



Creating Pollinator Habitat

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Pollinator Gardens and Pollinator Habitat

- Why create pollinator gardens or habitat?
- Where can this be completed?
- How is this done?
- Does it really work?



What is a pollinator garden vs. pollinator habitat? They are really similar and it depends on what your goals are for the property.

A pollinator garden is mulched and has the look and feel of traditional landscaping, except the plants selected are for the purpose of feeding adult pollinators nectar. Pollinator gardens are neat and tidy and usually heavily maintained to remove weeds and keep the selected plants from spreading too much.

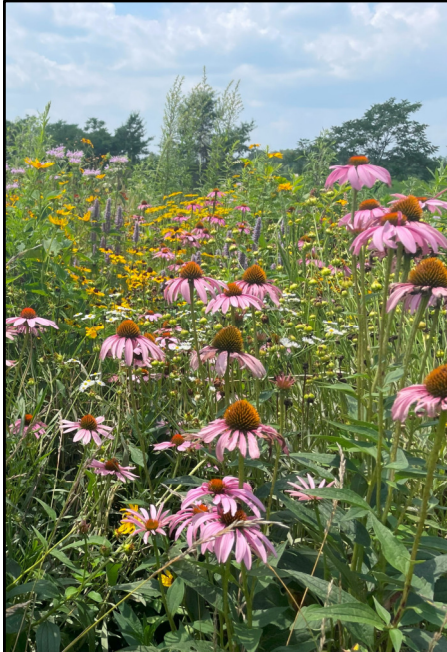
A pollinator habitat supports all aspects of a pollinator's life cycle. There is not landscaping mulch and looks more like an open field of flowers. The plants selected are for feeding adult pollinators, but also include plants needed for egg laying and caterpillar stages, as well as having habitat for nesting and overwintering purposes. Once established, it requires little maintenance. Our goal at the Turnpike was pollinator habitat.

With this presentation I plan to answer the questions of why, where, how and end with showing you some of the successes and lessons learned.



Why create pollinator habitat?





What's All the Buzz About?

- Pollinators are important for our food sources and contribute billions of dollars to the agricultural industry
- Many pollinators have very specific needs during their life cycle
- Threats: habitat loss/degradation, broadcast use of pesticides, disease, invasive species, climate change
- Threatened or Endangered Species Listings

First Bullet -

A pollinator is anything that helps carry pollen from one flower to another, allowing plants to become fertilized and produce fruits, seeds, and young plants.

Although some plants are self-pollinating, almost 90% of all plant species need the help of insects and animals to transfer pollen.

Butterflies, Moths, Bees, Beetles, Flies, Wasps, Hummingbirds, Small Mammals

- Bees are particularly important pollinators. Bees pollinate 70 out of every 100 crop species that feed 90% of the world. Honeybees are responsible for \$30 billion a year in crops

About 1 of every 3 bites of food you eat exists because of pollinators

Second bullet -

Many require open habitats with flowering plants (nectar/food and host plants) with nearby nesting areas and overwintering areas (sandy ground, shrubs, tree cavities, leaf litter, hollow stems)

Many pollinators only feed from certain plants or only lay eggs on certain plants because the caterpillars are adapted to only eat that plants' leaves.

Some examples: Monarch caterpillars only feed on milkweed leaves, Zebra swallowtails host plant are paw paw trees, Black swallowtail caterpillars eat leaves such as carrots, Queen Anne's Lace, dill, or parsley

Third bullet –

Development causes habitat loss and degradation

Without management, open fields will become forested and result in loss of habitat

Broadcast use of pesticides (direct impact) or even herbicides (indirect impact – killing host and nectar plants)

Invasive species – are not host plants and can outcompete native plants; therefore cannot complete life cycle

Disease, climate change

Fourth bullet -

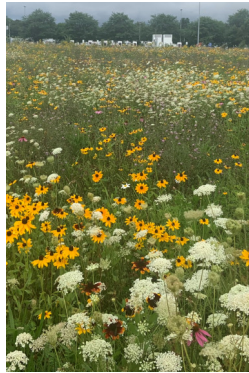
The threats are so abundant that there are several bee and butterfly species listed as federally threatened or endangered. Monarch butterfly listed as a candidate species – listing is warranted, expected to announce listing towards the end of this year 2023.

What can be done? Create habitat, minimize impacts when developing

What are the Non-Pollinator Benefits?



Sustainability
Goals/Ecologically
Minded



Aesthetics



Operational
Improvements



Public Education

Why do something about it

Sustainability Goals/Ecologically Minded - Prevent other pollinators from being listed and even delist current pollinators. How does the land being managed fit into its natural ecosystem

Aesthetics – From employees to the communities – most will appreciate the view in the spring, summer, and fall

Operational Improvements– targeted herbicide treatments and reduced mowing may result in cost savings and may create opportunities for staff to focus on other priorities.

Public Education – Be an example for your communities – anyone can provide pollinator habitat. Even if your “public” is limited to employees – they bring back what they learn to their families and communities

General – Consider the land being managed – everything should have a purpose. There may be areas that make sense to maintain as lawn for picnic tables, for example, or an area used by people walking. But consider pollinator habitat for areas that are not used.



Where can this be completed?





Assessing the Potential Areas

- Infrequent access areas
- Easy to access for maintenance during establishment and long term for tree/shrub control
- Existing habitat type

- Don't install in an area where you need to frequently access or that is an active pathway
- May want to avoid steeply sloped areas – decide what percent slope you would be comfortable using maintenance equipment – consider the location of any stormwater features
- Avoid direct impacts to wetlands
- Consider that the creation of pollinator habitat outweighs most of any negative effects. Roadway example – there may be pollinator mortality due to interactions with vehicles, but the benefits are greater than the negatives. Consider buffers from harm
- Water sources – great if near water, but insects don't need much so don't nix a site if there isn't a stream or lake near by. Puddles are sufficient.
- Choose an area that is mowed grasses or open field. Don't remove one type of habitat to create another. No reason to remove a treed area to convert to pollinator habitat – both are needed for a successful ecosystem



Assessing the Potential Areas



Existing habitat and vegetation present



Adjacent land use



Slope, drainage, sun exposure level, soil type



Utilities, stormwater management, road presence



Stressors



- Don't need to re-invent the wheel - utilize many different assessment data forms publicly available (pollinator partnership, Rights-of-Way Pollinator Habitat Working Group, Xerces Society – QR codes will be provided later in the presentation).
- Existing habitat structure – grassland, shrubland, forestland, wetland, riparian area, bare soils, sparse trees, etc. Contiguous habitat, fragmented habitat? What vegetation is present? Look adjacent to site as well. Are there naturally occurring pollinator friendly plants? Will want to include those in the seed mix. Are there invasive or aggressively growing plants? How will this affect the site?
- Invasive/Unwanted species presence – know that if using a site that has invasive or aggressive species, plan for more intense management in the first two years.
- Adjacent agricultural lands? Consider the mutual benefits (increase crop yields) – may want to seek out, but buffer ag areas due to herbicide use
- Adjacent to conservation lands – variety of wildlife habitat, adjacent to a utility corridor – herbicide use so implement a buffer
- Strive for ½ to 1 acre in size, but smaller is still ok
- Want shrubby areas nearby, shorter grasses nearby

- Assessment drives seed selection - don't want to select plants that prefer shade in a sunny location, if you know you have poor soils or acidic soils, then you should choose plants that adapt to those conditions.



How is this done?



Site Preparation Methods

- Broadcast herbicide
- Solarization
- Smother cropping
- Mulching
- Sod removal



After assessment, first step is selecting your method to remove existing vegetation.

- Idle lands – just stop mowing – good for sites where a variety of color is not a goal and aggressive species are minimally present. Lowest cost. Visually grassy with occasional flowers. Provides important habitat.

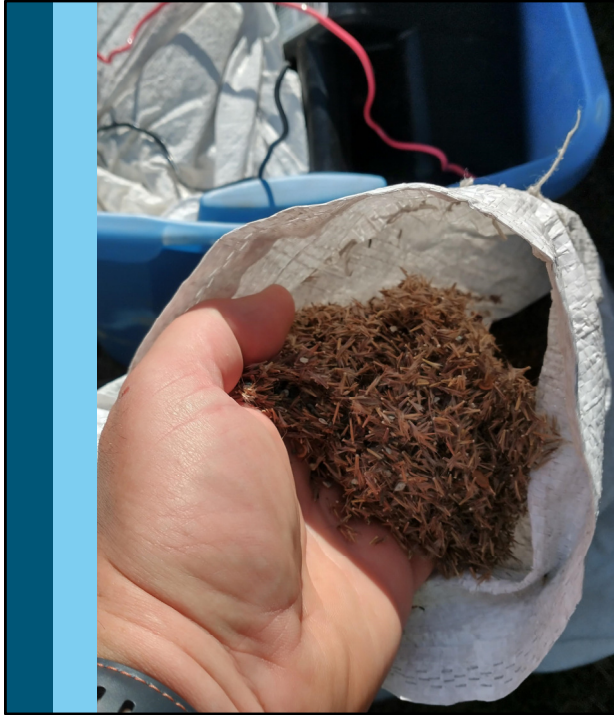
Habitat Creation – In most cases, you will need to first kill the existing vegetation. If the site has been previously disturbed, you will want to avoid further disturbance as much as possible. Tilling the soil, for example, can activate many unwanted weeds in the seed bank of the soil. Methods of vegetation removal depend on site specifics such as how small or large the area is and what is currently growing.

- Broadcast herbicide applications in the fall and spring.
- Small area – solarization – uses clear uv stable plastic. Ideal in hot climates. Higher cost.
- Smother cropping – Plant an annual the season prior to pollinator habitat planting that spreads and outcompetes weeds
- Small area – mulching to smother weeds – similar concept to solarization, but for shady sites
- Sod removal equipment

Broadcast Herbicide



- For the PA Turnpike Pollinator Pilot Project, we used the broadcast glyphosate herbicide method due to large areas, least disturbance to the soil, remaining dead vegetation kept soil intact and reduced erosion potential, not expensive, less labor intensive
- We tested timing of the herbicide – some sites were sprayed twice in the spring, some sites were sprayed in the fall and then again in the spring. A surfactant dye was helpful for the licensed professional to ensure coverage. Occasionally would need to spot spray locations missed.
- In the fall, the plant is expending most of its energy down to its roots; therefore, herbicide would be more efficient in killing the plant. In the spring, the plant is expending most of its energy to growth and leaves and can take multiple applications of herbicides to successfully kill the plant.
- Seeding should occur shortly after herbicide application. If there is idle time, there is an opportunity for weeds to germinate.
- A key point in this step of the process is to ensure that vegetation is dead. If live vegetation is observed, spot spray. If not, this vegetation could outcompete the seed that will need some time to germinate.



Seed Selection

- Quick germination and germination that may occur in a few years
- Variety of bloom times, at least ensure spring, summer, and fall
- Native grasses – provides nesting and some overwintering habitat
- Native milkweed species and other host plants for targeted pollinators



- Consider assessment data and plants native to the area
- Strive for about 80% native.
 - Native plants are adapted to the environmental conditions of the area and therefore require less maintenance
 - Deeper roots than most non-native plants and therefore able to live through drought conditions
 - Host plants to pollinator species
- Include annual flowering plants and other flowering plants that germinate quickly to reduce competition with undesirable species.
- Nurse crop can be utilized instead of an annual flowering plant; however, it will seed and come back in future years. Want to be careful that it doesn't out compete the planted species. May need control.
- The seed mix should include a variety of flowering species that include:
 - Quick germination and germination that may occur in a few years
 - Variety of bloom times, at least ensure spring, summer, and fall
 - Native grasses – provides nesting and some overwintering habitat
 - Native milkweed species and other host plants for targeted pollinators

Seeding

- Broadcast Seeding limitations
- Hydro Seed limitations
- No tilling
- Native Seed Drill



If broadcast or hydro seeding, will need to increase recommended seeding rates, depending upon supplier. There is more opportunity to lose seed due to environmental elements and less chance for germination as soil contact is needed. Increasing the seeding rates helps to overcome these drawbacks, but still not the most successful option.

Tilling involves turning and loosening the soil. While this can improve soil contact when broadcast seeding, this action activates the existing seed bank in the soil, which will mostly consist of undesirable species. These undesirable species may begin to germinate prior to the planted seed and may grow more quickly, resulting in tough competition for the seeds planted.

Recommend native seed drill for seed installation. Can be rented or contracted out, if don't own equipment.

Germination, Growth, and Pollinator Use

- When does germination occur
- Measure success
- If germination and growth is not as expected, evaluate
- Document pollinator use



The key to success is to monitor and manage the pollinator habitat during the establishment period. Should be as frequent as every two weeks in year one and then taper down to 3-4 weeks in years two and three. Continue to monitor the sites once or twice during the growing season.

Monitoring can be as simple as observations. Information gained during establishment monitoring and management can shape your future pollinator program. Use lessons learned at sites to apply to other sites, but don't be surprised if you find something that works at one site, it's not as successful at another site.

Can document germination dates, bloom dates, height measurements, percent coverage

Continue to improve your program – what flowers do the pollinators seem to use most, what plants worked well, which were outcompeted, etc.

Use your resources – seed suppliers can be very knowledgeable.



Undesirable Species Maintenance

- #1 Key to success – aggressive species control
- Early action
- Frequent monitoring
- Do your research
- Less maintenance as the habitat becomes established



Biggest key to success is managing undesirable species.

Control invasive or unwanted plant species early – spot herbicide treatment for perennials, cut prior to seeding for annuals

Individual plants sporadic throughout can see how nature responds before taking action, but monitor frequently, don't check back in a month.

Consider what plant you are trying to control and do research on what control method works best. If herbicide – which herbicide works best. Consider how the management methods may affect overall goals – May affect current pollinator species in habitat, but better for the habitat long term.

As the habitat becomes more established, less management is needed.

Conservation Mowing

- Leaving about 12-18" of plant height
- Provides overwintering habitat in stems and thatch
- Re-seeds for the next growing season
- Controls woody vegetation



Conduct conservation mowing, leaving about 12-18 inches of plant height remaining in the fall.

- Provides overwintering habitat in the stems and thatch
- Re-seeds for the next growing season – better contact with soil
- Controls woody vegetation

Equipment cutting mechanism should span wider than the equipment itself, otherwise equipment will mat down vegetation rather than cutting.

Testing whether perpendicular passes is more effective in mulching than a single pass

Take care not to rut up plots, if possible

Resources



Xerces
Society



Pollinator
Partnership



Rights-of-Way as
Habitat Working
Group



- Case Studies/Success Stories
- Webinars
- Interactive Seed Map
- Seed Mix Calculators
- Vegetation Management Guidelines
- Best Management Practices
- Funding Opportunities



Does it really work?



Central Administration Building



Before



After



Before and After view at the CAB Plot 2, Butterfly/Hummingbird mix. The after picture is from the spring of year 2.

Hickory Run Service Plaza



Before



After



Before and After view at Hickory Run, Plot 3, Deer resistant mix #1

Insect Pollinators



The large amount and variety of insect pollinators observed at the PA Turnpike pilot plots is a great indicator that the plots are providing pollinator habitat.

Sites easily would have hundreds of bees busily working compared to what used to be a grass lawn, devoid of insect activity.

We observed both monarch caterpillars and adults feeding on milkweed plantings. We are currently tallying insect numbers and varieties from the 2023 growing season but know we have seen at least more than 20 different species.

Public Outreach

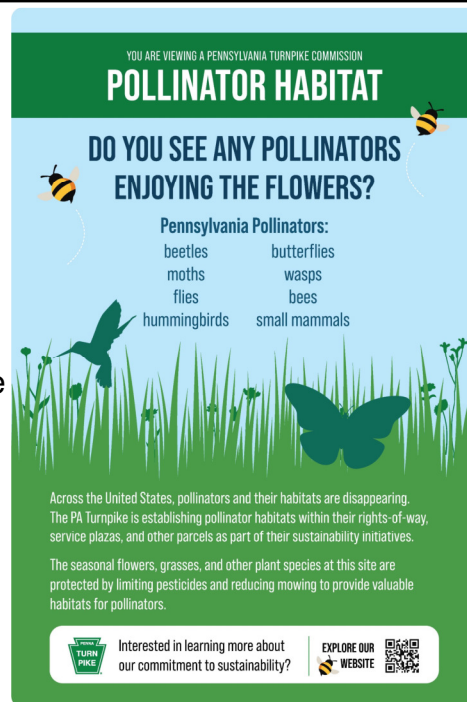
- Social media and press releases were used to prepare the public for seasons of dead vegetation which leads to beautiful color in spring and summer



The pollinator habitat goes through different stages and doesn't always look appealing. When the front lawn of the CAB along the mainline of the turnpike looked like someone had killed all our grass, obviously the public was going to start asking questions. Through a combination of social media posts and press releases, scattered throughout the last couple of years, we have been trying to prepare the public that the seasons of dead vegetation lead to the seasons of vibrant colors. We also focus on why the PA Turnpike is taking action and how anyone in the public can also create their own gardens or habitat and help the pollinators.

Public Outreach

- Signage is planned to be placed at service plazas
- Delineators were installed around the boundary of the pollinator plots



The PA Turnpike created signage for pollinator habitat areas where pedestrians may be near the sites. The signage is planned to be placed at service plazas and the PA Turnpike owned buildings where pollinator habitat has been created. During the pilot program, there have been observations of several people picking flowers from the plots and even taking their dogs for a walk.

Outreach has included informing our own staff and contractors. We created weatherproof stickers that are placed on delineators installed around the boundary of our plots. This provides a visual reminder to our staff and contractors not to mow during portions of the year where it may appear to need maintenance attention. The plot boundaries are included in our GIS system as we needed a way to reach multiple disciplines. At Hickory Run Service Plaza we had instances of a contractor mowing part of the plots, a utility conducting repairs and driving equipment through the road side of our plots, and even an RV traveling on the turnpike somehow turning around in an interchange in the plots.

Lessons Learned



The PA Turnpike Pilot Project will help us shape our pollinator guidance based on the results. Two primary takeaways (one here, one next slide):

Key to success is early observation and immediate action for aggressive or invasive species.

Most common aggressive species encountered:

American pokeweed

Crown vetch

Spotted knapweed

Canadian thistle

Porcelain berry

American pokeweed was aggressive in Plot 1 at the CAB. It required significant and frequent intervention once it was over 2ft tall in the first year. The timing and type of herbicide was very important and combined with hand and mechanical removal. The second year we had significantly less, but still an aggressive amount come back. Again needed management with both chemical and hand removal. We anticipate spot applying herbicide again at pokeweed germination in year 3 and will rely on the seed mix competition to finally eradicate most of it. We have applied this knowledge and timing to other plots that have also encountered aggressive pokeweed stands.

Lessons Learned



Year One



Year Two



- Patience. Don't expect it to be a finished product after year one. (Pictures are at the CAB of the PennDOT seed mixes in Plot 3)
- Year one vs. year two is a major difference
- Year one, not a big variety, several species missing, maintenance 3-4x per growing season. Dominated by annuals and fast growing flowering species and common weeds.
- Year two, new species flowering, less maintenance as the seeded species become more established – 2-3x per growing season.
- Year three is anticipated to be some maintenance in the spring to eradicate any remaining aggressive species, but after this point, the seed mix species will be well established and will then be able to outcompete anything else that starts to germinate. PA Turnpike will continue to monitor visually once or twice a year after year three.

Thank You!
Questions?

