USDA United States Department of Agriculture
Natural Resources Conservation Service

Monarch Butterfly *(Danaus Plexippus Plexippus)*

Landowner Guide

IDENTIFICATION

The monarch (Danaus plexippus plexippus) is a brush-footed butterfly with large orange and black wings and a black body with numerous white spots. Caterpillars have wide bands of orange and white separated by narrow black stripes. Historically, monarchs were common and numerous in most states east of the Rocky Mountains, but the loss of larval hostplants and nectar sources over the past 30 years has reduced monarch populations by more than 90%.

The US Fish & Wildlife Service (USFWS) is considering listing the monarch as a threatened or endangered species; the agency's listing determination is expected in December 2020. The species is considered vulnerable in Pennsylvania, where it breeds during the summer months.

LIFE HISTORY

Monarch butterflies have a unique and remarkable migratory pattern which defines their multi-generational life cycle: adults overwinter in a single location in the mountains of central Mexico, then fly north in the spring, reaching the southern US before they lay eggs and die. Those eggs hatch and mature into adults which fly further north; these adults arrive in Pennsylvania starting in mid-April. Successive generations mate and lay eggs, until a final "super generation" of monarchs appears in late summer/ early fall. This "super generation" completes the monarch life cycle by migrating south to the overwintering location in Mexico.

Photo courtesy of Jim Hudgins (USFWS)

Females lay hundreds of individual eggs on the undersides of milkweed leaves. Eggs hatch in 3 to 8 days, then the monarch larvae feed on milkweed leaves for another 10 to 14 days until they pupate into adults. Eggs and larvae have mortality rates higher than 90% and while adult mortality rates are unknown, they are presumably high.

HABITAT

Monarchs can use a variety of habitats, if they contain readily available milkweed plants and nectar sources. They have been documented in wetlands, grasslands, old fields, savannahs, suburban yards and gardens, orchards, roadsides, utility rights-of ways, and open forests.

LARVAL HOSTPLANTS

Milkweeds (Asclepias spp.) are the only larval hostplant used by monarchs, though the species of milkweeds varies geographically. In Pennsylvania, common milkweed (A. syrica) is the most-used host plant, followed by swamp milkweed (A. incarnata) and butterflyweed (A. tuberosa).

Declining milkweed availability and density is largely responsible for dropping monarch numbers.

ADULT NECTAR PLANTS

Adult monarchs feed on nectar from many different flowering plants. Since adult monarchs are present in Pennsylvania from late April through early October, having a variety of plants blooming throughout that entire period is critical. Early-blooming trees and shrubs are important nectar sources for adults arriving in April and May, while late-blooming goldenrods and asters provide much-needed energy for adults migrating south in the fall.

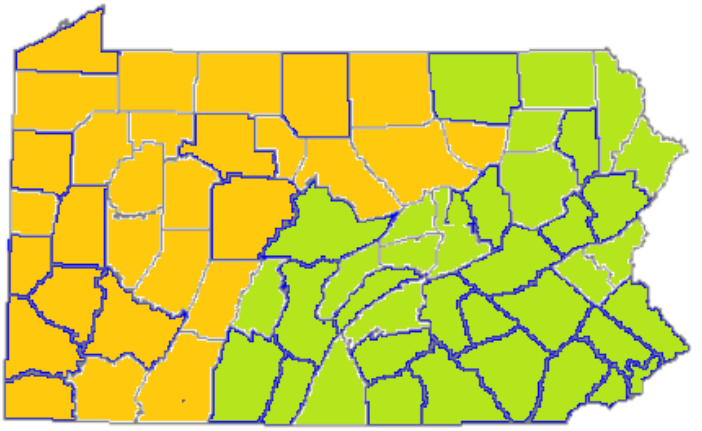

Figure 1. Priority areas of North Core (primary; orange) and North Exterior (secondary; green) zones of the eastern population of Monarch Butterfly in Pennsylvania.

HABITAT RESTORATION RECOMMENDATIONS

While monarchs occur across the entire state of Pennsylvania, the western half of the state hosts more migrating adults in both spring and fall, so habitat/milkweed restoration is a priority. Agricultural fields and adjacent areas (hedgerows, field borders, wetlands, etc.) should be managed for a high variety of blooming plants throughout the entire growing season, as well as high-density patches of common milkweed (approximately 500 stems/acres). Methods to achieve monarch habitat include:

1) Converting ag land adjacent to spring-blooming trees and shrubs
   - Herbicide: one application in late summer or early fall to control weeds in cropland, or two applications (late summer and mid- to late fall) to control weeds in hayfields or pastures
   - Seed: native meadow wildflower mix for nectar areas
     - In fall, seed with cover crop of winter rye; in spring, no cover crop needed
   - Seed or Plant: at least two species of milkweed, as seed (fall or spring) or plugs (spring only) to achieve 500 stems/ac for larval hostplants

2) Enhancing native meadows or native warm season grass plantings with forbs
   - Mow: planting areas to 6 inches (remove cuttings, if possible), in spring
   - Plant: forb plugs in open areas between grass clumps, for nectar areas, shortly after mowing
   - Plant: at least two species of milkweed plugs, to achieve 500 stems/ac for larval hostplants, shortly after mowing

3) Enhancing suitable nectar or larval habitats with spring-blooming trees and shrubs
   - Clear: adjacent areas using herbicide application (via stump/stem treatment) or cut and remove non-flowering or non-native trees and shrubs
   - Plant: bareroot trees and shrubs from the approved list, at a density of approximately 150 plants/acre
   - Seed: shade-tolerant, spring-blooming forbs from the approved list among/under trees and shrubs

LONG-TERM MAINTENANCE

1) Existing Monarch Habitat
   - Winter mow (September 1 – March 31) the nectar areas on a 3- to 5-year rotation, to create a mosaic of patches at different stages of re-growth.
   - In addition to winter mowing above, mow a third of the milkweed borders or patches each year before egg-laying peaks (around July 15), to maximize monarch reproduction; OR, if milkweeds are scattered among nectar plants, then mow a quarter of the entire habitat in the middle of the day, when adults are most active and most mobile. In both cases, set mower as high as possible (preferably above 10 inches) to encourage rapid regrowth of forbs.
   - Where existing monarch habitat occurs without fire, do not introduce fire. If site is currently burned, burn a third of the existing habitat after monarch adults have migrated in the fall, on a 3- to 10-year rotation, to create a mosaic of patches at different stages of regrowth.
   - Apply herbicides only as spot-treatments or stump-treatments, to prevent loss of nectar and larval plants. Limit or prevent drift from nearby crop fields as much as possible.
   - If milkweed/monarch habitat occurs in pastures, grazing should be monitored to prevent overgrazing of milkweed plants, which may lead to a buildup of milkweed toxins in livestock.

2) Restored/Created Monarch Habitat
   - Use late-winter mowing as described above, to maintain nectar areas on a 3- to 5-year rotation.
   - In addition to winter mowing above, mow a third of the milkweed borders or patches each year, before egg-laying peaks around July 15, to maximize monarch reproduction; OR, if milkweeds are scattered among nectar plants, mow a quarter of the entire habitat in the middle of the day, when adults are most active and most mobile. In both cases, set mower as high as possible (preferably above 10 inches) to encourage rapid regrowth of forbs.
     - Apply herbicides only as spot-treatments or stump-treatments, to prevent loss of nectar and larval plants. Limit or prevent drift from nearby crop fields as much as possible.

PENNSYLVANIA
Natural Resources Conservation Service
www.pa.nrcs.usda.gov

 May 2020