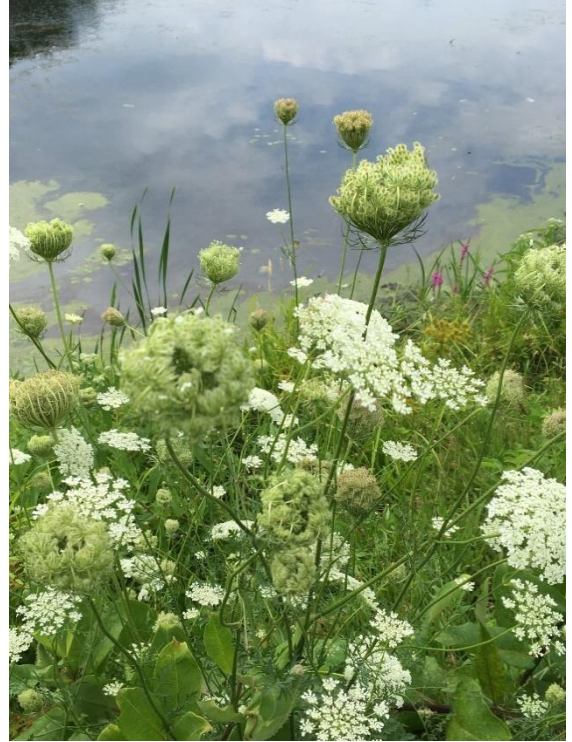


Plymouth Pollinator Protection Plan

Plymouth, MA



“Forget about that perfectly manicured lawn consisting of short green grass and nothing else. Boldly embrace biodiversity instead by turning that sterile lawn of yours into a mini-meadow or wildflower lawn of diverse proportions! The Earth will thank you, though your neighbors may raise an eyebrow or two. Let them.” (Magyar 2020)

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Purpose & Background

The Plymouth Pollinator Protection Plan (4P) serves to provide essential information regarding pollinator protection as well as methods to increase pollinator habitats throughout the Town of Plymouth. While these strategies are voluntary and not regulatory, this document serves to educate those interested in creating as well as preserving pollinator habitat areas. The Town will periodically review and amend this plan as needed by providing comprehensive protection strategies for pollinators and their respective ecosystems. Efforts will be made to identify grant funding or budgetary allocations for pollinator outreach, protection, and assistance.

The process of drafting the 4P began in early 2020, with major influence from the Massachusetts Pollinator Protection Plan, drafted in November 2014. The Massachusetts Farm Bureau established a Pollinator Stewardship Group with the purpose of constructing a draft plan for submission to the Massachusetts Department of Agricultural Resources (MDAR). In a separate effort within the same timeframe, eight county level honey beekeeping associations also drafted their own pollinator protection plan. Both documents were then submitted to MDAR in October 2015 for consideration in crafting a state-wide pollinator plan. That first draft was developed to provide a set of voluntary guidelines, outlining the roles of municipalities, honey beekeepers, pesticide applicators, land managers/farmers, nurseries/landscapers, and the general public, in protecting managed bee and other pollinator health.

Please note that while this Plan focuses on wild bees, managed bees and Monarch butterflies, all strategies listed in this document will provide direct benefit to all other pollinator populations. This Plan is a living document which will require periodic updates as new data becomes available in order to keep the information relevant and applicable. The collective actions and considerations of all stakeholders will ultimately determine not only the relevance of this Plan and its suggestions, but the future of pollinator populations in Plymouth.

Executive Summary

Pollinators provide critical services needed for agriculture, natural ecosystems and to ensure the sustainability and biodiversity of our environment. Worldwide, it is estimated that over three-fourths of flowering plants require a pollinator, typically an insect, for pollination¹. Pollinators, most often bees, are also responsible for one in every three bites of food taken by humans, so they are critical to the success and value of the nation's crops. Without this transfer of pollen from flower to flower, there would be little opportunity for plant reproduction and subsequently for fruit and seed production.

Pollinators are a crucial part of the environment and agricultural systems; they are important for 35 percent of global crop production. Animal pollinators include bees, butterflies, moths, wasps, flies, beetles, ants, bats, and hummingbirds. There are an estimated 20,000 species of bees globally, with approximately 4,000 species native to the United States². Though the presence and contributions from other insects is important, bees are still considered to be the most abundant and efficient of all pollinators. Bees have evolved to collect both pollen and nectar to feed developing larvae, as their hairy bodies collect and transport pollen from flower to flower. Massachusetts has a rich diversity of wild pollinators, including an estimated 377 species of bees and 120 species of butterflies and moths³.

Understanding that local government cannot act alone in promoting pollinator protection, the Plymouth Pollinator Protection Plan (4P) will recommend and provide guidance to develop the following strategies for enhancing quality pollinator habitats.

Strategies

1. Incorporate the 4P as a vital component of Plymouth's emerging Civic Agriculture Program, through Plymouth's Right to Farm Bylaw.
2. Promote pollinator protection to ensure public health while enhancing the environment through programs that do not subject pollinators to unreasonable adverse effects from exposure to pesticides and habitat loss.
3. Increase the Eastern Monarch Butterfly populations that have been devastated over the past several decades, primarily due to habitat destruction and fragmentation, as well as loss of keystone plant species.
4. Restore and enhance existing applicable open space lands within Plymouth for pollinators through local public-private initiatives and partnerships.
5. Identify and encourage planting of native wildflower species for bees and other wild pollinator species, which has the added benefit of reducing irrigation water demand.

1. Ollerton, J., Winfree, R., and Tarrant, S. 2011. How many flowering plants are pollinated by animals? *Oikos*, 120(3): 321-326.

2. Michener, CD. 2007. *The Bees of the World*. 2nd ed. 953 pp. Baltimore, Maryland. Johns Hopkins University Press.

3. Goldstein, P.Z., and J.S. Ascher. 2016. Taxonomic and behavioral composition of an island fauna: A survey of bees (Hymenoptera: Apoidea: Anthophila) on Martha's Vineyard, Massachusetts. *Proceedings of the Entomological Society of Washington* 118:37-92.

Pollinator Challenges

Development of land into vast expanses of impervious surfaces and lawns, and changes to farming methods have all contributed to a substantial decline in wildflower habitat. According to the 2017 Harvard University Study “Wildlands and Woodlands, Farmlands and Communities”, the New England landscape lost 65 acres per day from 1990 to 2010 to development or 24,000 acres/year. At this current rate, an additional 1 million acres will become developed within 50 years.

The ecological impact that development and loss of habitat pose for pollinators is compounded by the way homeowners, condominium associations and commercial businesses choose to landscape their properties. Yards and common areas are likely to consist of decorative plants and non-native grasses, creating a sterile environment which can prove fatal for pollinators. These management practices are made worse through the adopted use of herbicides, insecticides, and chemical fertilizers.

While wild bees face many of the same risks as managed bees, their biology and behavior are different. Some of the universal protections put into place for managed bees often fail to address wild bee concerns. For instance, unlike honeybee colonies with thousands of workers, nearly 90% of wild bees are solitary ground nesters, meaning they do not live in colonies with multiple workers⁴. As such, they do not have a population buffer, protecting future generations, if the egg-laying female dies before the reproductive cycle is complete. Compared to managed bees, wild bees also have potentially different routes of habitat disturbance and pesticide exposure. For example, ground nesting wild bees are subject to disturbance from tillage since it can damage nesting sites and destroy their brood chambers. Wild bees that gather mud or plant materials to construct brood cells may force immature bees to be exposed to higher quantities or levels of pesticides, given the proximity of their developing chamber to the chemicals. These bees may also come into contact more frequently with pesticide residues from soil drenches, chemigation, and chemicalized seed coatings. In the United States, Bumble Bees have experienced significant declines with eight prevalent species reduced by 96%, based on historic distributions⁵.

Monarch butterflies (*Danaus plexippus*), one of the most well-known and identifiable butterfly species, are among other wild, non-bee pollinators that frequent Plymouth. Unfortunately, Monarch Butterfly populations have been in decline over the past few decades with an estimated 90% population reduction nationwide⁶. Key population declines have been attributed to habitat loss, climate change, and pesticide use⁷. Unfortunately, Monarch Butterflies are not the only pollinator species in peril, given that Massachusetts Natural Heritage & Endangered Species Program (NHESP) currently lists nineteen (19) species of butterflies and moths and nine (9) species of beetles as endangered, threatened, or of special interest.

4. Ollerton, J., Winfree, R., and Tarrant, S. 2011. How many flowering plants are pollinated by animals? *Oikos*, 120(3): 321-326.

5. Michener, CD. 2007. *The Bees of the World*. 2nd ed. 953 pp. Baltimore, Maryland. Johns Hopkins University Press.

6. United States Department of Agriculture (USDA). 2015. Conservation and Management of Monarch Butterflies: A Strategic Framework. US Forest Service FSO44. <https://www.fs.fed.us/wildflowers/pollinators/MonarchButterfly/documents/ConservationManagementMonarchButterflies.pdf>

7. Arenas, P.O., and Ian Kaplan, 2019, Quantifying Pesticide Exposure Risk for Monarch Caterpillars on Milkweeds Bordering Agricultural Land, <https://doi.org/10.3389/fevo.2019.00223>.

Management Practices to Support Pollinators

1. Homeowners and Gardeners:

Homeowners and gardeners can play an important role in supporting pollinators by maintaining, enhancing, and/or increasing pollinator habitat on their property. The key to thinking about pollinator habitat is choosing plants that provide food, water, and shelter to meet the needs of all pollinators. These plants can include both native and non-native/ornamentals, although it has been shown that gardens with native plants tend to support more diverse pollinator groups while also being drought tolerant and requiring less management than those with non-native plantings. Some steps to consider include, but are not limited to:

- a. Select pollinator-friendly plants that are indigenous to the area by identifying existing soil conditions, drainage, grading and the amount and location of sunlight present throughout the day. Specific soil data can be found through the Soil Survey Geographic (SSURGO) Database on MassGIS (Bureau of Geographic Information) website: <https://docs.digital.mass.gov/dataset/massgis-data-nrcs-ssurgo-certified-soils>
- b. Planting native, drought-tolerant flowering species, which will reduce water use from irrigation.
- c. Implement drip/soaker hose irrigation, in lieu of broadcast water distribution, to limit water waste.
- d. Research the plants that currently grow on the property. There are many sources that can help in identifying individual wildflower species that are already growing in back yards before making changes.
- e. Local nurseries or landscaping companies often provide guidance on creating the best pollinator habitat for a specific plot of land. Please be aware that many cultivars have been genetically modified and do not provide pollen and nectar, such as tulips, daffodils, petunias, and ornamental roses.
- f. Reduce or eliminate the use of herbicides and insecticides to ensure a healthy and vibrant micro-ecosystem.

2. Seeding Methods:

a. *Conventional Seeding:*

Conventional seeding includes preparing a seedbed by tilling and packing the soil. Seed is broadcasted on the soil surface seed-to-soil contact is assured by a packing process. Broadcast seed by using air seeders, fertilizer spreaders, or other types of rotary or drop seeder implements. When a small number of seed is being applied over a large area, a carrier should be mixed with the seed. Carriers

such as pelletized lime, fertilizer, cracked corn, saw dust, vermiculite, etc., may be used. The seedbed should contain enough fine soil particles to provide uniform shallow coverage of the seed as well as contact with moisture and nutrients. It is important to have a firm seedbed. As a minimum, Culti-pack or roll before and after seeding. Be aware when walking on a properly prepared seedbed; the depth of your footprints should not exceed ¼ inch. Using heavy, no-till type drills to seed on conventionally prepared seedbeds is not recommended as they tend to sink into the soil making seeding depth difficult to control. Do not plant seed deeper than ¼ inch.

b. No-Till Seeding:

No-till can be used to establish new seedlings on land previously in row crops or existing turf. Turf must be dispatched or removed prior to seeding. As with conventional seeding, seed placement should be no deeper than ¼ inch. Appropriate tools equipped for no-till planting should be used to obtain proper seeding depth.

3. Beekeepers:

Beekeepers have a larger responsibility for the overall health and welfare of managed bee colonies. This includes ensuring good bee health, proper hive survival rates, continuing education of beekeepers, and communication with land managers, farmers, pesticide applicators, and the public to mitigate pesticide risk and enhance access to pollinator habitat. The Massachusetts Beekeeper Association publication “Best Management Practices for Beekeepers” is used as an important guideline for good husbandry practices in beekeeping. If additional support is needed, beekeepers may consider attending a bee-keeping school and/or work with a mentor to learn best beekeeping practices. There are opportunities for classroom instruction, field training, and mentoring provided by knowledgeable beekeepers through several beekeeping associations. The Plymouth County Beekeepers Association is a great regional resource that offers a bee school and host monthly meetings, allowing for knowledge distribution to new beekeepers from experienced members.

Note: Beekeepers must comply with Massachusetts Apiary Laws and Regulations related to honey beekeeping: Chapter 128, Massachusetts General Law, Sections 32-36B and 330 CMR 8.00-8.07: Apiary Inspection Regulations. Beekeepers should also check with the municipality in which the apiary is located in case there are local ordinances that also apply.

To maximize pollinator health, beekeepers are encouraged to consider the following practices:

- a. To ensure colony survival, establish the apiary in a location close to adequate nectar sources and fresh water, proper environmental conditions (i.e., sun exposure, windbreak and using the proper density of colonies based on surrounding area. Establish and maintain a positive relationship with neighbors, land managers and farmers through direct

communication when placing and/or moving the apiary so that bees are provided with the most beneficial habitat but do not pose a public safety issue.

- b. If supplying bees for pollination, setup a pollination contract in advance. That contract should outline at a minimum: the pollination fee, number of colonies per acre, payment schedule, bloom timeline/pollination schedule, and removal date. This ensures that both the farmer and beekeeper interests are protected. For additional information, review the USDA Insect Pollination of Cultivated Crops and sample contracts: University of Florida Sample Pollination Contract, Michigan State University Sample Pollination Contract
- c. Learn to recognize and understand the biology, life cycle and management of honeybees, along with their common pests, parasites, and pathogens. Several guides are available from USDA Diagnosis of Honeybee Diseases and the Massachusetts Pollinator Protection Plan, through the Massachusetts Department of Agricultural Resources (MDAR), which offer information vital to successful beekeeping.
- d. Regularly inspect colonies to determine the incidence and level of common pests, parasites, and pathogens. When present, incorporate Integrated Pest Management (IPM) practices for control, and evaluate pest pre/post population levels regarding treatment so that informed decisions can be made. "IPM is defined as a decision-making framework that utilizes least hazardous pest management options only when there is a demonstrated need and takes special precautions to reduce the hazards of pest management activities to people, other living organisms, and the environment. It employs a four-phase strategy:
 - 1. Reduce conditions that favor pest populations by strengthening natural ecosystem biodiversity,
 - 2. Establish an economic threshold of hive damage before pest control must occur,
 - 3. Monitor pest populations,
 - 4. Control pests with the most specific pest control option when the pre-established damage threshold is reached.

Note: Obtaining a commercial pesticide applicator license may be required if you are applying treatments to colonies not owned by you and in another beekeepers' apiary. Considering contacting the MDAR Apiary Program Working Group, Division of Crop & Pest Services for additional assistance.

- e. Keep updated on new developments in honeybee management to practice effective beekeeping techniques. For example, replacing a portion of old brood comb every year is a great way to not only practice good colony hygiene but also prevent pathogen buildup in colonies. There are several national organizations that periodically provide updated information:

- *American Association of Professional Apiculturists*
- *American Bee Journal*
- *American Beekeeping Federation*
- *American Honey Producers Association*
- *Bee Culture Magazine*
- *Beesource Beekeeping*
- *Honeybee Health Coalition*

- f. Support colony health by providing, supplemental feeds of sugar (dry or syrup) and pollen (fresh or protein patty) as well as enough water when needed.
- g. Support colony health by adequately preparing colonies for winter by ensuring an adequate workforce, healthy queen, food stores, low pest/pathogen levels, ventilation, insulation, windbreak, and mouse guard/entrance reducer to prevent pest invasion. One key method is to leave enough honey in the hive for the bees to overwinter.
- h. Work with the local beekeeping community to encourage queen rearing of northern adapted bees thereby increasing genetic resiliency.
- i. Communicate with local farms and nurseries to alert them to the locations of any nearby apiaries and/or colonies; keep informed about any potential pesticide applications that could impact bee colonies.
- j. Contact the local Mosquito Control Project and request hive locations to be placed on their “No Spray” list.
- k. Report any Bee Kills to MDAR immediately if local pesticide application or an infectious disease is suspected.
- l. Participate in state and national surveys related to hive health, so that the status of Massachusetts honeybees can be documented and tracked over time.

4. Pest Management

Pesticides are known to negatively impact pollinators based on the type, rate, timing, and proximity of the materials used within the colony. Communication,

cooperation, and education among stakeholders are the best tools to use to avoid non-target impacts of pesticides on pollinators. Stakeholders are encouraged to cooperate and educate one another about their individual needs so that the best decisions can be made for mitigating negative impacts on pollinators. Pesticide applicators should follow Best Management Practices (BMP's) for using pesticides in a way that minimizes the risk to pollinators. These include:

- a. The use of any pesticide is greatly discouraged; however, treat only targeted areas if necessary.
- b. Consider utilizing organic methods of pest mitigation whenever possible. Further information is available online:
 - i. <https://www.mass.gov/doc/pesticide-reduction-resource-guide-for-citizens-municipalities/download>.
 - ii. UMass Extension, Biological Control/Organic Information: <https://ag.umass.edu/greenhouse-floriculture/publications-resources/biological-control-organic-information>.
- c. Choose pesticide products wisely. Look for products that are listed as non-toxic, that have a low toxicity, short residual toxicity, and/or repellent properties to bees. There are several guidelines available to determine bee toxicity of pesticides:
 - EPA: [Guidance for Assessing Pesticide Risks to Bees, Policy Mitigating Acute Risk to Bees from Pesticide Products](#)
 - Michigan State University (MSU): [Minimizing Pesticide Risk to Bees in Fruit Crops](#)
 - Oregon State University (OSU): [How to Reduce Bee Poisoning from Pesticides](#)
 - The University of California Statewide Agricultural and Natural Resources Integrated Pest Management Program (UC IPM): [Bee Precaution Pesticide Ratings](#)
- d. Communicate with other beekeepers in the area about pesticide applications.
- e. Follow Integrated Pest Management (IPM) practices, which includes obtaining a Massachusetts Pesticide Certification or License, by contacting the MDAR Pesticide Bureau at <http://www.mass.gov/agr/pesticides> or call (617) 626-1785 for additional information.
- f. Reduce non-target exposure to pesticides by considering bloom periods of crops and nearby weeds and wildflowers. Avoid application during these times.

- g. Do not spray onto flowers/plants/trees when they are in bloom. This is when pollinators would be actively visiting them.
- h. When possible, apply pesticides early in the morning or later in the evening during times when pollinators are less active and/or not foraging in or near the treatment area.
- i. Stay current on product label changes and product reviews from EPA.
- j. Read and be familiar with BMP's created by national pest control agencies: National Pest Management Association (NPMA): *Pollinator Protection Best Management Practices*.
- k. When possible, use larger droplet sizes and drift reduction products.
- l. Learn more about pollinators including, but not limited to specific information on their life histories, biology, and distribution and occurrence in the landscape.
- m. Attend training sessions that offer information about the following topics:
 - i. Pollinators and Pesticides
 - ii. Integrated Pest Management Practices
 - iii. Drift Management

Planting Native Species

Establishing a planting plan with dense and diverse native flowering species will provide property owners the ability to expand the local pollinator ecology while enhancing the beauty of a succession of flowers and plant forms and experience a renewed connection with nature. Done properly, wildflower meadows are landscape components that will require minimal maintenance.

A place where bees and other pollinators can come and go safely with little disturbance or exposure to pesticides, household chemicals and other harmful impacts is ideal. Many native bees need patches of bare soil nearby in which to make their nests; others will nest in small holes in dead wood or stems, in cavities in stone walls or in leaf litter or debris piles. These features may be found along roadways, the edges of fields or woodlands, as well as around many residential properties and they should be preserved.

Not all wildflowers are suitable for all conditions. A site with full sun and good drainage is ideal for many species, but partial shade and/or wet areas can be tolerated, or even welcomed by many others. Understanding site characteristics (wet, medium, or dry soil and full sun, filtered sun, or shade, etc.) is essential when

purchasing wildflower species for the specific site, while creating a diverse meadow that blends into a mosaic of desired colors and textures. An ideal meadow mix will provide a continuous sequence of bloom from a dozen or more native perennial flowering species.

There are many wildflower-mix options available from reputable seed companies or the individual landowner can personally design a specific seed aggregation. Pre-made mixes may be convenient but must be selected carefully for successful species growth in New England. A few native warm-season grasses should be included to create habitat and shelter for many organisms, while providing dense cover that suppresses non-native plant growth. Be aware that less expensive mixes frequently contain a higher proportion of grasses than desired for good pollinator habitat.

Even small areas of wildflowers, especially when coupled with grass, tree, and shrub plantings, can shelter chipmunks, and migrating birds and can be used as a travel corridor by many wildlife species. Be aware that many landowners are saving money and labor by converting their high-maintenance lawns to wildflower plantings.

Recommended Plantings

The following list of Native Wildflower Species is by no means inclusive of all native fauna species found in Southeastern Massachusetts, including Coastal, Pine Barrens and Upland ecosystems:

1. **Clasping Milkweed** (*Asclepias amplexicaulis*) – These perennial plants are stout, glabrous (without hairs) and usually grow erect to 33 to 40 inches tall with upper leaves sessile, clasping the stem. The sap is milky. Leaves (4-6 inches long and 2-3 inches wide) are opposite; blades are thick and firm, lance to oblong, broadly notched at the base, broadly rounded or blunt at the tip with margins usually conspicuously wavy. Several pedicelled flowers typically emerge from the end of May through August and occur in a showy umbel; greenish, tinged with purple or rose. The leaves and stems are also often tinged with purple. Milkweed species are the food source for Monarch butterfly caterpillars.

- a. Light Requirement: Full sun
- b. Soil Moisture: Dry, well drained
- c. Soil pH: Slightly acidic to acidic (<6.0)



- d. Soil Description: Prefers sandy soils in open woods, roadsides, and old fields.
- e. Comments: Special value to Monarch Butterflies, Native, Honey and Bumble Bees.

2. **Coastal Jointweed** (*Polygonella articulata*) – This annual is part of the Buckwheat Family with alternate leaves, erect to ascending, hairless and very narrow (up to $\frac{3}{4}$ inch long) and about as wide as the stem. Stems are erect, slender, and wiry, hairless, often reddish brown in the lower plant, and usually much branched with erect to ascending branches. Mature growth to 20 inches in height with flowers about $\frac{1}{8}$ inch across, with 5 spreading tepals (petals and similar sepals) that are similar in size, white to pink, sometimes with a green or purplish midrib. In the center are 7 or 8 stamens surrounding a cone-shaped ovary with a 3-parted style at the tip. Flower stalks are slender, longer than the flower, jointed near the midpoint, ascending to spreading at flowering time.



- a. Light Requirement: Full sun, tolerates partial shade.
- b. Soil Moisture: Prefers dry conditions.
- c. Soil pH: Prefers acidic soils.
- d. Soil Description: Sandy, rocky or gravel soils, clay, pine barrens, riverbanks, roadsides
- e. Comments: Flowers August through October.

3. **Common Evening Primrose** (*Oenothera biennis* L) – a North American native biennial wildflower found all over North America; prefers full sun but can often be found growing along the edge of woods in partial shade. Typical flowering occurs from June to September. It grows by roadsides, railway banks and waste places in dry open soils, gravelly places, meadows, and old fields but tends to look lanky and weedy in poor soil. a tall wildflower, often 48 to 72 inches or more in height. The stem is erect, stout, soft-hairy, reddish, branching and forms a shrub-like appearance. Evening Primrose leaves are alternate, rough-hairy, lanceolate, about 3 to 6 inches long and lemon-scented. The taproot is elongated, fibrous, yellow on the outside and whitish within. The flower spikes grow on auxiliary branches all along the stalk. They are about 2-1/2 inches in diameter, bright yellow and have four petals, a cross-shaped stigma and a reflexed calyx. Hummingbirds visit the flowers to obtain nectar and insects to eat. The seed capsules provide food for many other birds during the winter months.

- a. Light Requirement: Full sun through shaded areas
- b. Soil Moisture: Prefers dry conditions.
- c. Soil pH: Adaptable
- d. Soil Description: Rocky or sandy soils, disturbed areas, lake shores, open woods
- e. Comments: Flowers July through September, attracts Hummingbirds.



4. **Downy Goldenrod** (*Solidago puberula*) – A perennial herb and part of the Aster Family, these plants are found along dry sites throughout eastern North America and have a very leafy stem covered with fine, spreading hairs. Flower clusters are long and slender, often reaching 12 to 36 inches in height. Typical blooming occurs between August through October.

- a. Light Requirement: Full sun to part shade
- b. Soil Moisture: Medium moisture, well-draining
- c. Soil pH: Acidic to Neutral (5.5 – 7.5)
- d. Soil Description: sandy roadsides, open woods and are primarily found along the coast.



- e. Comments: Special value to both Honey and Native Bees and butterflies.
- f. Other Golden Rod species common to the area:
 - i. *S. caesia* – Wreath Goldenrod
 - ii. *S. canadensis* – Canada Goldenrod
 - iii. *S. rugosa* – Rough-Stemmed Goldenrod
 - iv. *S. sempervirens* – Seaside Goldenrod

5. **Forked Bluecurls, Blue Curls** (*Trichostema dichotomum*) – A small Annual herb in the Mint Family reaching from 6-24 inches in height and typically bloom between August and late October. Flowers contain 2 or 3 blue, 2-lipped petals at the tips of short branches arising from the leaf axils. Leaves are broadly lance-shaped These herbs prefer dry, open, and sandy, well drained sites.



- a. Light Requirement: Full sun to part shade
- b. Soil Moisture: Dry, well drained
- c. Soil pH: Adaptable
- d. Soil
 - Description: Meadows, fields, man-made disturbed areas, sandplains, and barrens
- e. Comments: Special value to native bee and butterfly species.

6. **Goat's Rue** (*Tephrosia virginiana*) – The flowers of this 1 to 3-foot perennial resemble bi-colored sweet peas; lower petals are pink with upper petals having a pale-yellow color. Pinnately compound leaves have 8-15 pairs of leaflets. Stems and leaves are covered with soft, white hairs giving the 12-24 inches perennial a silvery appearance. Mature plants form attractive mounds. Bicolored, pea-like flowers, with pink wings and a yellow standard, crowded into clusters atop a hairy stem. Flowering occurs typically at the end of May through July.



- a. Light Requirement: Sun, part shade, shade
- b. Soil Moisture: Dry
- c. Soil pH: Slightly acidic (<6.0)
- d. Soil Description: Medium to sandy soils
- e. Comments: Mildly toxic to humans and other animals, used in butterfly gardens.

7. **Gray Goldenrod, Prairie Goldenrod** (*Solidago nemoralis*) – A slender-stemmed perennial plant grows 12 to 30 inches tall with thin, coarsely-toothed leaves. Flowers occur on the upper side of hairy stalks which arch out and downward creating a vase-shaped flower cluster. Clumps of slender, gray-downy stems produce terminal, one-sided, yellow plumes that gives the perennial a vase-shaped appearance. Individual plants bloom at various times, thus extending the flowering season but typically flower from June through October.



- a. Light Requirement: Full sun, tolerates partial shade.
- b. Soil Moisture: Prefers dry conditions.
- c. Soil pH: Acidic (<6.0)
- d. Soil Description: Sandy, rocky or gravel soils, clay
- e. Comments: Special value to butterflies.

8. **Longbranch Frostweed** (*Helianthemum canadense*) – This perennial prefers dry open sites and only flowers in sunlight. The common name refers to the ice crystals that form from sap exuding from cracks near the base of the stem in late fall. The flower lasts only one day and produces many seeds. Typically, one showy, yellow-petaled flower emerges on top of the main stem; later in season clusters of inconspicuous, bud-like flowers without petals in leaf axils. Flowers mainly from May through July.

- a. Light Requirement: Full sun to partial shade
- b. Soil Moisture: Dry and well drained soils
- c. Soil pH: Acidic (pH 5.1 – 6.5)
- d. Soil Description: Open woods, clearings, and barrens in dry, sandy soils
- e. Comments: Excellent to use in xeriscaping, natural landscaping.



9. **Narrowleaf Whitetop Aster** (*Sericocarpus linifolius*) – Another perennial aster that blooms in mid-summer to early fall, developing thin, white pedals. These plants thrive in dry to moist sandy, clay, and gravelly soils of open deciduous and pine woods, along with oak and pine barrens, roadsides, as well as in fields. Typical growth to 12 – 36 inches.

- a. Light Requirement: Full sun (>6 hr./day)
- b. Soil Moisture: Dry, well drained sandy soils
- c. Soil pH: Acidic to slightly acidic
- d. Soil Description: Dry fields, open woods
- e. Comments: Flowers July through October.



10. **New England Blazing Star** (*Liatris scariosa* var. *novae-angliae*) – Native to the northeastern United States, New England blazing star is a showy wildflower with star-like clusters of brilliant purple florets arranged on an upright stalk. Found only in Massachusetts, Connecticut, Maine, New Hampshire, New York, Pennsylvania, and Rhode Island this globally rare plant is protected under the Massachusetts Endangered Species Act. A perennial herb growing up to 36 inches in height. This plant can be found along road edges, sandplain grasslands and other open coastal areas.

- a. Light Requirement: Prefers full sun, tolerates partial shade.
- b. Soil Moisture: Prefers dry conditions.
- c. Soil pH: Adaptable
- d. Soil Description: Sandy soils, sandplain grasslands, coastal beaches, meadows, and fields
- e. Comments: Flowers August through early October. Rare, listed plant.



11. **New York Aster** (*Symphyotricum novi-belgii*) – A branching perennial herb, growing to 36-72 inches, with slender, mostly smooth stems bearing narrow leaves and numerous flower heads with blue-violet to rose (sometimes white) rays surrounding a yellow or reddish central disk. This large aster is abundant in low areas along the coast. There are many color forms, including those with white or rose rays. Typical blooming schedule occurs from July through early October.

- a. Light Requirement: Full sun to partial shade
- b. Soil Moisture: Moist, well-drained soils
- c. Soil pH: Adaptable
- d. Soil Description: Sandy or clay soils, shorelines, damp thickets, and meadows.
- e. Comments: Special value to Monarchs and other butterflies.



12. **Orangegrass, Pineweed** (*Hypericum gentianoides*) – This small annual herb, typically growing to 10 inches high, is part of the St.-Johnswort Family and produces small yellow, nearly sessile flowers on wiry, ascending branches. With its tiny flowers and scaly leaves on erect, wiry branches, It prefers open, bare, sandy, or rocky sites where its flowers open only in the sun. Its capsules are usually red. Blooming range occurs between July and October.

- a. Light Requirement: Full sun to part shade
- b. Soil Moisture: Dry, well drained, shallow soils
- c. Soil pH: Acidic to Neutral (4.8 – 7.0)
- d. Soil Description: Open fields, roadsides, woodland borders, rocky areas
- e. Comments: Flowers open only in full sun.



13. **Showy Aster** (*Eurybia spectabilis*) – This perennial herb has open clusters of showy flower heads with bright lavender rays surrounding a yellow central disk. The stem is stiff and rough, often branched toward the top. The flower's head can reach 1.5-inch wide with oblong, with spreading green tips. This very showy, large-flowered, short-stemmed aster is easily cultivated and makes a fine display in late summer, where typical blooming occurs between August and early October. Its distribution is mainly coastal, especially in pine barrens.

- a. Light Requirement: Full sun
- b. Soil Moisture: Medium to dry conditions
- c. Soil pH: Acidic to slightly acidic (5.1 – 6.5)
- d. Soil Description: Primarily sandy soils, woodland borders, along roadsides, pine barrens
- e. Comments: Flowers typically from August through October and is drought tolerant, suitable for xeriscaping.



14. **Sickle-leaved Golden Aster** (*Pityopsis falcata*) – A Perennial herb reaching 8 to 15 inches in height, producing orange and yellow flowers. Typical bloom range occurs between early July through early October and grow on deposits left along the front of the Wisconsin Glaciation, from S.E. Massachusetts to New York State. It can be locally abundant in open sandy soils in Massachusetts.

- a. Light Requirement: Full sun
- b. Soil Moisture: Dry, well drained sandy soils
- c. Soil pH: Acidic to slightly acidic
- d. Soil Description: Dry, sandy soil near the coast, pine barrens
- e. Comments: While widespread in Massachusetts, distribution is limited in other New England states.



15. **Stiff-leaved Aster, Flaxleaf Aster** (*Ionactis linariifolius*) – This perennial grows a stiff, leafy stalk 12 to 24 inches, terminated by several flower heads with blue ray and yellow center disk flowers that turn bronzy over time. Numerous short stems forming a mound of flowers in colors ranging from deepest lavender to pinks and whites.

- a. Light Requirement: Full sun to partial shade
- b. Soil Moisture: Medium to dry conditions
- c. Soil pH: Acidic to slightly acidic (5.1 – 6.5)
- d. Soil Description: Grassland, meadows, open woods, disturbed areas & shores of freshwater wetlands.
- e. Comments: Flowers typically from August through October.



16. **Sweet Goldenrod** (*Solidago odora*) – A smooth, tall, fragrant plant bearing crowded, cylindrical clusters of yellow flower heads along one side of slightly arching branches, Anise-scented goldenrod is a 24 to 60-inch perennial with a neat form and rich, anise scent. The yellow inflorescence is usually one-sided, with the base wider than the tip. These plants prefer dry, open woods and clearings and typically bloom between July and early October.

- a. Light Requirement: Full sun, tolerates partial shade.
- b. Soil Moisture: Well-draining, medium moisture
- c. Soil pH: Acidic to neutral (5.5 – 7.5)
- d. Soil Description: Average to poor, sandy soils
- e. Comments: Noted for attracting wildlife.



17. **Toothed Whitetop Aster** (*Sericocarpus asteroides*) – A perennial that blooms in mid-summer to early fall, developing either yellow or white petals and typically grows 6 to 24 inches. These plants prefer dry sandy, clay, and shaley open soils found in fields, open mixed and pine woods, road margins and the eastern deciduous forest. Toothed white-topped-aster is native to the eastern and southeastern United States. It is found in all New England states although is very rare in Maine.

- a. Light Requirement: Full sun to partial shade
- b. Soil Moisture: Dry, well drained
- c. Soil pH: Acidic to slightly acidic (5.0 -6.5)
- d. Soil Description: Dry, open woods, pine barrens
- e. Comments: Flowers June through October.
- f. Other Aster species common to the area:
 - i. *S. dumosus* – Long-Stalked Aster
 - ii. *S. pilosum* – White Oldfield Aster



- iii. *S. racemosum* – Smooth White Aster
- iv. *S. lateriflorus* – Calico Aster
- v. *S. novae-angliea* – New England Aster

18. Yellow Wild Indigo (*Baptisia tinctoria*) – Also known as Horsefly Weed, this smooth, bushy perennial blooms numerous few-flowered, elongated terminal clusters of yellow pea-like flowers. Widely distributed, Wild Indigo often increases in burnt fields, growing to 24 – 36 inches. Some 15 other species are found in eastern North America, including numerous yellow species farther south and some white or creamy ones. Flowering typically occurs from May through Mid-September.

- a. Light Requirement: Full sun to partial shade
- b. Soil Moisture: Dry to well-drained medium
- c. Soil pH: Slightly acidic to acidic (<6.0)
- d. Soil Description: Loamy, Sandy
- e. Comments: Flowers May to June.



19. Birdfoot or Bird's Foot Violet (*Viola pedata*) – This perennial is low clumped, 4-10 in. high, with large, almost pansy-sized flowers. The leaves, almost round in outline, are 3/4-2 inches long, deeply cut into 3-5 segments, and these again narrowly lobed. The leaf stem is 4-6 inches long. Flowers are pale to dark purple, broad, flat, 1-1 1/2 inches across. They have 5 petals, the 2 upper ones smaller than the lower 3 and deep violet. The lowest petal has the dark streakings which are common to most violets. There are 5 stamens with brilliant orange anthers. Flowers toward the end of May; another flowering possible end of Sept.)

- a. Light Requirement: Part shade, shade
- b. Soil Moisture: Dry
- c. Soil pH: Acidic (pH<6.8)
- d. Soil Description: Dry, rocky, or sandy soils



- e. Comments: This plant is particularly susceptible to crown rot without adequate drainage.

20. **Hollow-Stemmed Joe-Pye Weed** (*Eupatoriadelphus fistulosus*) – Also known as Trumpet Weed, a native perennial wildflower that grows from 2-6 feet with a hollow central stem. Floral colors may be pink or purple, consisting of 5-7 florets per head. This wildflower proliferates in moist/wet conditions and attracts a multitude of pollinators. Flowers appear mid-to late summer.



- a. Light Requirement: Full sun to partial shade
- b. Soil Moisture: Moist – wet
- c. Soil pH: Neutral (6.0 – 8.0) soil conditions
- d. Soil Description: Prefer moist to wet soils but will tolerate sandy conditions with sufficient moisture.
- e. Comments: An ecologically important wetland indicator species.
- f. Other Joe-Pye Weed species common to the area:
 - i. *E. dubium* – Atlantic Joe-Pye Weed
 - ii. *E. perfoliatum* – Boneset/Thoroughwort
 - iii. *E. purpureum* – Sweet Joe-Pye Weed

21. The following native flora species may be considered when designing pollinator-friendly habitat that are not typical flowering plants:

a. White Oak (*Quercus alba*) – Sandy plains, well-drained loamy soils



b. Northern Red Oak (*Quercus rubra*) – Well-drained soils



- c. Black Cherry (*Prunus serotina*) – Prefers moist, fertile soil; tolerates sandy conditions



- d. Gray Birch (*Betula populifolia*) – Moist, well-drained or sandy/gravelly soils



- e. Red Maple (*Acer rubrum*) – Loamy, moist sandy or clay, well drained soils



- f. Highbush Blueberry (*Vaccinium corymbosum*) – Wetlands/moist conditions



- g. Lowbush Blueberry (*Vaccinium angustifolium*) – Dry sandy soils

