# FLOWERING BEE LAWNS

## A TOOLKIT FOR LAND MANAGERS

Compiled by
Hannah Ramer, James Wolfin, Kristen C. Nelson,
Marla Spivak, Eric Watkins, MaryLynn Pulscher

August 2019

Nelson Lab: Depts of Forest Resources & Fisheries, Wildlife & Conservation Biology

Funding provided by the Minnesota Environment & Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR)

# TABLE OF CONTENTS

# INTRODUCTION

## Flowering Bee Lawns

Scientists at the University of Minnesota research *flowering bee lawns* as a concrete way that public land managers and homeowners can support bees. Many bee pollinator populations are in decline due to several factors, including a lack of bee-friendly flowers, exposure to pesticides, as well as diseases and parasites. Turfgrass lawns are ubiquitous in urban and suburban areas, covering more than 2% of the land area of the continental U.S., but don't provide nectar or pollen for bees. Flowering bee lawns incorporate low-growing, perennial flowers into turfgrass lawns. The selected flowers are rich sources of nectar and pollen for bees and can withstand mowing and moderate foot traffic. This means flowering lawns can support bees while preserving the open sightlines and many of the recreational uses provided by traditional lawns (Table 1).

Flowering lawns increase the diversity and abundance of flowers, helping support both honey bees and native bees. So far, we have found 56 species of bees feeding on Dutch white clover alone. That represents roughly 15% of all known bee species in the entire state of Minnesota.

Flowering bee lawns are designed to be easy to install, either through overseeding or as part of a new lawn renovation. Once installed, flowering bee lawns should require minimal maintenance with just a few alterations to typical lawn management practices.

## Research Project Background

This toolkit is based on research by the University of Minnesota Bee Lab, Turfgrass Science Lab, and Nelson Lab in partnership with Minneapolis Park and Recreation Board with funding from the Minnesota Environmental and Natural Resources Trust Fund (ENRTF).

The first research phase determined which low-growing flowering plants could sustain growth within turf and continue to flower after mowing.

In the second phase, we…

a. tested flowering lawns in public parks to see if they increase the diversity and abundance of honey bee and native bee pollinators.
b. surveyed Minneapolis park visitors to learn about their perceptions of bee pollinators and flowering lawns, and
c. conducted focus group interviews with public land managers representing 25 local, county and regional park departments from the 7-county Twin Cities Region.

# COMPARING FLOWERING BEE LAWNS WITH OTHER TYPES OF VEGETATION

Flowering bee lawns combine features of traditional turfgrass lawns and other types of vegetation supporting bees and preserving the open sightlines and many recreational uses associated with lawns.

| | Traditional turf | Bee Lawn | Urban meadow | Native prairie | Pollinator garden |
|---|---|---|---|---|---|
| Description | Area dominated by & managed for turfgrasses. Turf that has not been treated with herbicides may have unintentional forbs.[1] | A mix of low-input turfgrasses & low-growing forbs selected to provide bee forage. Mowed regularly to maintain recreational uses similar to lawns.[4] | "Naturalistic, unmown grassland with or without flowering forbs."[5] | Area dominated by grasses & grass-like species, often with a diverse assemblage of forbs & other plant species.[9] | Garden bed planted with species selected to provide high-quality pollinator forage. |
| Key criteria for selecting species | Appearance (e.g. color, texture); Maintenance requirements | Provision of pollinator forage (& other ecological benefits); Ability to grow in lawn conditions | Biodiversity (& other ecological benefits); Appearance/color diversity | Native species (& other ecological benefits) | Provision of pollinator forage (& other ecological benefits) |
| Vegetation height | Short (2-4.5 inches)[3] | Short (2-4.5 inches)[3] | Short (2 inches) to Tall (40 inches) [5] | Short (6 inches) to Tall (120 inches)[9,11] | Varies |
| Suitability for foot traffic | Excellent | Good | Poor to None | None | None |
| Mowing frequency | 1-6/month[2,3] | 1-3/month[4] | 1/month to 1/season[5] | 0-2/season[10] | N/A |
| Other maintenance considerations | Staff are usually already familiar with & skilled at maintaining. | Can mow less frequently than traditional turf. No new equipment is necessary. Herbicide use should be avoided. | Mowing is substantially reduced. Removal of plant residues may require additional equipment/effort. | May be maintained by prescribed burns. Requires specialized training and equipment. | Requires intensive management, such as hand weeding & mulching. |

Illustration by Joseph Nowak III. References: [1]Ignatieva, Eriksson, Eriksson, Berg, & Hedblom, 2017; [2]Yue et al., 2017; [3]Cornell University, 2018; [4]Lane, 2016; [5]Southon et al., 2017 (p.106); [6]Hoyle et al., 2018; [7]Smith & Fellowes, 2015; [8]Smith & Fellowes, 2014; [9]Blair, Nippert, & Briggs, 2014; [10]Minnesota Dept of Natural Resources, 2004; [11]Oregon State University, 2018.

# Recommended Species

| | Dutch white clover<br>*Trifolium repens* | Self-heal<br>*Prunella vulgaris* | Creeping thyme<br>*Thymus serpyllum* | Ground plum<br>*Astragalus crassicarpus* |
|---|---|---|---|---|
| |  |  |  |  |
| Description | Legume with trifoliate, ovate leaves. Flower heads are white tinged with pink or cream. | Stems spread along the ground. Leaves are lance or ovate. Whorls of purple florets. | Woody, spreading stems, with small leaves and pink to purple flowers. | Spreading legume with pinnate leaves and purple to white pea-like blooms. |
| Forage for bees | Pollen and nectar | Primarily nectar, some pollen | Primarily nectar, some pollen | Nectar, possibly some pollen |
| Bloom Time | May to October | June to August | July to August | April to May |
| Bloom Height | 2.5" | 2.5" | 2" | 3" |
| Sun | Full sun to shade | Part shade to full sun | Full sun | Full sun |
| Soil types | Sandy to loam to clay | Silt/clay/loam | Prefers sandy, will establish in loam | Sandy |
| Native Range | Europe | North America | Northern Europe | Great Plains |
| Additional Notes | 56 bee species have been observed foraging on this species in Minneapolis parks. As a member of the legume family, it can fix nitrogen and improve overall lawn health. | In Minneapolis parks, 96% of the bees observed on self-heal were native. The longer corolla is good for larger bees with long tongues, like bumble bees, and very small bees that can crawl into the flower. | Has small blooms good for smaller, short-tongued bees. This species is closely related to the thyme used in cooking and has a similar scent. | Blossoms can provide early-season forage, especially for large-bodied, long-tongued bees. It is in the legume family and can fix nitrogen. Seeds may be hard to find or expensive. |

# ESTABLISHMENT & MAINTENANCE

*Adapted from public outreach materials by James Wolfin*

## Site & Species Selection

It is crucial to pick a site where flowering lawns are a good fit in terms of biophysical factors as well as park use.

Our survey in Minneapolis found that 95-97% of park visitors supported flowering bee lawns in parks. Survey respondents liked the way flowering lawns look and they wanted to support bee pollinators. A small percentage of visitors expressed concern about the risk of bee stings. With these perceived benefits and concerns in mind, we suggest a few approaches for selecting a site for a flowering bee lawn, each with different tradeoffs:

(1) A high-visibility, high use site will allow for more opportunities for education and engagement. Signage can highlight the aesthetic benefits as well as the benefits to bees.

(2) A low-visibility, low-use area will still provide forage for bees, but may reduce potential concerns from park visitors.

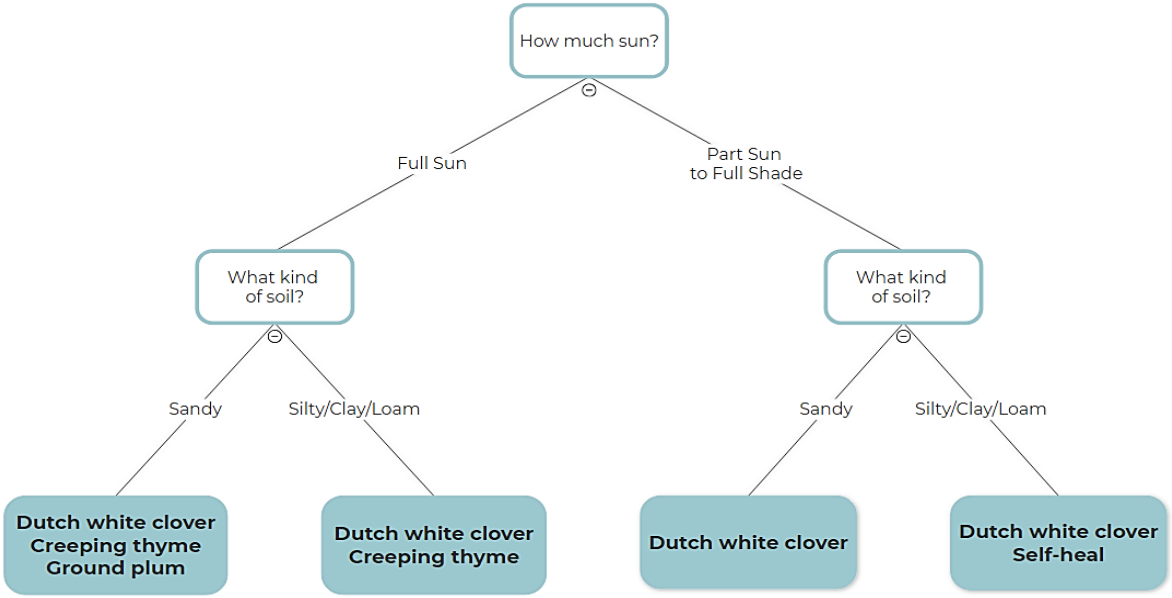
(3) A high visibility, low-use location away from ball fields or playgrounds but near walking paths or parkways may offer a happy medium. Visitors can easily choose how close to get.

(4) You may already have a 'partial' bee lawn if you have Dutch white clover in your turf. In this case, the public is already accustomed to it, and you can consider enhancing these clover areas by adding a greater diversity of species.

The particular flowering species that best suited to your site will depend on the sunlight and soil conditions (see diagram). Choose sites that receive at least some sunlight, because honey bees prefer warm temperatures for foraging.

For turfgrasses, Kentucky bluegrass *(Poa pratensis)* and fine fescues *(Festuca spp.)* work well in bee lawns. Fine fescues are lower input and work better in shady sites than Kentucky bluegrass. We don't recommend perennial ryegrass (*Lolium perenne)* or tall fescue (*Festuca arundinacea).*

Depending on the season, water access may be helpful during establishment. No irrigation is required if you choose a dormant seeding in the late fall. For a spring seeding, irrigation is recommend for the first 30 days.



## Buying seed

The UMN Bee Lab developed the Bee Lawn Mix for lawn renovation projects. The mix contains strong creeping red fescue, Chewings fescue, hard fescue, sheep fescue, Dutch white clover, creeping thyme, and self-heal.

As of spring 2019, the Bee Lawn Mix is available at:

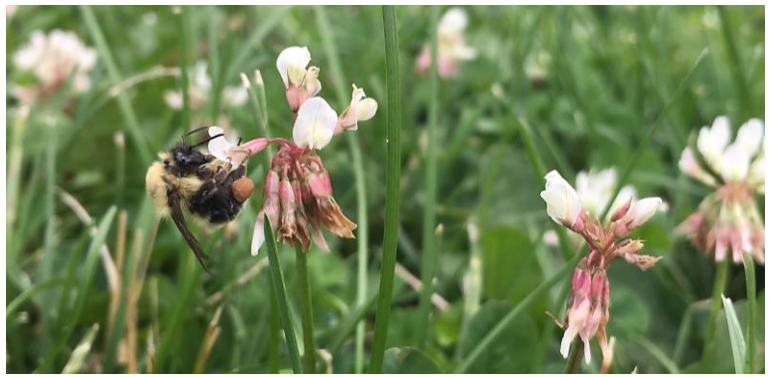
- **Otten Brothers Garden Center**
  952-473-54-25
  2350 Wayzata Blvd, Long Lake, MN
- **Beisswenger's Hardware**
  651-633-1271
  1823 Old Hwy 8 NW, New Brighton, MN
- **JK Landscape & Construction**
  320-558-4445
  19512 Hubble Road, Clearwater, MN
- **Organic Lawns by Lunseth**
  612-226-1898
  Installation only
- **Jerry's Hardware**
  952-929-4601
  5115 Vernon Ave S, Edina, MN

  952-884-2209
  10530 France Ave S, Bloomington, MN
- **Eggplant Urban Farm Supply**
  651-645-0818
  1771 Selby Ave, St. Paul, MN
- **Leitners Garden Center**
  651-291-2655
  945 Randolph Ave, St. Paul, MN

You can also make your own seed mix for overseeding or lawn renovations. Use the table below to calculate the amount of seed needed based on the size of the area you want to plant.

**SEEDING RATE**

| Common name *(Latin name)* | Seeding rate per 1000 sq ft |
|---|---|
| Dutch white clover *(Trifolium repens)* | 1.1 oz |
| Creeping thyme *(Thymus serpyllum)* | 0.16 oz |
| Self-heal *(Prunella vulgaris)* | 1.2 oz |
| Ground plum *(Astragalus crassicarpus)* | 3.0 oz |
| Fine fescue* *(Festuca spp.)* *For lawn renovation only, not necessary if overseeding | 4 lbs |



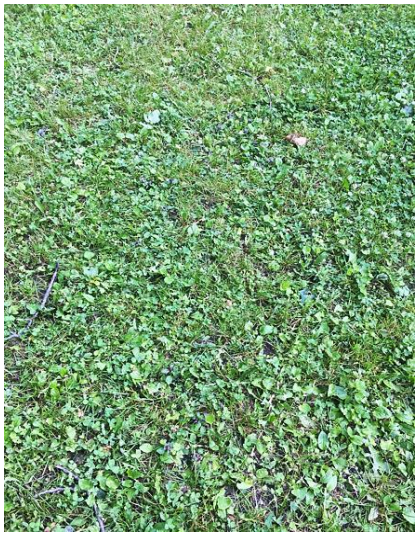
## When to Install a Bee Lawn

We strongly recommend a dormant seeding in the late fall, whether overseeding flowers into existing turf or establishing flowers alongside new turfgrasses. The goal is to target a time when soil temperatures have dropped below 40°F, typically around the third week of November in Minnesota. At this soil temperature, it is too cold for seeds to germinate, but the ground is not yet frozen. This gives plants the best chance to germinate the following spring and reduces competition from surrounding plants. Overseeding in the early spring is also an option, though bee lawn flowers will face more competition from established lawn weeds.

## Site Prep

The kind of site preparation required depends on whether you will be overseeding flowering species into an existing lawn area, or whether you'll be eliminating the existing vegetation and planting turfgrasses and flowering species at the same time:

| Overseeding | Lawn renovation |
|---|---|
| Before seeding bee lawn flowers, we recommend:<br>(1) Scalping (or mowing to ≤1 inch) to allow better soil-to-seed contact and reduce competition for sunlight<br>(2) Core aeration to increase the flow of air, water, and nutrients, and to alleviate the stresses associated with soil compaction | Eliminating pre-existing turfgrasses or weed species can reduce competition for bee lawn seeds, but it is more expensive. Suggested methods include using a sod cutter, herbicides, or solarization.<br><br>Note: Many herbicides contain ingredients harmful to pollinators. Avoid these if possible. |

## Seeding

Apply a starter fertilizer along with, or immediately following seeding.

For dormant seeding in the late fall (highly recommended), no irrigation is required. If you overseed in the spring, irrigation for the first 30 days will help with establishment.

For lawn renovations, lightly rake soil over seeds after spreading. During the first week, irrigate the area several times each day to keep the soil moist. This is generally accomplished with three irrigation cycles spaced evenly throughout the day (e.g. 8am, noon, and 4pm). Application rates should be approximately 0.10" of water during each irrigation cycle. Fine fescues will germinate anywhere from 4-8 days. Following germination, reduce irrigation by adjusting the frequency to 2x per day for 5-7 days, followed by 1x per day until irrigation can be withheld. This assumes no rainfall. Be sure the area does not stay constantly wet (maintain moisture but not saturation) and withhold irrigation when rainfall is sufficient. Use a germination blanket to keep the seeds in place and to retain moisture. As with any new lawn establishment, temporary fencing may be necessary for 1-2 months until bee lawn is established. *Blooms may not be observed for certain flowers until 1-2 seasons after seeding.*

## Maintenance

Once established, maintenance practices for flowering bee lawns are largely similar to those for any other low-maintenance turf lawn area.

| | |
|---|---|
| MOWING<br>Bee lawns can be mowed regularly, ~1-3 times/month. Allow vegetation to grow to at least 2.5 inches (ideally a bit more) to encourage blooms. | WEEDS<br>Refrain from using broad-spectrum herbicides, which would kill bee lawn flowers. Hand weeding or a spot treatment is recommended. |
| FERTILIZER<br>Once established, no additional fertilizer is needed. Dutch white clover will fix nitrogen. | IRRIGATION<br>No additional inputs of water should be required. |

# OUTREACH & EDUCATION

## Balancing Benefits and Concerns

When we surveyed park visitors in Minneapolis, 95-97% supported creating flowering lawns in public parks. Aesthetics and supporting bees were the two most commonly mentioned potential benefits of flowering lawns (and that was even before we explained that flowering lawns were designed to provide food for bees). Selecting a location for a flowering lawn that (a) is visible and (b) where park visitors are able to observe bees if they choose could enhance perceived benefits.

On the other hand, the 2-5% of survey respondents did not support flowering lawns and expressed concerns about bee stings, especially in play areas used intensively by small children who may not know how to calmly avoid bees. Selecting locations that (a) have low to moderate foot traffic and/or (b) can be easily avoided if park visitors prefer, could help alleviate the concerns of some park visitors. Finding the right place for your community and your parks is important for success.

## Crafting a Message

It's important to tailor the message to your audience. Some park visitors will be most excited about bees while others will be enthusiastic about adding more color to the landscape. Our research suggests that solely discussing the benefits to bees is likely to engender both stronger support as well as stronger opposition. When we shared the flowering lawns were designed for bees, strong support for flowering lawns increased by 12%, but overall support decreased by 1.8%. Emphasizing things like the aesthetic benefits, biodiversity, nitrogen fixation, or reducing herbicides might resonate more strongly with some.

It's much easier to win support by emphasizing benefits that community members already care about, so it's important to learn more about what your community members value most and then tailor your message.

### START SMALL OR GO BIG?

Depending on your community, it might make sense to first try out flowering bee lawns on a small scale, in an out-of-the-way spot where you can monitor the establishment and see how it could fit in to your park system and maintenance practices. That trial run could reveal where you'd like to make adjustments and help you build a case for wider scale adoption.

On the other hand, there may already be an organized group of pollinator supporters or a pollinator-friendly ordinance in your community. Establishing a bee lawn in a highly visible area and promoting it widely could help your community advertise the innovative practices that you use and the ecological benefits your park system provides.

## Getting the Word Out

People tend to view alternative vegetation in a positive light when there are clear signals that it is a result of intentional design choices (Nassauer, 2011). In our research in the Twin Cities region, some park visitors and land managers expressed concern that community members who aren't familiar with flowering lawns could assume the low-growing flowers are weeds and they may be interpreted as a sign of neglect. Elsewhere, researchers found that public garden visitors didn't notice when flowers were added to lawn areas unless there was signage or a public event (Shwartz, Turbé, Simon, & Julliard, 2014). Some community members may not even notice a change or be aware of the ecological benefits.

Signage on-site at flowering lawns can help communicate to park visitors that the flowers were intentionally added to the turf and that they are serving an important ecological function. In addition to signage, you can also publicize the benefits of flowering lawns through newsletters, flyers, your website, social media, educational programs, or public events.

## Frequently Asked Questions

While attention to pollinator and bee conservation has surged recently, flowering bee lawns are still a relatively new concept. Community members may have questions about flowering bee lawns, so here are some answers to have at the ready:

***WHAT IS A FLOWERING LAWN?***
Flowering bee lawns are turfgrass areas with low-growing, perennial flowers mixed in. You can walk on them and mow them like a regular lawn, and the flowers provide food for bee pollinators. This means that flowering lawns can support bees and while preserving the open sightlines and most recreational uses of traditional lawns.

***ARE THESE WEEDS?***
No. A weed is a plant growing in a place you don't want it. These flowers were intentionally chosen because they are rich sources of nectar and pollen for honey bees and native bees (and because they withstand mowing and foot traffic). We want these flowers right where they are because they provide important environmental benefits.

***CAN I WALK ON A FLOWERING LAWN? WILL I DAMAGE IT?***
You are more than welcome to walk on flowering lawns! Regular recreational uses like walking through, sitting on, playing catch or pickup sports on the flowering bee lawn won't damage it. The flower species were specifically chosen to be able to withstand moderate foot traffic.

***DOES MOWING DAMAGE FLOWERING LAWNS?***
Mowing does not damage flowering lawns. The flowers in the bee lawn mix were chosen because of their ability to bloom at low heights and to keep growing after being mowed. Allowing the vegetation to grow to 2.5 inches or more will encourage the most blooms.

### *HOW DO FLOWERING LAWNS HELP BEES?*

Many bee species populations are declining because of several factors, including a lack of bee-friendly flowers, exposure to pesticides, diseases, and parasites. Turfgrass lawns cover a huge amount of land, but they don't provide much food for bees. Flowering lawns incorporate low-growing flowers into lawns to provide rich sources of nectar and pollen. U of M researchers found 56+ species feeding just on Dutch white clover in Minneapolis parks. That's nearly 15% of the ~400 bee species in the state!

### *I DON'T LIKE BEES. WHY ARE YOU ATTRACTING THEM TO PARK AREAS?*

Our parks are committed to providing high quality recreational opportunities and ecological benefits such as plant pollination at the same time. We believe that increasing bee-friendly flowers in park areas that don't conflict with recreational uses can serve both of these crucial goals at the same time.

### *WHY ARE BEES SO IMPORTANT ANYWAY?*

In a word: pollination. As bees collect nectar and pollen for food, they also end up transferring pollen from flower to flower. More than one-third of the world's crops species rely on bee pollination and 80% of wild plants depend on bees or other animals for pollination. Maintaining bee diversity is crucial for ecosystem health.

### *WHAT IS THE DIFFERENCE BETWEEN WASPS & HONEY BEES?*

Bees are fuzzy and wasps appear shiny and hairless. A wasp can sting multiple times but if a honey bee stings, it dies. Wasps tend to be more bothersome at picnics.

### *WHAT ABOUT CREEPING CHARLIE?*

Creeping Charlie can be a source of nectar for some species of bees, but its pollen isn't readily available to visiting insects. It can also be fairly invasive. We don't recommend it in flowering lawns.

### *ARE THERE OTHER BENEFITS OF FLOWERING LAWNS?*

Aside from providing nectar and pollen for bees, flowering lawns with low-input turf species can also decrease the maintenance and input requirements of lawn areas. For example, we may be able to mow bee lawns less frequently, saving money and staff hours and reducing $CO_2$ emissions from mowers. Dutch white clover fixes nitrogen, helping to build an important nutrient in the soil. Lastly, flowering lawns don't require irrigation after the establishment phase, which conserves water.

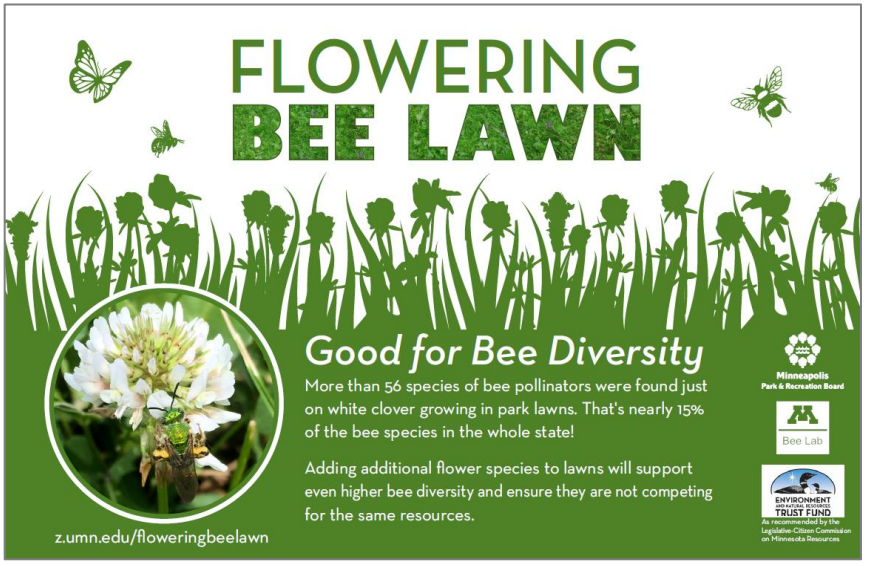
### *CAN I PLANT A FLOWERING BEE LAWN IN MY YARD?*

Absolutely! The more habitat we can create for bee pollinators, the better. Plus, if you grow vegetables or fruit in your yard, attracting pollinators may help increase your harvests.

To learn more about how to start a flowering lawn in your yard, visit z.umn.edu/floweringbeelawn

# SAMPLE OUTREACH SIGNS / POSTERS

Electronic versions will be available on the Bee Lab website at z.umn.edu/floweringbeelawn starting in August 2019.



## Additional Resources

Bee Lab, University of Minnesota. "Flowering Bee Lawns." https://z.umn.edu/floweringbeelawn. Accessed May 28, 2019.

Foord, K., (2015) "Creating a Bee Friendly Lawn with White Clover" https://z.umn.edu/beelawn. Accessed June 14, 2019.

Ramer, H., Nelson, K.C., Spivak, M., Watkins, E., Wolfin, J. (2019). Exploring Park Visitor Perceptions of 'Flowering Bee Lawns' in Neighborhood Parks in Minneapolis, MN, US. *Landscape and Urban Planning.* 189, 117-128.

Wolfin, J., "If you build it, who will come? Evaluating the diversity of bees in flowering lawns." Turfgrass Science, University of Minnesota. Published Feb 3, 2019. Accessed May 28, 2019. https://turf.umn.edu/news/if-you-build-it-who-will-come-evaluating-diversity-bees-flowering-lawns

Wolfin, J. and H. Ramer, "Conservation Practices to Support Pollinators." *Hole Notes Magazine*, Vol. 53, No. 7, Aug 2018. https://issuu.com/mgcsa/docs/hole_notes_august_2018

## Bee Lawns in the Media

Fosdick, D., "Save the Bees (and Time and Money) by Creating a Bee Lawn." *Washington Post*. May 28, 2019. https://www.washingtonpost.com/national/energy-environment/save-the-bees-and-time-and-money-by-creating-a-bee-lawn/2019/05/28/09748fb8-8146-11e9-b585-e36b16a531aa_story.html?noredirect=on&utm_term=.8e9973420a7c

Gayle, R., "Redesigning Green Spaces Into More Diverse Bee Spaces." *Utah Public Radio.* July 11, 2018. https://www.upr.org/post/redesigning-green-spaces-more-diverse-bee-spaces

## References


Blair, J., Nippert, J., & Briggs, J. (2014). Grassland Ecology. In R. K. Monson (Ed.), *Ecology and the Environment* (The Plant, pp. 389–423). New York: Springer Science+Business Media. http://doi.org/10.1007/978-1-4614-7501-9

Cornell University. (2018). Routine Care: Mowing. Retrieved December 5, 2018, from http://safesportsfields.cals.cornell.edu/mowing

Hoyle, H., Norton, B., Dunnett, N., Richards, J. P., Russell, J. M., & Warren, P. (2018). Plant Species or Flower Colour Diversity? Identifying the Drivers of Public and Invertebrate Response to Designed Annual Meadows. *Landscape and Urban Planning*, *180*, 103–113. http://doi.org/10.1016/j.landurbplan.2018.08.017

Ignatieva, M., Eriksson, F., Eriksson, T., Berg, P., & Hedblom, M. (2017). The Lawn as a Social and Cultural Phenomenon in Sweden. *Urban Forestry and Urban Greening*, *21*, 213–223. http://doi.org/10.1016/j.ufug.2016.12.006

Lane, I. (2016). *Floral Enrichment of Turf Lawns to Benefit Pollinating Insects*. University of Minnesota. Retrieved from http://hdl.handle.net/11299/181804

Minnesota Dept of Natural Resources. (2004). Managing, Restoring and Re-establishing Prairie and Savanna Communities. In *Guidelines for Managing and Restoring Natural Plant Communities along Trails and Waterways* (p. 37).

Nassauer, J. I. (2011). Care and Stewardship: From Home and Planet. *Landscape Journal*, 100(4), 321-323.

Oregon State University. (2018). Short and Tall Grasses. Retrieved December 5, 2018, from https://forages.oregonstate.edu/regrowth/how-does-grass-grow/grass-types/short-and-tall-grasses

Shwartz, A., Turbé, A., Simon, L., & Julliard, R. (2014). Enhancing Urban Biodiversity and Its Influence on City-Dwellers: An Experiment. *Biological Conservation*, *171*, 82–90. http://doi.org/10.1016/j.biocon.2014.01.009

Smith, L. S., & Fellowes, M. D. E. (2014). The Grass-Free Lawn: Management and Species Choice for Optimum Ground Cover and Plant Diversity. *Urban Forestry & Urban Greening*, *13*(3), 433–442. http://doi.org/10.1016/j.ufug.2014.04.008

Smith, L. S., & Fellowes, M. D. E. (2015). The Grass-Free Lawn: Floral Performance and Management Implications. *Urban Forestry & Urban Greening*, *14*(3), 490–499. http://doi.org/10.1016/j.ufug.2015.04.010

Southon, G. E., Jorgensen, A., Dunnett, N., Hoyle, H., & Evans, K. L. (2017a). Biodiverse Perennial Meadows Have Aesthetic Value and Increase Residents' Perceptions of Site Quality in Urban Green-Space. *Landscape and Urban Planning*, *158*, 105–118.

Yue, C., Wang, J., Watkins, E., Bonos, S. A., Nelson, K. C., Murphy, J. A., Meyer, W. A., & Horgan, B. P. (2017). Heterogeneous Consumer Preferences for Turfgrass Attributes in the United States and Canada. *Canadian Journal of Agricultural Economics*, *65*(3), 347–383. http://doi.org/10.1111/cjag.12128