Pollinators Benefit from Young Forests Created to Conserve a Songbird

Science to Solutions

In Brief

Native insect pollinator populations are declining across North America. Scientists and conservationists have increased efforts to understand native pollinator population needs and develop best management practices. Just like grassland communities, forest communities can provide valuable habitat for pollinators. Within the eastern United States, several efforts are underway to increase young forest habitat for the imperiled golden-winged warbler. Recent studies investigated how pollinator communities responded to golden-winged warbler habitat management. These studies provide informative and science-based management recommendations for how land managers and private landowners can benefit pollinator communities while also sustainably managing their forests for a songbird.

Pollinators in Decline

Insect pollinators are extremely important for native plants and cultivated crops. For example, insect pollinators aid in the reproduction of about 85% of wild flowering plants (Ollerton et al., 2011) and 75% of cultivated crops (Klein et al., 2007). A study in 2012 suggested that, in the United States, pollination services were estimated to be valued at $34 billion/year (Jordan et al., 2021). This is why scientists are extremely worried about the decline of native pollinators in the United States (Koh et al., 2016).

Forest Management and Pollinators

Forested landscapes provide important habitat for insect pollinators. For example, many bumble bee species overwinter and nest in forests (Mola et al., 2021) and many bee species specialize on spring ephemerals that only grow in forest understories (Fowler, 2016). Recent work has also found that early successional communities (e.g., young forests and shrublands) within forested landscapes provide valuable habitat for pollinators. These early successional communities are important to pollinators because they provide nesting sites (e.g., dead snags and logs), have abundant flowering plants that provide nectar and pollen, and have more sunlight and warmer site conditions compared to areas with a dense canopy which are more heavily shaded and cooler (Hanula et al., 2016).

At left, a bumble bee *(Bombus spp.)* nectaring on thistle *(Cirsium spp.)* and Fritillaries *(Speyeria spp.)* nectaring on water hemlock *(Cicuta douglasii)* in a golden-winged warbler *(Vermivora chrysoptera)* managed area. Photo by Emma Keele.

Connecting Habitat Management for Birds with Pollinators

The golden-winged warbler *(Vermivora chrysoptera)* is a declining songbird that requires early successional habitat for nesting. Early successional communities in the eastern United States are not common on the landscape due to the lack of natural disturbances (e.g., wildfires) and incessant natural succession (i.e., a closed canopy forest developing over time). Therefore, active habitat management is needed to create the conditions required for breeding golden-winged warblers and associated wildlife. In general, habitat management for the golden-winged warbler involves removing most canopy trees from mature forest to create high light conditions that stimulate young trees and shrubs to grow. Golden-winged warblers nest on the ground in areas with a mix of broad-leaved herbaceous plants, shrubs, and saplings. Therefore, amongst the few remaining large trees and regenerating young trees and shrubs, scattered patches with grass, brambles *(Rubus spp.)*, and broad-leaved herbaceous plants are created for golden-winged warbler nesting. In addition, due to the nature of a timber harvest with large mechanical equipment, spots of bare soil are created, and woody debris is often left behind, both of which are potential nesting habitat for bees. These conditions that benefit golden-winged warblers also benefit some bees and butterflies. Therefore, researchers wanted to know how pollinator communities responded to habitat management for the golden-winged warbler. This research identified several important factors that influence pollinator use of young forest communities in the Appalachian Mountains.

Image of a young forest created to benefit nesting golden-winged warblers 1-year-post-harvest (left) and 9-years-post-harvest (right) in Pennsylvania. The less tall and dense woody vegetation in the 1-year-old harvest provides better habitat for pollinators compared to sites with abundant tall and dense woody vegetation. Photos by Codey Mathis and Emma Keele.

Number of Years Post Management

Mathis and colleagues studied the response of pollinator communities to deciduous forests treated with an 'overstory removal' timber harvest in Pennsylvania (Mathis et al., 2021). One finding was that the number of bees and butterflies were highest in timber harvests less than 6-years-old. For example, bee density was 4.6 times greater in 1-year-old harvests compared to 9-year-old harvests. These younger stands supported the highest pollinator densities because they had less tall and dense woody vegetation cover and greater cover of grasses, broad-leaved herbaceous plants, and brambles *(Rubus spp.)*. It is important for land managers or private landowners to understand that young forests provide relatively short-term benefits to pollinators (<6 years). This is because, over time, trees in young forests grow taller and their canopies become denser, creating conditions that many pollinators do not like.

Woody Vegetation Characteristics

Mathis and colleagues also characterized flowering plant communities in timber harvests (Mathis et al., 2022). Like pollinator communities, they found that blooming plants were most abundant and diverse in younger sites (<6 years), which had shorter and less dense woody vegetation and fern cover, and more open characteristics such as broad-leaved herbaceous plants (asters, milkweed *[Asclepias spp.]*, and Indian tobacco *[Lobelia inflata]*), grasses, and brambles *(Rubus spp.)*. This study also highlighted that the blooming plant community changes throughout the growing season in young forests. For example, short shrub cover provided abundant blooms in the spring (blueberries *[Vaccinium spp.]* and huckleberries *[Gaylussacia spp.]*) but hosted a much lower abundance of blooms in late summer.

Value of Log Landings

Another study compared pollinator communities in log landings (i.e., a small area that is cleared of all woody vegetation to stage timber during the harvest) to those in adjacent interiors of regenerating timber harvests in northeastern Pennsylvania (Lee et al., 2021). A main finding from this work was that log landings had two times the bee density and five times the butterfly density compared to adjacent timber harvest interiors. Log landings with the most blooming plants and shorter, less dense woody vegetation had the highest pollinator densities. When comparing log landings with the lowest blooming plant abundance to those with the highest blooming plant abundance, bee density increased 9-fold and butterfly density increased 15-fold.

Management Recommendations

- Mathis et al., 2021
  - Create young forests via regeneration timber harvest with scattered residual trees (basal area 10–20 ft^2/acre) in the central Appalachians to support high densities of bees and butterflies within the first 6 years post-harvest.
  - Promote and encourage abundant and diverse native blooming plant communities to increase pollinator density and diversity in young forests. Plants within the families of Asteraceae, Rosaceae, and Ericaceae are favorites of pollinators.
  - Control extensive blankets of fern and shrub cover using herbicide or brush-hogging to promote more abundant and diverse blooming plant communities and in turn higher pollinator densities.

- Mathis et al., 2022
  - Timber harvests with scattered open patches throughout the stand that have high grass/broad-leaved herbaceous plant cover and low dense and tall woody vegetation and fern cover will have the highest blooming plant density and diversity.
  - Promote plant communities in managed stands that contain species that bloom at different times throughout the growing season, such as early-season spring ephemerals, blueberries *(Vaccinium spp.)*, and black huckleberry *(Gaylussacia baccata)*; mid-season laurels *(Kalmia spp.)* and brambles *(Rubus spp.)*; and late-season fireweed *(Chamaenerion angustifolium)*, asters, and goldenrods *(Solidago spp.)*.
  - Monitor for invasive non-native plants as most of these species favor disturbed areas and can be dispersed by logging equipment.

- Lee et al., 2021
  - If a log landing is created during a timber harvest, it can serve as an important micro-habitat for pollinators. However, it is not recommended that more log landings be created or that they should be made larger than necessary. Rather, current timber harvest practices that create a small number of moderate sized log landings necessary for the operation will provide excellent short-term habitat for pollinators.
  - To provide the greatest benefit to pollinators, be sure that forest management plans include language about planting mix details that should be used to retire log landings and harvest trails (i.e., skid trails). Specifically, the sowing of non-native grasses or non-native broad-leaved herbaceous plants should be avoided (e.g., Timothy grass *[Phleum pratense]* and birds foot trefoil *[Lotus corniculatus]*). Instead, use native mixes that promote a diverse community of native grasses and broad-leaved herbaceous plants, as this will lead to the highest pollinator densities (e.g., milkweed *[Asclepias spp.]*, hyssop *[Agastache spp.]*, sunflowers *[Helianthus spp.]*, goldenrod *[Solidago spp.]*, and American burnweed *[Erechtites hieraciifolius]*).

Putting it All Together

Understanding how habitat management for a focal species (i.e., golden-winged warbler) impacts additional species is valuable to allow limited conservation resources to be used more efficiently. The NRCS's Working Lands for Wildlife partnership provides financial and technical assistance for private landowners to include golden-winged warbler management on their property. The research highlighted here identifies what habitat components are important for pollinators so that when compatible with landowner objectives, future management that targets golden-winged warblers can also benefit native pollinator communities.

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Additional Resources:

To learn more about Natural Resource Conservation Service's Working Lands for Wildlife partnerships, visit: **nrcs.usda.gov/wildlife**

To learn more about insect conservation and flowering plants to include in conservation plantings, visit **xerces.org**

To find your local NRCS service center, visit: **nrcs.usda.gov/contact/find-a-service-center**