Thelma Heidel-Baker, The Xerces Society

THE WISCONSIN POLLINATOR PROTECTION PLAN

BEST MANAGEMENT PRACTICES FOR

Maximizing Pollinator Health & Pollination Services on Farms

Give us your feedback on the plan with this 5 minute survey:
https://www.surveymonkey.com/r/MLGFGVV

Over one-fifth of the land area of Wisconsin is farmland, and opportunities abound to benefit pollinators through agricultural management practices. For growers raising pollinator-dependent crops, the benefit to fostering pollinators is clear: good crop yield depends on healthy pollinator communities. **But <u>all</u> growers and farmers can benefit from pollinator-friendly practices.** Hedgerows can harbor beneficial insects that control crop pests[1], and prairie plants grown on contour can limit soil erosion and nutrient loss[2]. Habitat benefitting pollinators can also double as forage for grazers and/or habitat for game species and other wildlife.

Contribution of pollinators to crop yields

- Many crops have significantly higher yields when bees are present. These include apple, strawberry[3], soybean[4], cranberry[5], tart cherry[6], green bean[7], raspberry, cucumber and tomato.
- Pasture plants like clover and alfalfa require insect pollinators for successful seed set.
- Corn does not rely on insect pollination, but bees are known to feed on corn pollen when other floral resources are scarce.

Honey bee or bumble bee?

A honey bee colony contains 100 to 1000 times more worker bees than a bumble bee colony, but on a per-bee basis, bumble bees are often more efficient pollinators because of their:

- Higher flower visitation rates.
- Larger and hairier bodies.
- Longer foraging hours and tendency to forage earlier in the day when day-opening flowers are most fertile.
- Tendency to switch among crop rows (good for crops like apple that require cross-pollination).
- Ability to release pollen from tubelike flowers-- like tomato and cranberry--by vibrating at a certain frequency ("buzz pollination"). Honey bees cannot do this.

Honey bee

Bumble bee

Pollinator dependent crops have higher visitation rates when more pollinator **<u>species</u>** are present; simply adding more honey bees to a field will not fully compensate for a lack of wild pollinators[8]. There are about 400 wild bee species in Wisconsin[9], so there is great potential for boosting bee diversity and pollination services in and around crop fields.

Improving and creating habitat for pollinators

Farm fields located near natural areas like woodlands and prairies tend to have more bee species and higher crop fruit set than those surrounded by only farmland[10]. Habitat diversity is one reason many apple growers in Wisconsin get their pollination services from wild bees without having to rent honey bees[11].

For farms that are not near natural areas, attracting pollinators depends heavily on on-farm management practices[16]. A global study of 39 crops found that bee abundance was 76% higher in "diversified" fields – those with mixed crop types, or that had hedgerows or flower strips at the margin – than in monoculture fields[17]. In a Michigan study, wildflower strips planted adjacent to blueberry fields paid for themselves after four years due to a boost in crop yield[18]. Pollinator benefits of on- and off- field management practices are summarized below. Costs and benefits of these practices to the grower will depend on the type of crop grown (pollinator-dependent or not) and grower goals and values.

Beneficial Practices for Pollinators

Location of Practice	Management Practice[12]	Potential Benefits
Outside crop fields	Leave existing nesting habitat (dead wood, bare patches of soil, hollow stems, bunch grasses)	Pollinator communities can be maintained long-term if nesting habitat is located near flowering crops.
	Add wildflower strips or flowering hedgerows on slopes, field margins or roadside ditches	Higher yields of adjacent pollinator-dependent crops. Prairie strips can be configured to prevent loss of water, soil and nutrients from crop fields[13].
Within crop fields	Use pollinator attractive plants for intercropping or cover cropping	Higher yields of adjacent pollinator-dependent crops.
	Grow multiple types of blooming crops	Increased pollinator health and diversity; higher yields of pollinator-dependent crops; diversified income streams.
	Reduce tillage intensity	Shallower tilling and leaving margins untilled may be beneficial for bees nesting in crop fields and margins[14].
Within and outside crop fields	Minimize pesticide use	Minimizing the use of pesticides can reduce negative effects on beneficial species including pollinators.
	Change mowing or haying practices	Pollinators benefit when flowering plants are allowed to bloom in field margins or between crop rows (particularly when crop is not blooming).
	Reduce field size	Increased crop pollination when flowering crop plants are nearer to bees nesting in field margins.
Pastures	Incorporate legumes into pastures. Rotate grazing so that some paddocks allowed to fully bloom.	Blooming forage crops like clovers can increase pasture production while benefitting both grazers and pollinators[15].

Cost-share and technical assistance

Installing pollinator habitat requires up-front costs and establishment takes several years before all benefits are realized. A helpful summary of costs for prairie plantings in row crop systems is available from the Leopold Center for Sustainable Agriculture[19]. Funding and information may also be available through the programs listed below. Your local Farm Bill biologist[20] and land conservation staff[21] can help determine your eligibility for these and other programs.

Landowner Programs:

- Wisconsin Department of Natural Resources (DNR) Landowner Incentive Program (LIP)[24]
- United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP)[25]
- USDA NRCS Conservation Reserve Program (CRP)[26] and Conservation Reserve Enhancement Program (CREP)[27]
- USDA NRCS Conservation Stewardship Program (CSP)[28]
- US Fish and Wildlife Service Partners programs[29]

Other organizations involved in habitat restoration:

- Healthy Grown Potatoes[30]
- Pheasants Forever[31]

Compensating for milkweed loss

Monarch butterfly population estimates for 2015 are 80% below their 20-year average[22]. Monarch butterflies need milkweed plants (genus *Asclepias*) to complete their life cycles, and their decline is closely correlated with the loss of milkweed plants in and near agricultural fields. There are 13 species of milkweed native to Wisconsin[23]. Common milkweed (*Asclepias syriaca*) is known for its aggressive habit, but most milkweed species are not weedy and make beautiful and beneficial additions to wildflower strips. Milkweeds don't just serve monarchs; they are attractive nectar sources for a wide range of pollinators. **Note: Milkweed can be toxic to livestock.** Although actively grazing animals will typically avoid it unless good forage is scarce, milkweed should be discouraged in fields that will be hayed.

Whorled milkweed (Asclepias verticillata)

Swamp milkweed (Asclepias incarnata)

Butterfly milkweed (Asclepias tuberosa)

Photos: Frank Mayfield

Pesticide use and avoiding drift

Growers face the difficult challenge of minimizing crop pests while attracting beneficial insects like pollinators and pest predators. Cautious pesticide use is advised to avoid pest resistance and protect the health of beneficial insects and other non-target organisms:

- Always follow the pesticide label exactly regarding application timing and dose. The label is the law!
- Use Integrated Pest Management (IPM) guidelines for your crop pest problems. Identify the pest and degree of infestation before treating with pesticides. Use established economic thresholds when available to determine when control measures are needed. Incorporate preventative management options such as resistant crop varieties and cultural control practices.
- Heed pesticide labels that say "highly toxic to bees," "toxic to bees" or "extended residual toxicity".

- To help choose products that are less toxic to pollinators, refer to the "Bee precaution pesticide rating" online tool[32] from University of California Integrated Pest Management Program (UC IPM). Also see EPA's "Information on Residue Toxicity Times."[33] Take equal caution using pesticides approved for use in organic agriculture; these are not necessarily safe for bees.
- Avoid spraying pesticides on blooming plants being visited by pollinators. This includes crops, weeds in cropland, and wildflowers or weeds in field margins/ditches. Spraying at night may avoid some harm to pollinators, but can still affect beneficial organisms; some predators of crop pests are most active at night.
- Keep in mind that systemic insecticides applied as soil or seed treatment can remain in plants for extended periods of time, and may be present in the pollen or nectar even if the insecticide is applied prior to bloom.
- Avoid using seed treated with pesticides unless a pest problem has been diagnosed. If treated seed is used:
  - Remove blooming crop weeds before planting treated seed.
  - Reduce dust release when planting treated seed. Dust contaminated with pesticide sticks easily to bee hairs and can be transferred to nests and fed to larvae. Use seed treatments designed to reduce dust. If a dust formulation must be used, use deflectors that direct dust down.
  - Collect and properly dispose of any spilled treated seed. Treated seed can be toxic to birds and other wildlife if ingested.
  - Refer to the ASTA and CropLife guide to seed treatments[34] and University of Wisconsin-Extension handout, "What's on your Seed?"[35]

- Educate yourself about safe pesticide use. The pesticide applicator certification training manual[36] is a useful resource for everyone, and is required training for some types of pesticide applicators.
- Do not allow pesticides to drift off site, as this is a violation of pesticide regulations.
- Consider using buffer strips between pollinator habitat and land that gets sprayed regularly with pesticides. Some landowner programs require this, e.g., the Natural Resources Conservation Service (NRCS) Conservation Reserve Program (CRP) requires a 150 ft. buffer between CRP land and sprayed areas.

What is FieldWatch?

FieldWatch[37] is a non-profit organization that provides voluntary online mapping tools for crop producers, beekeepers, and pesticide applicators. Crop producers can use the DriftWatch mapping tool to alert nearby pesticide applicators of their specialty crops. Pesticide applicators should check the FieldWatch website for neighboring bee hives and specialty crops before appying pesticides.

FieldWatch
Communication. Cooperation. Collaboration.

driftwatch
Specialty Crop Site Registry
by FieldWatch

Getting involved and spreading the word

Monitoring pollinator population trends to document what management practices do and do not work is important not only for pollinator health but crop production as well. Growers are encouraged to share their practices with neighbors, grower groups, and agronomy businesses, and participate in scientific research to help answer questions about pollinator health in agricultural settings.

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How can you tell if bees like your farm?

Use the simple protocol[38] provided by The Xerces Society and a bee guide[39] from Michigan State University to identify bees and monitor their presence on your farm. The Xerces Society provides an assessment form[40] to score pollinator habitat on your farm and aid in management planning.

Books, Manuals and How-To's:

- For growers contracting managed bees:
  Delaplane, Keith S., Daniel R. Mayer, and Daniel F. Mayer. 2000. "Crop Pollination by Bees." CABI.
- USDA Pollination Handbook
  http://www.ars.usda.gov/SP2UserFiles/Place/20220500/OnlinePollinationHandbook.pdf
- USDA. 2015. "Attractiveness of Agricultural Crops to Pollinating Bees for the Collection of Nectar and/or Pollen."
  http://www.ree.usda.gov/ree/news/Attractiveness_of_Agriculture_crops_to_pollinating_bees_Report-FINAL.pdf
- Sustainable Agriculture Research and Education (SARE). "Cover Cropping for Pollinators and Beneficial Insects." Informational handout.
  http://www.sare.org/Learning-Center/Bulletins/Cover-Cropping-for-Pollinators-and-Beneficial-Insects
- Michigan State University. May 2007. "Conserving Native Bees on Farmland". Extension Bulletin E-2985.
  http://nativeplants.msu.edu/uploads/files/E2985ConservingNativeBees.pdf
- Pacific Northwest Extension. "How to Reduce Bee Poisonings from Pesticides." PNW 591
  http://extension.oregonstate.edu/crook/sites/default/files/bee2.pdf
- USDA NRCS Agronomy Tech Note #9. "Preventing or Mitigating Potential Negative Impacts of Pesticides on Pollinators Using Integrated Pest Management and Other Conservation Practices." http://www.xerces.org/guidelines/pollinator-pesticide-risk-reduction/
- NRCS. 2008. Wisconsin Biology Technical Note 8. "Pollinator Biology and Habitat."
  http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_020421.pdf
- The Xerces Society for Invertebrate Conservation. "Farming for Bees."
  http://www.xerces.org/guidelines-farming-for-bees/

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[3] Chagnon, M., et al. 1993. "Complementary aspects of strawberry pollination by honey and indigenous bees (Hymenoptera)." *Journal of Economic Entomology* 86.2: 416-420.

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[8] Garibaldi, L., et al. 2013. "Wild pollinators enhance fruit set of crops regardless of honey bee abundance." *Science* 339.6127: 1608-1611.

[9] Ascher, J. S. and J. Pickering. 2015. Discover Life bee species guide and world checklist (Hymenoptera: Apoidea: Anthophila). www.discoverlife.org

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[12] List of management practices adapted from: Garibaldi, L., et al. 2014. From research to action: enhancing crop yield through wild pollinators. Frontiers in Ecology and the Environment, 12(8), 439–447.

[13] Iowa STRIPS project. https://www.nrem.iastate.edu/research/STRIPs/content/management-overview

[14] Sardiñas, H.S., et al. 2015. "Sunflower (Helianthus annuus) pollination in California's Central Valley is limited by native bee nest site location."*Ecological Applications*.

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[21] Directory for Farm Service Agency and county conservation contacts: http://wisconsinlandwater.org/files/pdf/WILandWaterDirectory.pdf

[22] Monarch butterfly population data collected by personnel of the Monarch Butterfly Biosphere Reserve and WWF-Telcel Alliance, and summarized by The Xerces Society here: http://www.xerces.org/monarchs/

[23] Wisflora: Wisconsin Vascular Plant Species: http://www.botany.wisc.edu/herb/

[24] Wisconsin DNR Landowner Incentive Program: http://dnr.wi.gov/topic/endangeredresources/lip.html

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[26] USDA NRCS Conservation Reserve Program (CRP): http://www.nrcs.usda.gov/wps/portal/nrcs/main/wi/programs/

[27] USDA NRCS Conservation Reserve Enhancement Program (CREP): http://datcp.wi.gov/Environment/Land_and_Water_Conservation/CREP/index.aspx

[28] USDA NRCS Conservation Stewardship Program (CSP): http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp/

[29] US Fish and Wildlife Service Partners for Fish and Wildlife: http://www.fws.gov/midwest/partners/

[30] Healthy Grown Potatoes: http://eatwisconsinpotatoes.com/wisconsin-potatoes/healthy-grown/

[31] Pheasants Forever: https://www.pheasantsforever.org/Habitat/Why-Habitat.aspx

[32] University of California Statewide Integrated Pest Management Program. “Bee precaution pesticide rating” online tool: http://www2.ipm.ucanr.edu/beeprecaution/

[33] EPA data on residual time to 25% bee mortality (RT25): http://www2.epa.gov/pollinator-protection/residual-time-25-bee-mortality-rt25-data

[34] American Seed Trade Association / CropLife America seed treatment management practices: http://seed-treatment-guide.com/guide/

[35] University of Wisconsin Extension and UW Nutrient and Pest Management Program. “What’you’re your Seed?” http://ipcm.wisc.edu/download/pubsPM/Whats_on_your_seed_FINAL_4.pdf

[36] Wisconsin pesticide applicator training: http://ipcm.wisc.edu/pat/certification/requirements/

[37] FieldWatch, DriftWatch and BeeCheck voluntary mapping tools: http://www.driftwatch.org/

[38] To distinguish among various kinds of bee, wasp, and fly, refer to the “Streamlined Bee Monitoring Protocol” from The Xerces Society: http://www.xerces.org/streamlined-bee-monitoring-protocol/

[39] Michigan State University Extension. October 2015. “Bees of the Great Lakes Region and Wildflowers to Support Them.” 110-page pocket guide for identifying bees, plus wildflower planting guidelines. http://shop.msu.edu/product_p/bulletin-e3282.htm

[40] The Xerces Society. "Pollinator Habitat Assessment Form and Guide for Farms and Agricultural Landscapes." http://www.xerces.org/wp-content/uploads/2009/11/PollinatorHabitatAssessment.pdf