

## How to Enhance Golden-winged Warbler Managed Sites for the Monarch Butterfly and Other Pollinators in the Great Lakes Science to Solutions



### In Brief

Early-successional communities within the eastern United States have become rare and this has led to the loss of wildlife species, dependent on this community type for habitat. The decline of early-successional communities has been, in large part, caused by the lack of natural disturbances. For example, reduced wildfire and beaver activity have decreased the area of young forests and shrublands within eastern deciduous forests. Furthermore, supporting this community type through human effort (i.e., habitat management) is expensive, due to the management tools needed to simulate natural disturbances (e.g., brush hogging and prescribed fire) and the need for periodic disturbance to revert older sites to early-successional conditions. To deal with these challenges, multiple NRCS working lands programs provide private landowners financial and technical assistance to create young forests and shrublands on their property for songbird conservation (e.g., Golden-winged Warbler [*Vermivora chrysoptera*]). In addition to songbirds, growing scientific evidence suggests that early-successional communities provide habitat for some groups of insect pollinators, which is important, given that insect pollinator populations are also declining. Two recent studies assessed how several insect pollinator groups respond to avian-focused early-successional habitat management in the Great Lakes. These studies found that NRCS working lands programs offer a win-win for songbirds, pollinators and NRCS clients by offering landowners the tools to better manage their land for early-successional communities, which also offers habitat to songbirds and pollinators.

### Benefiting Associated Wildlife Species

Wildlife management plans often have one “focal” or “target” species for which conservation efforts are intended to benefit. With that in mind, habitat management for one species may also affect non-focal species. For example, the Golden-winged Warbler is a focal species for multiple NRCS working lands programs in the Appalachian Mountains and Great Lakes. Several recent studies provide evidence that breeding habitat management efforts for the Golden-winged Warbler also benefits many other associated species that also require conservation attention, including the American Woodcock (*Scolopax minor*)<sup>1</sup>, Eastern Whip-poor-will (*Antrorstomus vociferus*)<sup>2</sup> and insect pollinators<sup>3</sup>. Another at-risk wildlife species that is associated with early-successional communities and is believed to benefit from warbler breeding habitat management is the monarch butterfly (*Danaus plexippus*).

### Conservation Goals for Monarch Butterfly

The monarch butterfly is a species of conservation concern as it is estimated that the eastern migratory population (*D. p. plexippus*) has declined by nearly 80 percent, from 1996-2015<sup>4</sup>. Furthermore, a U.S. Fish and Wildlife Service report concluded that the likelihood of no recovery (i.e., quasi-extinction) for this monarch population is about 50-70 percent, by 2080<sup>5</sup>. These declines are believed to be driven by reductions in milkweed (*Asclepias* spp.; monarch’s obligate larval host plant) and declines in nectar plant availability, both driven by land conversion and intensive agriculture<sup>6</sup>.

Therefore, scientists identified that the best way to stabilize the eastern monarch population is to increase the abundance and quality of breeding habitat by planting and promoting the growth of billions of milkweed stems<sup>7</sup> and supporting the presence of nectar-producing flowers.

### Opportunity to Assess Habitat Management Co-Benefits

The Golden-winged Warbler is a focal species for the NRCS *Regional Conservation Partnership Program* in the Great Lakes. The monarch butterfly is a focal species for the NRCS *Working Lands for Wildlife* initiative within ten central states, including the Great Lakes. These conservation efforts overlap in the Great Lakes, providing a valuable opportunity for researchers to assess if breeding habitat management for Golden-winged Warblers can contribute to monarch butterfly conservation goals.

### Warbler Management Contributes to Monarch Habitat

Keele and colleagues assessed the degree to which monarchs benefited from warbler breeding habitat management and tested for within-site and landscape habitat associations to understand what characteristics were most beneficial for monarchs in warbler sites<sup>8</sup>. To address these objectives, monarch and milkweed data were collected at sites managed for warblers and compared with data collected at sites specifically managed for monarchs (Monarch Joint Venture’s Integrated Monarch Monitoring Program<sup>9</sup>). Although researchers found that monarch and milkweed densities were much higher in sites specifically managed for monarchs, they estimated that warbler breeding habitat created through NRCS’s Regional Conservation Partnership Program (from 2015-2022), produced habitat for an estimated 5,502 adult monarchs and growing space for 399,528 milkweed stems. In addition, the authors determined that sites managed for warblers were most beneficial to monarchs when they had greater blooming plant density, greater milkweed density, and were situated within landscapes with emergent herbaceous wetlands nearby.



An adult monarch (*Danaus plexippus*; left photo) and monarch caterpillar (right photo) observed within a site managed for Golden-winged Warblers (*Vermivora chrysoptera*). Photos by Emma Keele.





Monarch eggs (left photo) and monarch caterpillar (right photo) found on swamp milkweed (*A. incarnata*) within a warbler managed site. Photos by Emma Keele.

## Two Managed Community Types Equally Provide Habitat for Pollinators

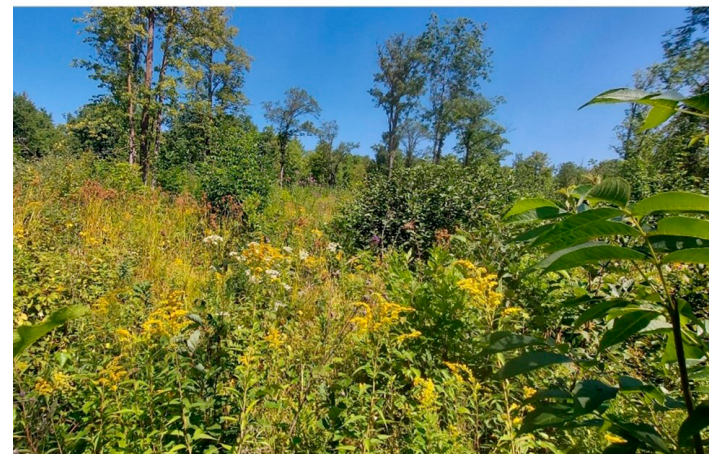
Keele and colleagues also assessed within-site and landscape habitat associations, for other butterflies and bumble bees (*Bombus spp.*), within sites managed for warblers<sup>10</sup>. They reported that butterfly and bumble bee densities were similar between two community types, such as alder shrub wetlands and upland deciduous forests, which are commonly managed for Golden-winged Warblers in the Great Lakes Region. This finding suggests that these two community types provided important habitat features for butterflies and bumble bees. The most important within-site habitat features to benefit pollinators in sites managed for warblers were abundant blooming plants and periodic openings with sparse tall shrub cover. On a landscape scale, butterfly density increased at sites with more semi-natural herbaceous land cover types, whereas bumble bee density was constant among landscapes managed for warblers.

## Management Recommendations

- Sites managed for warblers that were > 10 ha (>25 ac), were most likely to attract adult monarch butterflies. This may be because larger areas would likely provide more blooming plants and milkweed that attract adult monarchs.<sup>8</sup>
- Sowing native seed mixes, especially milkweed, within managed areas are the best way to enhance sites for monarchs. Recommended areas to target are retired log landings, skid trails or patches with sparse woody regeneration. Average milkweed density within warbler-managed sites was 36 stems/ha but greater densities are desirable.<sup>8</sup>
- Monarch butterflies in these studies heavily used flat-topped white aster (*Doellingeria umbellata*), geraniums (*Geranium spp.*), joe-pye weed (*Eutrochium spp.*) and swamp thistle (*Cirsium muticum*).<sup>8</sup>
- Monarch landscape preferences (more semi-natural land cover) conflicted with warbler landscape preferences (> 70% deciduous forest cover). Additionally, both monarchs and warblers tended to avoid coniferous forests<sup>11</sup>. Therefore, enhancing the herbaceous community component within a deciduous-dominated landscape may mitigate landscape disagreements.<sup>8</sup>
- Managing alder shrub wetlands and upland deciduous forests for golden-winged warbler breeding habitat will also support similar densities of butterflies and bumble bees.<sup>10</sup>
- Abundant and diverse herbaceous blooming plant communities were the most consistent predictors of butterfly and bumble bee densities. Therefore, enhancing the herbaceous plant community, as recommended above for monarchs, is an excellent option to benefit many other pollinators.<sup>10</sup>
- Sites with more semi-natural land cover types (e.g., pasture and herbaceous wetlands) in the landscape will host higher butterfly densities, but conservation planners should take care to also balance the needs of Golden-winged Warblers (> 70% deciduous forests).<sup>10</sup>

## Putting it All Together

Due to the drastic population declines of the monarch butterfly and other insect pollinators, concerted efforts to create and enhance habitat are needed. A common theme, informed by these two featured studies<sup>8,10</sup> and many others<sup>3,12,13</sup>, is that abundant blooming plants within forested landscapes are an important habitat component for pollinators because they provide pollen and nectar (i.e., food) within natural landscapes. Given that many disturbance-dependent herbaceous plants colonize recently managed Golden-winged Warbler sites (e.g., goldenrod), coupling insect pollinator with warbler habitat creation provides a valuable opportunity for multi-species benefits.



Two community types commonly managed for Golden-winged Warblers in the Great Lakes, alder shrub wetlands (top photo) and upland deciduous forests (bottom photo). Abundant blooming plants pictured here are joe-pye weed (*Eutrochium fistulosum*; top photo), goldenrod (*Solidago spp.*), and flat-topped white aster (*Doellingeria umbellata*; bottom photo). Photos by Emma Keele.





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## Additional Resources

To learn more about the Natural Resource Conservation Service's Working Lands for Wildlife partnership, visit [nrcs.usda.gov/wildlife](https://nrcs.usda.gov/wildlife).

To learn more about insect conservation, flowering plants to include in conservation plantings, and more about monarch conservation, visit [xerces.org](https://xerces.org) and [monarchjointventure.org](https://monarchjointventure.org).

To find more information about what species of milkweed to plant based on region and businesses that sell milkweed seeds, visit [plantmilkweed.org](https://plantmilkweed.org).

## Primary Resources

- <sup>1</sup> McNeil, D. J., Johnson, K. E., & Larkin, J. L. (2023). Assessing American woodcock use of habitat managed through programs targeting a declining songbird. *The Journal of Wildlife Management*, 87(7), e22457.
- <sup>2</sup> Larkin, J. T. (2023). A Multi-Regional Assessment of Eastern Whip-poor-will (*Antrastomus vociferus*) Occupancy in Managed and Unmanaged Forests Using Autonomous Recording Units [University of Massachusetts Amherst]. Masters Theses. <https://doi.org/https://doi.org/10.7275/35866786.0>
- <sup>3</sup> Mathis, C. L., McNeil, D. J., Lee, M. R., Grozinger, C. M., King, D. I., Otto, C. R. V., & Larkin, J. L. (2021). Pollinator communities vary with vegetation structure and time since management within regenerating timber harvests of the Central Appalachian Mountains. *Forest Ecology and Management*, 496. <https://doi.org/10.1016/j.foreco.2021.119373>
- <sup>4</sup> Semmens, B. X., Semmens, D. J., Thogmartin, W. E., Wiederholt, R., López-Hoffman, L., Diffendorfer, J. E., Pleasants, J. M., Oberhauser, K. S., & Taylor, O. R. (2016). Quasi-extinction risk and population targets for the Eastern, migratory population of monarch butterflies (*Danaus plexippus*). *Scientific Reports*, 6. <https://doi.org/10.1038/srep23265>
- <sup>5</sup> U.S. Fish and Wildlife Service. (2020). Monarch (*Danaus plexippus*) species status assessment report, version 2.1. <https://www.fws.gov/savethemonarch/pdfs/Monarch-SSA-report.pdf>
- <sup>6</sup> Thogmartin, W. E., Wiederholt, R., Oberhauser, K., Drum, R. G., Diffendorfer, J. E., Altizer, S., Taylor, O. R., Pleasants, J., Semmens, D., Semmens, B., Erickson, R., Libby, K., & Lopez-Hoffman, L. (2017). Monarch butterfly population decline in north america: Identifying the threatening processes. *Royal Society Open Science*, 4(9). <https://doi.org/10.1098/rsos.170760>
- <sup>7</sup> Thogmartin, W. E., López-Hoffman, L., Rohweder, J., Diffendorfer, J., Drum, R., Semmens, D., Black, S., Caldwell, I., Cotter, D., Drobney, P., Jackson, L. L., Gale, M., Helmers, D., Hilburger, S., Howard, E., Oberhauser, K., Pleasants, J., Semmens, B., Taylor, O., ... Wiederholt, R. (2017). Restoring monarch butterfly habitat in the Midwestern US: "All hands on deck." *Environmental Research Letters*, 12. <https://doi.org/10.1088/1748-9326/aa7637>
- <sup>8</sup> Keele, E. C., McNeil, D. J., Duchamp, J. E., Bastidas, E., & Larkin, J. L. (2023). Assessing the benefits of managed golden-winged warbler (*Vermivora chrysoptera*) nesting habitat for breeding monarch butterflies (*Danaus plexippus*) in the western Great Lakes. *Journal of Insect Conservation*, 879–894. <https://doi.org/10.1007/s10841-023-00505-8>
- <sup>9</sup> MJV. (2020). Integrated Monarch Monitoring Program (Issue Version 3.0). [https://monarchjointventure.org/images/uploads/documents/IMMP\\_Guidebook\\_2021.pdf](https://monarchjointventure.org/images/uploads/documents/IMMP_Guidebook_2021.pdf)
- <sup>10</sup> Keele, E. C., McNeil, D. J., Duchamp, J. E., & Larkin, J. L. (2023). Factors driving bumble bee (Hymenoptera: Apidae: *Bombus*) and butterfly (Lepidoptera: Rhopalocera) use of sheared shrubland and young forest communities of the western Great Lakes. *Environmental Entomology*, 1–13. <https://doi.org/10.1093/ee/nvad101>
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- <sup>13</sup> Lee, M. R., McNeil, D. J., Mathis, C. L., Grozinger, C. M., & Larkin, J. L. (2021). Microhabitats created by log landings support abundant flowers and insect pollinators within regenerating mixed-oak stands in the Central Appalachian Mountains. *Forest Ecology and Management*, 497. <https://doi.org/10.1016/j.foreco.2021.119472>