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**Title:** Operation Monarch for Golf Courses: Developing Protocols for Monarch Butterfly Conservation Plantings in Golf Course Naturalized Roughs

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**Objectives:**

- 1) Evaluate methodology for establishing milkweed for monarch butterfly conservation in golf course naturalized roughs
- 2) Document effectiveness of milkweed stands, with or without wildflowers, for attracting and sustaining monarchs, native bees, and honey bees on golf courses
- 3) Promote golf courses for monarch butterfly conservation through outreach education, webinars, conferences, trade journal articles, and media releases

**Start Date:** 2017

**Project Duration:** 2 years

**Total Funding:** \$46,400

**Summary:**

The monarch, an iconic beloved butterfly renowned for its spectacular long-distance migrations, is threatened by loss of wild milkweed, its sole larval food plant, to the extent that habitat restoration may be essential to the species' survival. Golf courses can take a leadership role in helping to save the monarch by creating milkweed refuges in out-of-play areas. We evaluated 8 species of native milkweeds for their conservation value to monarchs and bees, and for suitability for use in different golf course settings. All 8 species were suitable as larval food, but the taller species (common, swamp, showy, and narrow-leaf milkweed) were most attractive to the egg-laying butterflies and yielded the most monarchs. Common, showy, and narrow-leaf milkweeds spread by rhizomes and tillers, so they are the most suitable species for establishing large stands in naturalized roughs. Swamp and butterfly milkweeds "stay put" (do not tiller) so they are better suited for more formal plantings along cart paths and similar settings.

The different milkweed species attracted different assemblages of bees; e.g., common and swamp milkweed were particularly attractive to larger bee species (honey bees, bumble bees, and carpenter bees) whereas butterfly and narrow-leaf milkweed attracted more diverse bee assemblages with greater representation of smaller native bees. Surveys of pre-existing milkweed stands on golf courses verified usage by monarchs. Trials conducted at three golf courses and at the UK Turf Research Farm, evaluated several methods for establishing milkweed in naturalized roughs. Plots were prepared by scalping, verticutting, or fraze mowing, treated with a grass herbicide, and the seeds of three species of milkweeds were sown by hand

or drill-seeded into the soil. Plots were established with or without a wildflower strip. Procedures that worked well for establishing wildflowers were not very effective for milkweeds. The following guidelines reflect what we have learned so far: 1) Sowing milkweed seed in roughs is unreliable; it is better to transplant seedlings. Purchase your plants locally, when possible, to ensure that they will do well in your climate. Ask the supplier for seedlings grown from more than one genotype to ensure they will be able to outcross and produce viable seeds in the field, and get 2-year plants when available. 2) Use milkweed species that produce tillers to fill in naturalized roughs, and non-tillering species for more manicured sites; 3) Scalp down competing vegetation, plant in spring, and water seedlings for best establishment. 4) Mow in autumn after milkweed senesces, 5) your milkweed will attract and help to sustain both monarchs and bees.

Results from the first summer of this work were presented at Field Days and reported in a feature story on TurfNet ([https://www.turfnet.com/news.html/\\_research-aims-at-establishing-monarch-friendly-protocols-r902](https://www.turfnet.com/news.html/_research-aims-at-establishing-monarch-friendly-protocols-r902)). Further studies to evaluate best practices for establishing milkweeds from one or two-year old transplants are planned for 2018, including evaluations of growth, tillering, seed set, and usage by monarchs. We are also writing an article for Golf Course Management, and working on on-line materials with guidelines to help superintendents interested in establishing monarch habitat as part of their course environmental plan.

#### **Summary Points:**

- Transplanting seedlings was more reliable than seeding for establishing milkweed stands
- All eight species of milkweeds evaluated were suitable for larval growth but the taller species (common, swamp, and showy milkweed) yielded the most monarchs
- Common, swamp, butterfly, and narrow-leaf milkweeds were the best for supporting bees
- Common, showy, and narrow-leaf milkweeds spread from tillers making them the best suited species for establishing large stands in naturalized roughs
- Swamp and butterfly did not spread so they are better suited for use in high-profile sites
- Value of golf courses for monarch conservation was publicized in national media



Fig. 1. Monarch butterflies and bumble bees like swamp milkweed (photo credit: J. Hudgins).



Fig. 2. Common milkweed along cart path helps to sustain monarch caterpillars.



Fig. 3. Student worker checks for monarchs on common milkweed in naturalized rough.



Fig. 4. One of the replicated garden plots in which 8 milkweed species were compared.