

The Maryland Pollinator Protection Plan

MARYLAND DEPARTMENT OF AGRICULTURE

Acknowledgements

We would like to thank the University of Maryland (UMD), Keystone Policy Center (Keystone), the Bee Informed Partnership (BIP), and the United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service, Professional Development Center for their facilitation assistance and input throughout this process. We would also like to thank all of our stakeholders who dedicated their time and effort into providing insightful input. Special thanks go out to the Wisconsin Department of Agriculture, Trade and Consumer Protection and the University of Wisconsin for all of the useful material provided. The development of this publication was supported in part by the USDA Specialty Crop Block Grant Program (Grant #15-SCBGP-MD-0039). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the USDA.

Introduction

Pollinator health is declining across the country, putting the nation's food supply — about one-third of which depends upon pollinators — at risk. Maryland is no different. At the President's request, the Environmental Protection Agency (EPA) has engaged state agencies in developing Managed Pollinator Protection Plans (MP3s) to mitigate risk to honey bees and other managed pollinators.

MDA, UMD, and Keystone held a large stakeholder meeting where over 70 stakeholders convened, including state agencies, beekeepers, growers, pesticide applicators, landowners, and land managers, to discuss and identify opportunities to promote managed pollinator health in Maryland.

Consensus from the meeting was the understanding that this is a fluid document that can be ever-changing depending on the needs of our pollinators. There was also an expressed interest for the first stages of this document to be a set of educational materials. Educating stakeholder groups about the issues surrounding pollinators and helping them understand what they can do to help is a large step in the right direction.

The current document outlines suggested Best Management Practices (BMPs) for the various stakeholder groups, and should be viewed as a voluntary plan aiming to improve pollinator health and mitigate the risk of pesticides to managed pollinators. While the listed practices are suggestions and not regulations, Maryland hopes that people choose to follow them to make the state a healthier place for pollinators.






Pollinator health background

There are many types of pollinators found in Maryland. Honey bees, native bees, butterflies, moths, flies, birds, and beetles all provide efforts toward pollination. The European honey bee (*Apis mellifera*) is a pollinator species that has been widely discussed recently in news and social media. Honey bee population numbers were steadily decreasing for over 30 years nationwide but have started to increase slightly in the last few years (Figure 1).

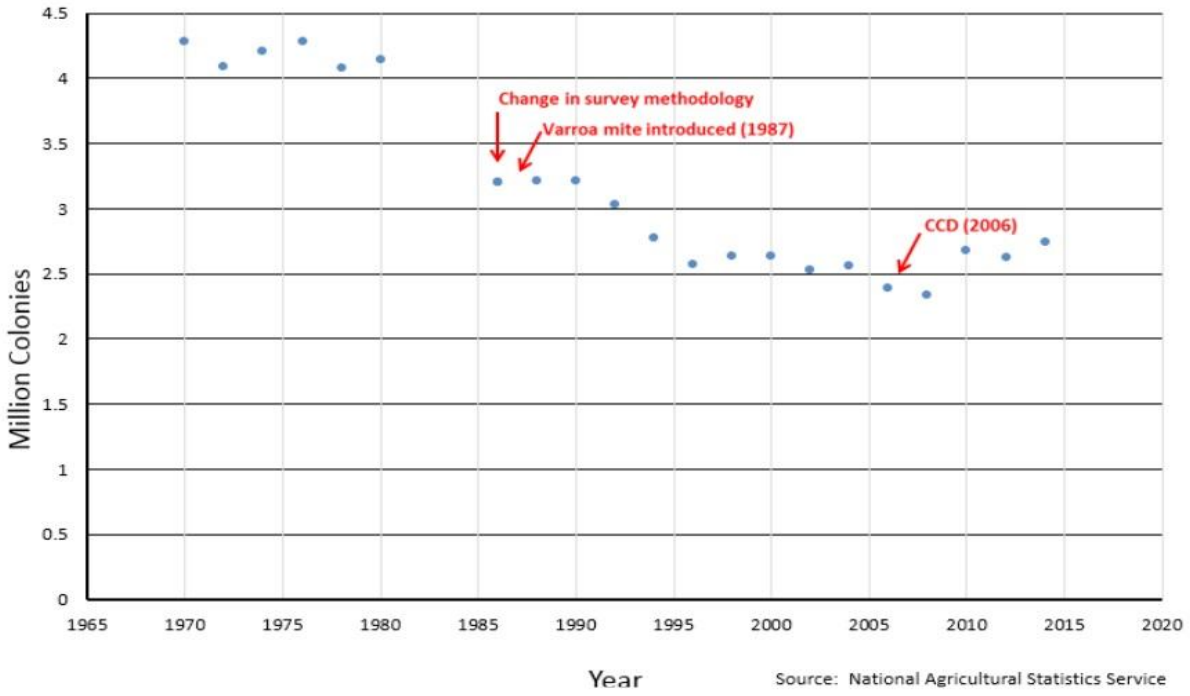


Figure 1

Honey bee population decline is a very complex issue with many different factors affecting honey bee health. Figure 2 shows some of the known factors.





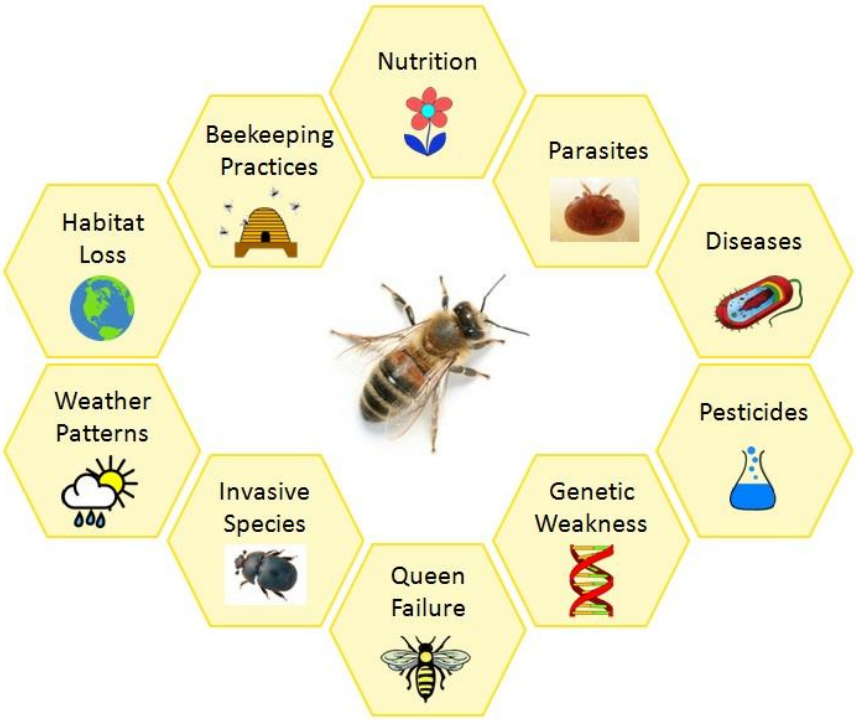



Figure 2

According to the Bee Informed Partnership, Maryland experienced a high percentage of winter loss in 2014-2015 relative to national level of winter loss (Figure 3).





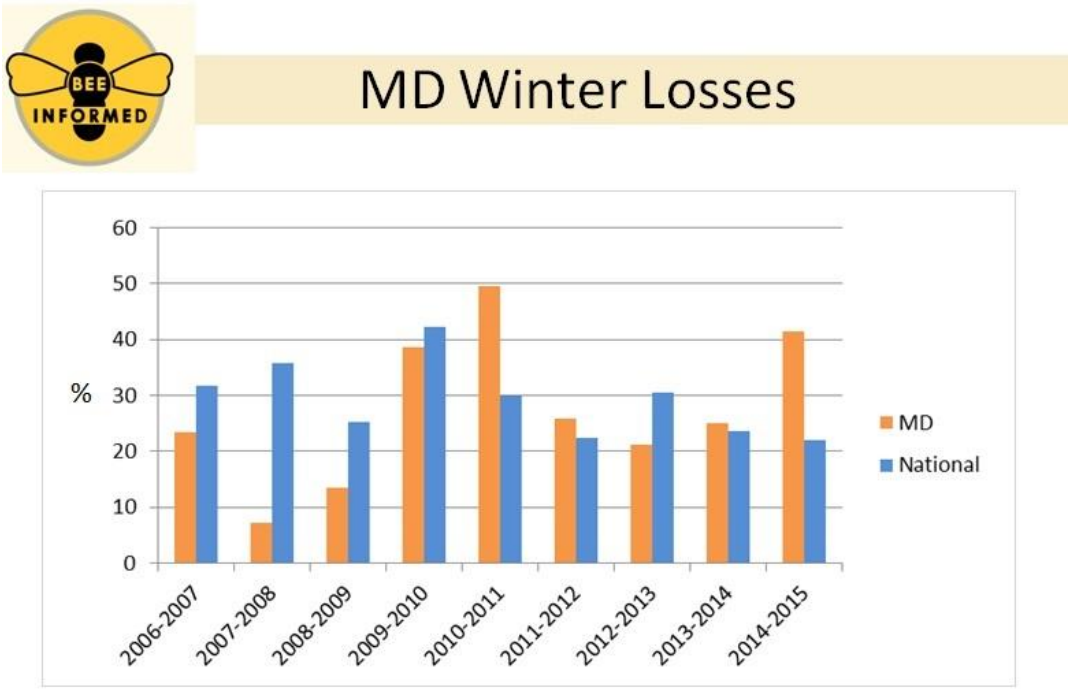



Figure 3

This level of loss is not economically sustainable for our beekeeping industry. Focusing on the issues affecting honey bee health and educating individuals on what they can do to help is necessary at this time. We are pleased to have this opportunity to share some of this information with you.

We recognize that not only managed pollinators should be considered when discussing pollinator health in Maryland. We have extended the scope of information in the MP3 to include ways to promote the health of many native pollinators.






Improving Pollinator Habitat in Gardens & Lawns

Flowering plants need pollinators and pollinators need flowers. By planting a diverse array of flowers and implementing other simple practices, your yard or garden can attract flower visitors including bees, butterflies, flower flies and hummingbirds.

Pollinator plantings

Regional pollinator plant lists and planting guidelines are available from The Xerces Society (http://www.xerces.org/), Pollinator Partnership (http://www.pollinator.org/), and Maryland Department of Natural Resources (DNR) (http://dnr2.maryland.gov/wildlife/Pages/default.aspx). To find a nursery or seed source, see lists provided by Plant Native (http://www.plantnative.org/) and The Xerces Society.

The following are guidelines for choosing plants that will benefit pollinators:

- Choose plants that suit your yard, considering soil type, drainage, slope, and amount of available sunlight.
- Aim for at least three species of flowering plant in bloom at all times from early spring to late fall. Flowering plants include wildflowers, garden herbs and fruits/ vegetables, and flowering shrubs and trees like redbud, American basswood, willows, and fruit trees.
- Provide flowering plants other than highly modified cultivars. Whether native or non-native, many flowering plants that have been highly modified through breeding have often lost pollen and nectar, or are too complex for bees to navigate. Some common garden plants like tulips, daffodils, petunias and ornamental roses are not typically visited by pollinators. Common garden herbs and wildflowers that do attract pollinators include mints, oregano, garlic, chives, parsley, lavender, zinnias, cosmos, and wild-type sunflowers.
- Choose a variety of flower colors. Bees are most attracted to blue, white, yellow and purple flowers -they do not see red. Butterflies are drawn to orange, red, yellow and purple, while flower flies mainly visit white and yellow flowers. Hummingbirds are particularly attracted to red flowers.

Nesting habitat for bees

Beekeepers provide honey bee colonies a home in hive boxes, but all the other species of bee found in Maryland nest in the wild. Bumble bees are social and nest in small colonies, but most other species of bee are solitary and do not form colonies. Small-bodied bees may only travel 200 yards or less from their nests, so it is important that nesting habitat be located near pollinator-attractive flowers. Some tips for providing nesting habitat:






- Leave some areas undisturbed. Most solitary bee species nest in the ground, in bare patches of semi-loose soil. Deep or frequent tilling can disturb nests.
- When possible, leave things a little messy. Bumble bees tend to nest in old rodent burrows, cavities, abandoned bird nests, and brush piles. Solitary bee species nest in hollow or pithy plant stems, downed logs, leaf litter, or old beetle holes.
- Avoid disturbing existing bee nests. Ground nests can resemble ant hills. Take time to observe and identify their inhabitants before assuming nests are homes for nuisance species. Solitary bees are docile and rarely sting unless handled.
- Use homemade "bee hotels" with caution. Homemade bee nests are often colonized by wasps, and can harbor predators and pathogens if not properly cleaned and maintained. Wooden bumble bee boxes tend to have very low success rates. For more information see "Providing Nest Sites for Pollinators" from The Xerces Society (http://www.xerces.org/providing-nest-sites-for-pollinators/).

Blooming "bee lawns"

- Lawns can be pollinator friendly if dandelions, clover and other flowering lawn plants are allowed to bloom. These can provide important early season pollen and nectar sources when other floral resources are sparse.
- Before applying an insecticide to treat lawn pests, first mow to remove any clover or dandelion blooms that might attract pollinators. By the time flowering lawn plants regrow, insecticides will be less present in nectar and pollen.

Pesticide use

Pesticides are one of many tools available to manage lawn and garden pests. When using pesticides follow the label directions exactly -- the label is the law. Before using any pesticide on lawns or gardens:

- Identify the pest and assess the damage. Many plants can tolerate insect damage and no action may be necessary. The UMD Extension offices and Home and Garden Information Center can help identify insect damage or disease (https://extension.umd.edu/hgic).
- If pest damage is extensive, explore and understand options for management. Choose methods that minimize harmful effects on pollinators and beneficial insects that prey on pests.
- Avoid applying insecticides to flowering plants or to areas where pollinators may be nesting.






Beekeeping to Maximize Pollinator Health

Beekeeping is a rewarding venture, but new beekeepers may easily become overwhelmed by all the considerations that go into keeping bees. Habitat loss, nutritional deficiencies, pesticide exposure, parasites, pathogens, and harsh weather are some of the main causes of concern for bee health. Parasites, improper nutrition and pesticide exposure are compounding issues that can make colonies more susceptible to disease. The following practices are recommended to improve overall pollinator health and minimize hive loss in managed bees.

Habitat and nutrition

- Bees need a diverse mix of natural pollen and nectar. The best way to ensure adequate nutrition is to place bee hives in areas where at least three species of flowering plant are in bloom at all times from early spring through late fall.
- When assessing floral resources, avoid garden cultivars and hybrids that have been bred for size, color or extra petals and provide little or no nectar and pollen for bees.
- Bees need water. Make sure uncontaminated water sources are readily available.
- Protein patties and sugar (dry or syrup) can be provided when floral resources are inadequate.
- Density matters. Too many hives placed in one location can lead to inadequate forage as well as increasing the likelihood of disease and parasite spread.

Winter preparation

Honey bee colonies are perennial; the queen and many workers live through the winter by feeding on honey stores and “shivering” to keep warm. This differentiates honey bees from bumble bee colonies that instead produce new queens in the fall which hibernate while the rest of the colony dies. Beekeepers managing honey bees can minimize the likelihood of overwintering colony loss by preparing hives each fall:

- Assess honey bee hive strength well before winter. Assess honey quantity, brood production, and worker mortality. Check for disease and mites. Queens with low fertility can be killed and replaced and smaller, healthy colonies combined, to increase probability of winter survival.
- Replace old, rotten or damaged equipment before winter. Gaps or holes in woodenware will allow access of mice and other nuisance pests. Snow, ice and water will also jeopardize the winter cluster.
- Take steps to avoid starvation. Colonies in areas with cold winters need about 100 lbs. of honey stored to last the winter. If less than this is present in late fall, supplemental carbohydrates (sugar, candy board or heavy syrup) can be added to the hive. Supplemental






feeding with honey from an external source has been linked to disease spread. High fructose corn syrup that is old, has been heated, or is no longer clear, may contain levels of hydroxymethylfurfural (HMF) that are unsafe for bees. Do not feed bees starches which can cause dysentery over winter.

- Keep the hive dry. Insulate the top of the hive to reduce condensation above the bee cluster. Screened bottom boards can still be used throughout the entire year in Maryland and these, combined with an upper entrance, provides adequate ventilation in winter when moisture from respiration can be an issue.
- Consider adding an entrance reducer or mouse guard at hive entrances in the fall to prevent rodent damage.

Disease and pest management

Many pathogens are spread among managed colonies and from managed colonies to wild bees. It is crucial to catch problems early, assess treatment effectiveness, and avoid unnecessary treatment. The following practices are recommended to track and prevent the spread of bee pathogens:

- Use a hive inspection sheet to keep track of regular hive health assessments. The Maryland Department of Agriculture Apiary Program offers free inspections of registered hives. Inspections include the identification of common pests and diseases as well as a visual check for exotic pests or diseases. Under Maryland Law (COMAR 15.07.01.02), everyone who keeps bees must register their hives within 30 days of first obtaining a honey bee colony and then annually thereafter (http://mda.maryland.gov/plants-pests/Documents/ApiaryRegistrationForm.pdf).
- Diagnose hive ailments and choose carefully among treatment options. A diagnostic field guide is available through Penn State University (http://extension.psu.edu/publications/uf013). Disease diagnostic services are also available free of charge through the USDA Beltsville Bee Lab. Read and follow all product label directions carefully when applying any disease or mite control products in beehives.
- Monitor for Varroa mites. Varroa mites should be assumed to be in every colony but the levels of these mites determine their damage to overall colony health. Varroa mites weaken honey bees by feeding on their hemolymph, and can transfer pathogens like deformed wing virus (DWV) and Israeli acute paralysis virus (IAPV) among colonies. Check for Varroa mites every 2-3 months, using sticky boards, ether or powdered sugar rolls. As a suggested guideline, treat for Varroa when mite counts exceed 3 mites per 100 bees sampled. See Figure 4 for MD registered products for Varroa mite control.
- For more detailed information on Varroa management, see “Tools for Varroa Management – A Guide to Effective Varroa Sampling & Control” by the Honey Bee Health Coalition (http://honeybeehealthcoalition.org/wp-content/uploads/2015/08/HBHC-Guide_Varroa-Interactive-PDF.pdf).






- Monitoring for foulbrood bacterial diseases. The mottled appearance of live brood intermixed with dead brood cells can indicate a number of ailments including European foulbrood and American foulbrood.
- Foulbrood spores can remain viable for 40 years or more, and burning the infected hive is the surest way to prevent its spread.
- Resistance to the antibiotic terramycin is a problem in some hives afflicted with American foulbrood. The USDA Beltsville Bee Lab provides bee and comb testing for antibiotic resistance.
- If foulbrood is suspected, contact the MDA Apiary Program at (410) 841-5920 or ppwm.mda@maryland.gov.
- Pesticides and other substances added to the hive can accumulate in royal jelly, wax and honey, and persistent use of certain miticides (fluvalinate and coumaphos) increases the likelihood of pesticide resistance, eventually rendering treatment ineffective. Formic acid and oxalic acid mite treatments should not lead to resistance.
- Rotate out a portion of old brood comb every year to reduce the buildup of pathogens and other substances.

Maryland Registered Products for Varroa Mites

Product Name	Active Ingredient	EPA Registration #
Api Life VAR	thymol (74.09%), oil of eucalyptus (16%), menthol (3.73%)	73291-1
Apistan	fluvalinate (10.25%)	2724-406
Apivar	amitraz (3.33%)	87243-1
Checkmite	coumaphos (10%)	11556-138-61671
HopGuard II	hop beta acids resin (16%)	83623-2
Mite-Away Quick Strips	formic acid (46.7%)	75710-2
Oxalic acid dihydrate		91266-1-73291

Figure 4



Maximizing Pollinator Health & Pollination Services on Farms

For growers raising pollinator dependent crops, the benefit to fostering pollinators is clear: good crop yields depend on healthy pollinator communities. But all growers and farmers can benefit from pollinator- friendly practices.

Contribution of insect pollinators to crop yields

The degree to which crops depend on insect mediated pollination varies. Some examples include the following:

- Soybeans show an 18% higher yield and heavier seeds when honey bees and wild bees are present.
- Apple flowers are self-sterile and depend heavily on cross-pollination by bees to bear marketable fruit.
- Watermelons require at least 8 visits from pollinators for proper fruit set.
- Green bean seed yields are 9% - 35 % higher with bumble bees present.
- Strawberries require at least 20 bee visits per receptacle, and receive complementary pollination benefits from honey bees and wild bees.
- Raspberries set more and heavier fruit when pollinated by bees.
- Cucumbers tend to be misshapen when not fully pollinated by bees.

Improving and creating habitat for pollinators

Farm fields located near natural areas like woodlands and meadows tend to have more bee species and higher crop fruit set than those surrounded only by farmland. Habitat diversity is one reason many apple growers in Maryland get their pollination services from wild bees, without having to rent honey bees.

For farms that are not near natural areas, attracting pollinators depends heavily on on-farm management practices. Bee abundance, on average, is higher in “diversified” fields with mixed crop types, or those that have hedgerows or flower strips at the margin, as opposed to monoculture fields. Costs and benefits will depend on the type of crop grown (pollinator dependent or not) and the goals of the grower. Pollinator benefits of on- and off- field management practices are summarized in Figure 5.






Location of Practice	Management Practice	Potential Benefits
Outside of crop fields	Leave existing nesting habitat (dead wood, bare patches of soil, hollow stems, bunch grasses)	Diversified pollinator communities can be maintained long-term if adequate nesting habitat is located near foraging habitat.
	Add wildflower strips or flowering hedgerows on slopes, field margins or roadside ditches	Increased pollinator diversity; higher yields of adjacent pollinator – dependent crops.
Within crop fields	Intercrop, cover crop or adopt agroforestry using pollinator attractive plants	Diversified pollinator communities can be maintained long-term if flowering plants are available spring through fall. Blooming cover crops like clovers and alfalfa can serve both grazers and pollinators.
	Grow multiple types of blooming crops	Increased pollinator health and diversity; higher yields of pollinator dependent crops; diversified income streams.
	Reducing tillage intensity	Though they more commonly nest in field margins, wild bees have been found nesting within tilled fields. Tilling can make soil more accessible to wild bees, but can also disturb established nests. Shallower tilling or leaving margins untilled may be beneficial for bees.
Within and outside of crop fields	Strive to minimize pesticide use	Minimizing the use of pesticides can reduce negative effects on beneficial species including pollinators. Do not drift off target; it is a violation of state law.
	Change mowing, haying and herbicide practices	Pollinators benefit when flowering plants are allowed to bloom in field margins or between crop rows (particularly when crop is not blooming). Letting alfalfa go to bloom before haying provides a rich resource for pollinators.
	Reduce the distance between beneficial crops and non-crop plants	Increased crop pollination; wildflower strips and flowering hedgerows are more effective when they border smaller fields, by minimizing distances between crop flowers, bee nests, and non-crop foraging habitat.

Figure 5



Cost-share and technical assistance

Installing pollinator habitat requires up-front costs and establishment takes several years before all benefits are realized. Funding and information may also be available through the programs listed below. Your local county land conservation department can help determine your eligibility for certain cost-share programs.

Landowner Programs:

- USDA Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program
- USDA NRCS Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program
- USDA NRCS Conservation Stewardship Program
- US Fish and Wildlife Service Partners Programs

Pesticide use and avoiding drift

Growers face the challenge of protecting crops from pests and disease, while protecting pollinators and beneficial insects that eat crop pests. Cautious pesticide use is advised to avoid pest resistance and protect the health of beneficial insects and other non- target organisms. The following are recommended guidelines for minimizing pesticide harm to pollinators.

- Always follow the pesticide label exactly, regarding application timing and dose. The label is the law!
- Use Integrated Pest Management (IPM) guidelines for your crop pest problems. Identify the pest and degree of infestation before treating with pesticides. Use established economic thresholds, when available, to determine when control measures are warranted. Incorporate preventative management options, such as resistant crop varieties and cultural control practices.
- Be aware of pesticide labels that contain language like “highly toxic to bees,” “toxic to bees” and “extended residual toxicity.” Use equal caution when applying pesticides approved for use in organic agriculture; these are not necessarily safe for bees.
- Avoid spraying pesticides on blooming plants that are being visited by pollinators. This includes crops, weeds in cropland, and wildflowers or weeds in field margins/ ditches. If sprays must be used, avoid spraying during the day when pollinators may be foraging.
- Seed treated with pesticides is an option where pest problems have been diagnosed but prophylactic use should be avoided. If use of treated seed is warranted,
    - Remove blooming crop weeds before planting treated seed.
    - Reduce dust release when planting treated seed. Dust contaminated with pesticide sticks easily to bee hairs and can be transferred to nests and fed to larvae. Use seed






treatments designed to reduce dust. If a dust formulation must be used, use deflectors that direct dust downward.

- Consider using buffer strips between pollinator habitat and land that gets sprayed regularly with pesticides. Some landowner programs require this, e.g., the NRCS CRP requires a buffer between CRP land and sprayed areas.

Getting involved and spreading the word

The more neighboring land managers use best practices for pollinators, the greater the potential positive impact on pollinator health. Growers are encouraged to share their practices with agribusinesses, grower groups, and land managers, and participate in scientific research to help answer questions surrounding pollinator health in agricultural settings.

Monitoring pollinator population trends to document which management practices do and do not work is important not only for pollinator health but crop production as well.






Improving Pollinator Habitat in Meadows, Roadsides & Open Spaces

Providing a high diversity of species that offer flowers throughout the growing season is the most important action that can be taken to promote healthy pollinator communities. Pollinator habitat can be provided in small patches of land, large continuous fields, or linear strips, as in the case of roadsides and other right-of-ways. Collectively, these efforts can improve pollinator health, diversity and abundance.

Increasing pollinator habitat is a goal that complements other management goals including erosion control, native plant propagation, and wildlife habitat. A section devoted to the special considerations for roadsides is included, but most of the BMPs outlined in Figure 6 apply to a wide array of habitat improvement projects on public and private land.

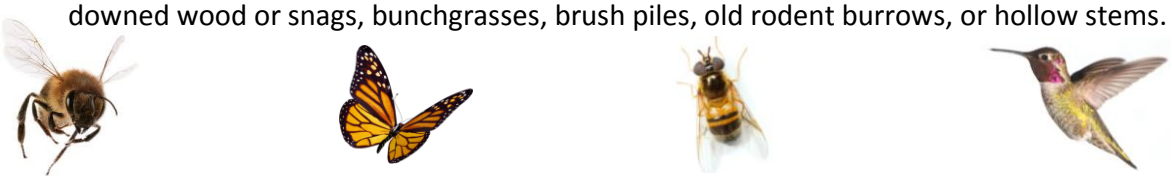
Establishment timeline: What to expect for meadow plantings
Year One:
Few flowers. Native perennial plants put energy into below-ground root building. Mowing in the first year is necessary to prevent weed establishment.
Year Two:
Few flowers. Some early species will bloom. Mowing or spot herbicide treatment may be used to control weeds.
Year Three and Beyond:
Many flowers. Ongoing maintenance may consist of spot herbicide treatment to control weeds, and mowing, grazing, bailing, or prescribed fire if desired.

Figure 6

Before starting a pollinator habitat project

It is important to start a habitat project with a plan that outlines short- and long-term goals, so that a management strategy can be designed to meet these goals. NRCS, UMD Extension, or county conservation office staff may be able to provide guidance during this process. Pertinent questions to answer during the planning stage include:

- How much of the area is currently covered by flowering plants? Are any of these flowering plant species key pollinator plants? Are any of them noxious or invasive weeds that need to be controlled?
- If there are already non-weedy herbaceous flowering plants (forbs), shrubs or trees at the site, is it possible to enhance rather than replace the habitat?
- Are there nearby areas that might be used as nesting habitat for bees? This may include downed wood or snags, bunchgrasses, brush piles, old rodent burrows, or hollow stems.



- What is the land use on adjacent sites? What weeds are present and what pesticides are used there that might affect the project site?
- Are there high slope areas where erosion may result from disturbing soils?

How to pick a seed mix

Healthy pollinator communities depend on a variety of flowering plants with adequate nectar and pollen resources.

- A minimum goal is to have at least three plant species flowering at all times from early spring through late fall, but the more diverse the wildflower mix the better. The total seed count should be composed of mostly forb seeds so that grasses do not crowd out forbs.
- Example regional seed mixes, vendor information, planting instructions, and a seed mix calculator are provided by The Xerces Society. Regional plant lists and planting guides are available from the Xerces Society and Pollinator Partnership.
- A good seed mix will contain plants that host butterfly larvae (e.g., milkweeds for monarch butterflies) and bunch grasses that provide nesting habitat for bees and birds.
- If shrubs or trees are desired at your site, these can be chosen to benefit pollinators as well: American basswood, willows, and many fruit trees have flowers attractive to pollinators.
- A number of native seed nurseries that provide regionally-appropriate seed and stock are available in Maryland and neighboring states. Seed vendors and nurseries can be found through Plant Native and The Xerces Society's milkweed seed finder.
- Annuals can be planted in the first year for rapid establishment of floral resources and weed blocking while perennial plants get established.

Costs and benefits

In general, the more wildflower species in a seed mix, the more expensive it is. Early spring blooming species tend to be especially costly because they are rarely harvested by combines. Despite the upfront costs and effort, benefits of native meadow plantings can pay off in the long run with lower inputs and maintenance requirements, reduced need for mowing and herbicide use, and less erosion and stormwater runoff.

Site preparation

Methods used to prepare the site will depend on site conditions. For sites that were historically native meadows, tree and brush removal may be enough to promote flowering plants that had been suppressed by shade. Many grassland sites, including older Conservation Reserve Program (CRP) lands and right-of-ways, require more work if they were planted with low diversity grass mixes or weedy brome grass where most forbs, except the most aggressive weedy species, have a difficult time establishing.






Vegetation can be removed through sod removal, herbicide application, or solarization. For the pros and cons of each method, see “Establishing Pollinator Meadows from Seed” from the Xerces Society (http://www.xerces.org/wp-content/uploads/2013/12/EstablishingPollinatorMeadows.pdf).

Maximizing native forb establishment

Sometimes meadow restoration projects fail pollinators because grasses establish more easily and out compete forbs. There are several steps you can take to aid forb establishment:

- Forbs should be well represented in seed mixes. Ideally, choose a mix that has a 3:1 ratio of wildflower to grass, by seed count.
- Seed in the fall (October - December). Many native forbs require a period of winter dormancy before germination. Grasses do not, and will get a head start on forbs if seeded in the spring.
- Be sure to include early season forbs. Some prepackaged seed mixes are biased towards late season wildflowers.
- Grasses and wildflowers can be planted in separate rows. Species will intermix naturally over time.
- Do not add fertilizer to native meadow plantings. Native meadow plants don’t need it, and adding fertilizer will only help weeds.

Ongoing maintenance and monitoring

- While seedlings are getting established weed control is necessary. If herbicides are used for weed control, always follow the product label exactly for application timing and dose.
- Ongoing activities like mowing, burning or grazing are necessary to prevent woody encroachment into meadows and keep habitat open.
- Preventing weed outbreaks and protecting sensitive species are proactive endeavors, and require on-the-ground knowledge. Scout the land and adjacent roadsides early in the season (May-June) for noxious weeds and, if possible, remove by hand before they spread.
- Whenever possible, leave fallen trees and leaf litter on site; these provide nesting habitat for bees and other wildlife, and overwintering sites for butterflies.

Special considerations for roadsides and other right-of-ways

Roadside maintenance requires a balancing act to control erosion, stop the spread of invasive weeds, protect driver safety, and provide attractive vistas for drivers. Once established, native meadow plants along roadsides can fulfill all of these goals. Establishing meadow plants along roadsides raises unique challenges, but ongoing projects and research give examples for how to address them (Figure 7).



Issue	Potential Solution
Plants near the road edge must tolerate road salting.	Choose salt tolerant native forb species within the salt zone of roads.
A fast green-up time is required for erosion control.	An annual cover crop (oats or winter wheat) can be seeded in the first year after planting.
Mowing is timed to cut off seed heads of invasive species, which often coincides with bloom time for wildflowers.	Between May and August, invasive species can be spot mown and/ or spot treated with herbicide, while other areas mowed in a staggered fashion after August 1.
Driver safety (wildlife- car collisions)	For visibility, the road shoulder (~8 ft. from road edge) can be mowed regularly, and other areas of the right-of-way mowed less frequently.
Pollinator safety (pollinator-car collisions)	Provide plantings that offer nesting and forage opportunities along each side of the road so that bees and butterflies have less reason to cross traffic.
Disconnect between planting implementation and long-term management.	Successful right-of-way pollinator plantings require collaboration among landowners, natural resource experts, engineers and maintenance staff/ volunteers.

Figure 7

State agency activity in Maryland

With the passage of Maryland House Bill 132 "State Government – Pollinator Habitat Plans," by the Maryland General Assembly in 2016, MDA, DNR, the Maryland Environmental Service, and the Maryland State Highway Administration are required to develop pollinator habitat plans. This is a wonderful opportunity to utilize public lands for pollinator habitat enhancement and for state agencies to lead by example. These plans will be made available to the public on each agency's website by September 2017 and they will be implemented by July 1, 2018.

Additional information

For more detailed information on pollinator forage planting, see "Native Herbaceous Plantings – Establishment, Maintenance and Management for Wildlife and Pollinators" by USDA NRCS Maryland (https://efotg.sc.egov.usda.gov/references/public/MW/MD_FS_Native_Herbaceous_Plantings_2_10_16_final.pdf).

