

Four Steps to Starting  
a Milkweed Stand

- 1

PLAN

Designate non-play areas of the golf course that receive at least six hours of sun daily. Choosing sites with irrigation is helpful for establishment in the first year. Choose species of milkweed that are native to your area ([monarchmilkweedhabitat.com](http://monarchmilkweedhabitat.com)).
- 2

PREPARE

Obtain milkweed, potting soil, nectar plants or seeds (optional), and any equipment needed for planting. An auger can be helpful for large-scale plantings. Control grasses and other weeds with herbicide or tillage before planting.
- 3

PLANT

Dig an 8x8" hole, mixing the potting soil with the native soil. Plant milkweed in clusters of 4-5 plants with 3-5 feet between plants.
- 4

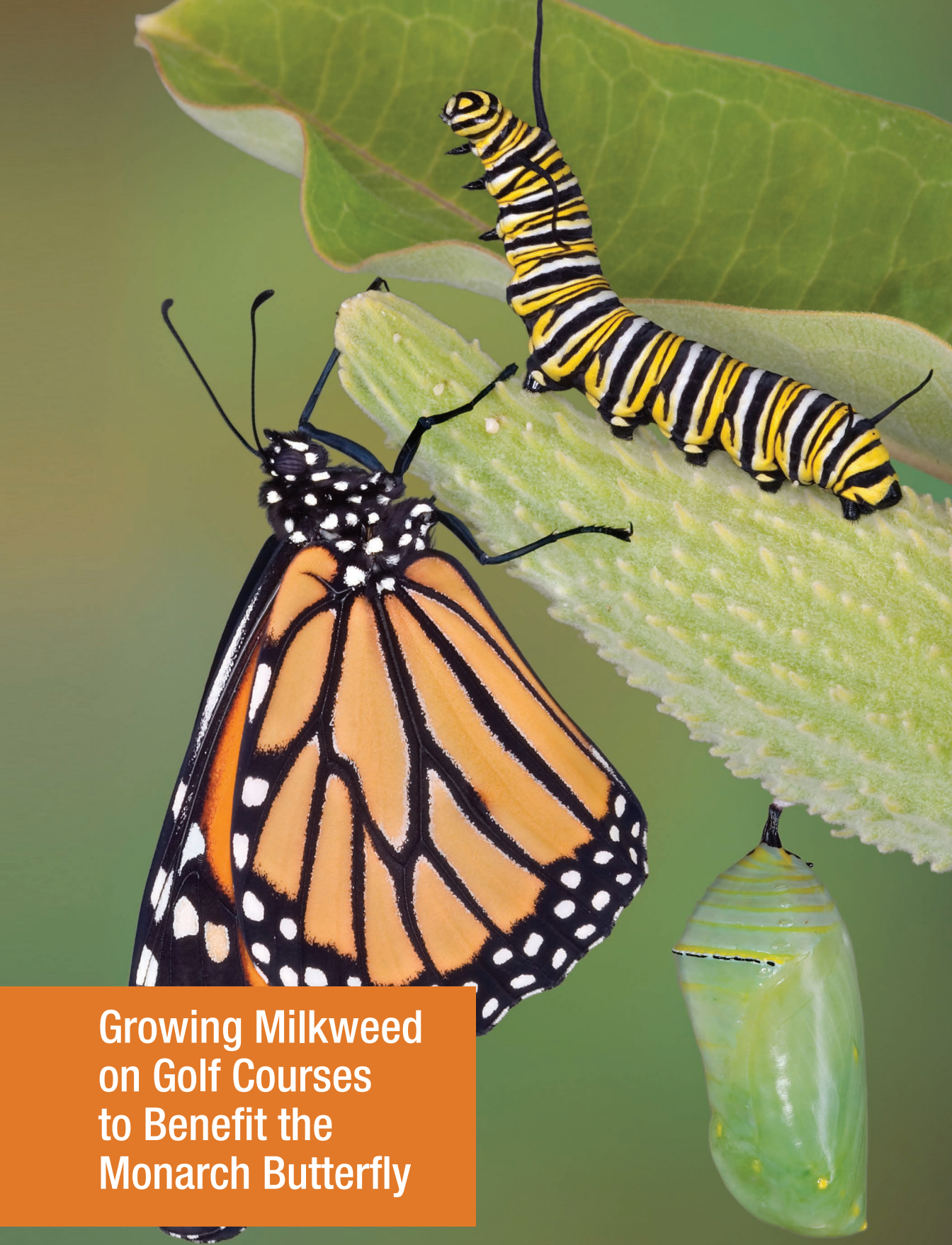
MAINTAIN

Make sure seedlings have adequate water for establishment, irrigating if necessary in the first year. Herbicides can be used around plants to control grasses after the plants are established. Mowing after the fall migration has passed can help control woody species. Growing nectar plants that bloom throughout the migration attract monarchs and provide a food source for adults.

Living Acres, a research driven effort from BASF, focuses on promoting practical monarch habitat establishment and conservation in non-production areas.  
[agro.basf.us/sustainability](http://agro.basf.us/sustainability)



Growing Milkweed  
on Golf Courses  
to Benefit the  
Monarch Butterfly



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Written by Harold D. Coble, Ph.D., Professor Emeritus of the faculty of North Carolina State University and made possible by a grant from BASF. 2016



## Executive Summary

Monarch butterfly populations have been declining in the United States since the late 1990s. One of the many factors contributing to this decline is the shrinking number of milkweed plants. Milkweed is a critical component in the monarchs' reproduction cycle. The majority of monarchs fly north from central Mexico in spring and summer, landing in central and eastern parts of the United States. During this migration, adult female monarchs lay eggs only on milkweed plants. When the eggs hatch, the resulting larvae feed on milkweed leaves.

Thousands of golf courses lie along the monarchs' migration path. By allowing milkweed species to grow on land in non-play areas on golf courses, superintendents can play a key role in helping maintain and restore the monarch population. This booklet explains the vital natural connection between monarchs and milkweed, and provides guidance on how superintendents can establish habitat to help preserve this unique and beloved butterfly species.

**Milkweed is a critical component in the monarchs' reproduction cycle.**



## The Life of the Monarch

The monarch butterfly is an iconic species that overwinters as an adult, typically congregating in large numbers to roost in trees. The majority of monarchs overwinter in central Mexico, and start to move north in February through the central and eastern parts of the United States, and as far north as southern Canada during the spring and summer (Cockrell et al. 1993). A smaller population of monarchs overwinters in southern California, and migrates northward into Oregon and Washington state.

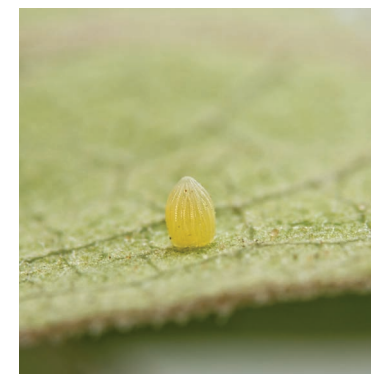
During the northward migration, monarchs require milkweed species for reproduction. Adult mated females lay eggs on the underside of milkweed leaves or on a milkweed flower. Eggs hatch between three and eight days later and the resulting larvae feed on milkweed leaves.

Larvae go through five stages of development (instars) during a nine to 14-day period until they are ready to pupate. Pupation is the period of metamorphosis from larvae to adult. The change occurs in a sack produced by the larvae called a chrysalis that attaches to milkweed plants or some other stable structure.

When the pupation period is complete in two to five weeks, adults emerge from the chrysalis and the northward migration continues. Meanwhile, the cycle of mating, the production of eggs and the transformation from larvae to pupae to adult continues. Adult monarchs normally live for three to five weeks during this reproductive phase.

The vast majority of monarch butterfly reproduction occurs in the northern-central and eastern regions of the United States. Two-to-three generations of butterflies will procreate during the summer. By mid-to-late August, the northern migration ends and adult monarchs begin their southern migration, returning to their winter roosting site usually by late autumn. When the southern migration begins, adults enter reproductive diapause and do not depend on milkweed to propagate.

**Two-to-three generations of butterflies will procreate during the summer.**



# The Great Monarch Migration

A **3,000** mile journey

**A** Monarch butterflies can be found overwintering in the oyamel fir forests of southern Mexico. This site offers the ideal weather conditions that butterflies need.

**B** Beginning in March the monarchs known as the Migration Generation start to make their way north from Mexico to begin their spring breeding. When the monarchs get to Texas in mid-March, they begin to lay their eggs, which hatch into what is known as the First Generation.

A majority of monarch butterflies travel along the **I-35 Corridor**

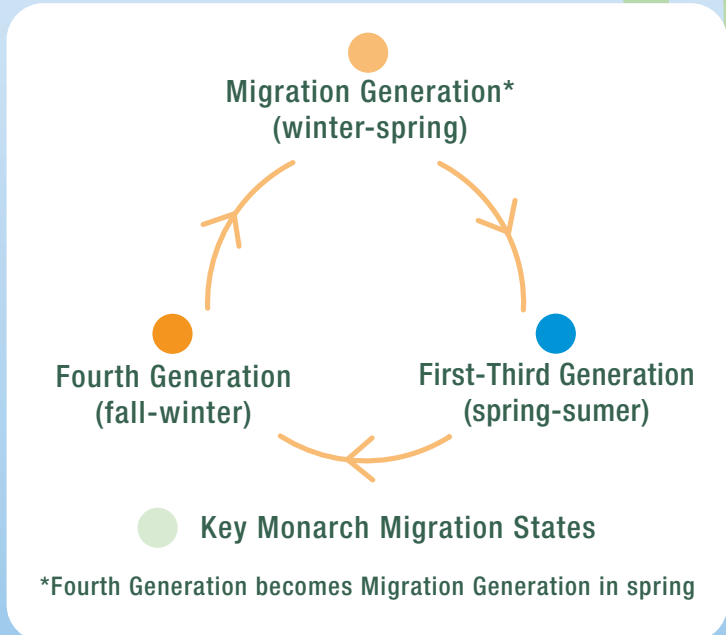
Monarchs only lay their eggs on **Milkweed**, which is the sole food for their larvae

**Nectar plants** serve as food for mature butterflies

**C** The First Generation spends its spring transitioning from caterpillars to monarchs and traveling north and east, reproducing along the way. Three more monarch generations will follow the first and each will lay their own round of eggs.

**D** The Fourth Generation monarchs, the great-great grandchildren of the Migration Generation, are the ones that migrate south to Mexico in the fall. These monarchs travel up to 100 miles every day.

**A** The Fourth Generation monarchs overwinter in the oyamel fir forests. The following spring, the Fourth Generation monarchs become the Migration Generation, beginning the incredible journey northward, continuing the cycle of many more monarch generations.



The Fourth Generation monarchs overwinter in the very same **Oyamel Fir** branches as their ancestors

LIVING  
ACRES

To learn more about the #MonarchChallenge, a BASF Living Acres biodiversity initiative, visit [Facebook.com/BASFLivingAcres](https://www.facebook.com/BASFLivingAcres)





**Dr. Harold Coble**  
Lonnie Poole Golf Course, Raleigh, NC

Dr. Harold Coble, a Professor Emeritus of Crop and Soil Sciences at North Carolina State University, serves as an advisor to the school's Lonnie Poole Golf Course (LPGC). Below, he shares his thoughts and experiences on helping LPGC become the first golf course to partner with BASF on the Living Acres Monarch Challenge. Through the program, he and a group of volunteers planted approximately 750 milkweed plants and seeded nectar-producing wildflowers on the course's out-of-play areas to create a habitat for monarch butterflies.

**“In our first year we’ve had incredible success. Nearly 95% of our milkweed plants survived which is fantastic. In many ways, this has been an ideal public/private partnership.”**

The agronomist is hopeful but realistic about the monarch's fate. “This is definitely a critical moment for the monarchs. Of the several challenges monarchs face, declining milkweed populations is a major one. But unlike so many other environmental challenges, the milkweed population decline has a straight-forward solution. It's as simple as establishing a butterfly habitat that includes milkweed and nectar plants. Golf courses and their superintendents have a unique opportunity here to be heroes by creating the habitat so vital to the species' survival.”



**Brian Green**  
Director of Golf Course  
Maintenance

Lonnie Poole Golf  
Course, Raleigh, NC

**“Just like any other modern golf course superintendent, I’ve been challenged to step up our sustainability efforts. The monarch habitat fits right into our sustainability goals.”**

“The Monarch Challenge has been a big hit with the staff and club members, as well as the outside community. People who’ve never played golf have stopped by to see the habitat. The conservation effort has also become personally important to the club's members. They feel good about it and invested in it. I'd encourage all golf courses to explore the opportunity.”

## Throughout golf courses, land in non-play areas can support milkweed communities without interfering with the sport or operations.

Monarch butterfly populations have been declining in the United States since the late 1990s (Monarch Joint Venture 2015). Reasons for this decline are complex and likely include climate change, loss of overwintering sites due to illegal logging, reduction in nectar sources for adults, and a decline in milkweed plants resulting from improved weed control in agricultural fields. (Hartzler 2010, Pleasants & Oberhauser 2012).

When BASF recognized the serious implications of a monarch population decline, we knew we wanted to help. In 2015, we launched The Monarch Challenge as part of a broader Living Acres sustainability platform. The Monarch Challenge educates and supports farmers, superintendents, and other land owners in planting milkweed and creating or protecting monarch habitat in non-crop, non-play, or marginal areas of their land.

Throughout golf courses, land in non-play areas can support milkweed communities without interfering with the sport or operations. Those areas include secondary rough, naturalized areas, and other out-of-play areas on the golf course.

To increase milkweed abundance, it is encouraged for superintendents and maintenance crews to be at the forefront of planning, supporting and executing this effort.







## The Nature of Milkweed

Milkweeds are warm-season perennial plants that can reproduce from both seeds and vegetative buds arising from lateral roots.

Over 100 species of milkweed have been identified as native to the United States and Canada, mostly of the genus *Asclepias*. With few exceptions, these plants have a milky sap that can be toxic to mammals if ingested in large enough amounts. This toxin is ingested by monarch larvae, providing protection from predation for both the caterpillars and adult butterflies.

Of the many milkweed species, a few stand out as particularly critical for the monarch migration. Of these, common milkweed (*Asclepias syriaca*) is by far the most frequently used in the central U.S. region. Studies have shown that up to 90 percent of overwintering monarchs tested in Mexico completed the larval stage on common milkweed (Malcolm et al. 1993).

Other milkweed species that play a lesser but significant role for monarchs include swamp milkweed (*Asclepias incarnata*) in the Midwest and green milkweed (*Asclepias viridis*) in the southern United States. Non-native tropical milkweed (*Asclepias curassavica*) has been introduced in the Gulf Coast states, but may be detrimental to monarchs because of a parasite associated with that species (Monarch Joint Venture 2014).

Establishment of milkweed is typically most successful when planting seedlings or root sections rather than seeds. Plants started from seedling or root sections grow rapidly, reaching up to 6 feet in height under good growing conditions. These perennial plants begin blooming in April in the southern part of their range, with most plants blooming in late May through July. The bloom stage usually coincides with the arrival of monarchs on their northward migration to breeding grounds.

## Identifying Easy-to-Grow Milkweed

**Butterfly Milkweed**  
*Asclepias tuberosa*

**Height:**  
3'

**Color:**  
Orange

**Ideal Environment:**  
Drier areas

### General Information:

This is a great milkweed for the home garden and it also performs beautifully in the wild. This species is best started from seed. Transplanting the milkweed will decrease the survival rate. Butterfly Milkweed will develop an extremely long taproot, is long-lived and highly drought-resistant.



J.S. Peterson, hosted by the USDA-NRCS PLANTS Database



**Common Milkweed**  
*Asclepias syriaca*

**Height:**  
6'

**Color:**  
Pink

**Ideal Environment:**  
Room to spread

### General Information:

This is the iconic "milkweed," common in fields, along roadsides, farm fields, ditches, and disturbed areas. It will form large, clonal stands over time, and spread vigorously by underground rhizomes, making it less suitable in the garden but perfect for natural areas.



**Whorled Milkweed**  
*Asclepias verticillata*

**Height:**  
2'

**Color:**  
White

**Ideal Environment:**  
Drier areas,  
tolerant of clay soils

### General Information:

Ideal for poor soils, roadsides and slopes, where few other plants grow well. Monarchs can use this as a host plant and are often found nectaring on the plants as well. This species blooms later in the summer than other milkweeds plants. As a result, this plant attracts adult monarch butterflies over a longer season when grown in conjunction with other species.



Thomas G. Barnes, hosted by the USDA-NRCS PLANTS Database



**Swamp Milkweed**  
*Asclepias incarnata*

**Height:**  
5'

**Color:**  
Dark pink

**Ideal Environment:**  
Wetter areas

### General Information:

This species of milkweed is common in wetlands, roadside ditches and along irrigation channels and ponds. It will develop a crown at the soil level from which multiple stems will emerge, but unlike common milkweed, it is not as easily propagated by root division. It is best started from seed and then transplanted.



Larry Allain, hosted by the USDA-NRCS PLANTS Database







## Maintaining Established Milkweed Stands

### Four Steps to Starting a Milkweed Stand

1. PLAN
2. PREPARE
3. PLANT
4. MAINTAIN

Details on the back page

During the initial year of establishment, competition from other vegetation immediately around milkweed plants should be kept to a minimum. Occasional mowing or other means of removal are fine, but no herbicides should be applied directly to milkweed plants during the first year. Once milkweed plants have been established for a year, they can typically withstand some competition from other vegetation. For monarchs, having other nectar-producing plants in the area as a food source is beneficial.

Although occasional fertilizer applications will promote faster and more extensive milkweed growth, fertilization is not necessary to maintain the population. Bear in mind that after the initial year of establishment, milkweed increases its tolerance to many herbicides.

Herbicides that may injure milkweed, such as glyphosate, dicamba or picloram, should not be applied directly on the plants. Any herbicide treatments should be timed to minimize disruption to the monarch population. After monarchs have departed on the southern migration, the area can be mowed to control unwanted plants without damage to milkweed populations. Such mowing would be beneficial to control tall-growing weeds and woody species that may invade the established area.



**After  
monarchs  
have migrated  
south, the  
area can  
be mowed.**

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