1 - Jun 15	**		*		
Warm-season Prairie	May 15 - Jun 30		*	*		
Prairie Sedges and Forbs	May 15 - Jun 30		*	*		
Wetland Grasses	Apr 1 - Jun 30	**		*		
Wetland Sedges and Forbs	Apr 1 - Jun 30	**		*		
State Native Construction Mix	Apr 1 - Jun 30		*	*		
Oats Cover	Apr 1 - Jun 30			*	*	*
Winter Wheat Cover	**	*			*	*

## Plant Installation - Recommended Dates/Vegetation Type

Plant Type	Early Spring	Late Spring	Mid-Summer	Early Fall	Mid-Fall	Late Fall (Dormant Planting)
	Green-up- May 15	May 15 - June 30	Jun 30 - Aug 1	Aug 1 - Sep 10	Sep 10 - Oct 15	North: Oct 15 - Frozen Soil South: Nov 1 - Frozen Soil
Bare-root Herbaceous			*	**	**	
Bare Root Woody			*	**	**	
Containerized Prairie				*	*	*
Containerized Wet Meadow				*	*	*
Containerized Marsh				*	*	*
Containerized Woody					*	
Submergent Plant Fragments				*	*	**
Vegetated Mats				*	**	**
Woody Cuttings			**	**	*	

### Expected Success Rates:

High Success
Medium Success
Not Recommended Without Watering or Favorable Weather Conditions
*Low Success
** Not Recommended

**Note:** Many projects will have NRCS, Mn/DOT, or other specifications that will define planting dates. Variance can often be granted due to seasonal conditions.

Dates included in the tables above represent average dates for Minnesota. Planting dates may be one to two weeks later in the northern half of the state and one to two weeks earlier in southern half of the state depending on seasonal conditions. Most seed mixes contain combinations of the vegetation types listed in the table; dates should be chosen that will ensure long-term success of the entire seed mix. Local staff should use their judgement about the most appropriate planting dates.

## Seeding Considerations

**Spring/Summer Seeding:** Spring and summer tends to be the best season for grass establishment and forbs such as pasque flower, prairie smoke, phlox, shooting star, golden alexanders, gentian, meadow rue, and many violets that do not require stratification. Forbs and sedges that require a winter for stratification tend to do better with fall planting but when planted in the spring they can sit dormant for a season until they are ready to germinate.

**Fall Dormant Seeding:** It is common to wait until around October 15th or possibly November 1st in the southern part of the state when dormant seeding. It is important that conditions will be cold enough to prevent germination right before winter. It is also common to wait until shortly before snowfall to prevent the loss of seed from wind, birds and rodents. Fall dormant seeding is commonly done when forbs and sedges are a primary goal for a project. Fall dormant seeding and winter seeding typically should not be conducted in areas where there will be flowing or standing water in the spring as seed may be lost.

**Snow Seeding:** Snow seeding is conducted during late winter when there is less than a foot of snow, and on sunny days when seed can move to the soil surface. This technique has been successful for a wide variety of species types. Refer to the Minnesota Wetland Restoration Guide for more information about snow seeding.

**Cover Crop Use:** Cover crop species are included in state seed mixes. Oats (*Avena sativa*) should be used in spring or summer, and winter wheat (*Triticum aestivum*) in fall. If a project is focused on stabilization and slopes are between 5-10%, cover species should be increased by 35 pounds per acre. If slopes are more than 10% cover species should be increased to 56 pounds per acre.

## Plant Installation Considerations:

**Plant Condition:** the planting dates listed in the table assume that containerized plants are fully rooted into containers, that pre-vegetated mats have established vegetation, and that herbaceous, and woody bare root plants (and cuttings) are stored in optimal conditions prior to planting.

**Weather Conditions:** Weather conditions (including rainfall and temperatures) during a season can have a big influence on the ideal planting dates for vegetation. Planting dates may need to be adjusted based on past and projected conditions.