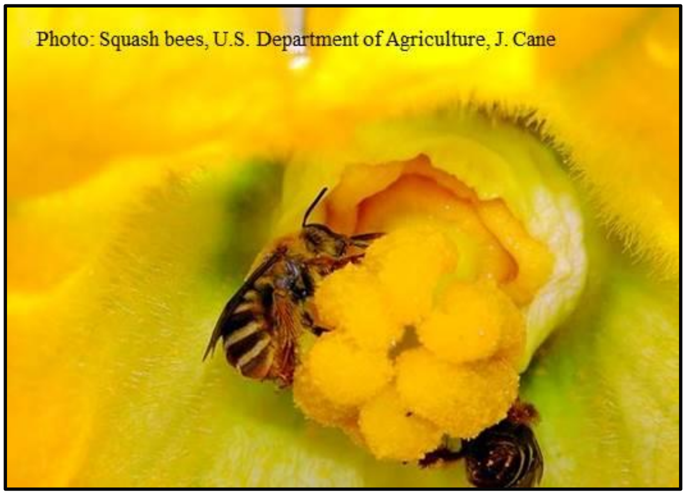
EnviroAtlas
people health nature economy
Fact Sheet
www.epa.gov/enviroatlas

Acres of Pollinated Crops with No Nearby Pollinator Habitat

This EnviroAtlas national map estimates the total acres of agricultural crops within each 12-digit hydrologic unit (HUC) that have varying amounts of nearby forested pollinator habitat. The crop types selected from the U.S. Department of Agriculture Cropland Data Layer (CDL) require (or would benefit from) the presence of pollinators, but crops may have no nearby native pollinator habitat. This metric is based on the average flight distance of native bees, both social and solitary, that nest in woodland habitats and forage on native plants and cultivated crops.



Why is native pollinator habitat important?

Native pollinators such as bees, butterflies, birds, bats, and flies provide a critical service to native and agricultural ecosystems. Without these pollinators, many plants would not produce fruit and seeds. About 75% of all crop plants benefit from native and domesticated (honeybee) pollinators.[1] The lack of local pollinators can result in lost crop productivity and increased costs from transporting honeybees from distant locations.

The use of managed honeybee colonies for crop pollination is an accepted practice for food and seed crops. For example, each year in California, ⅓ of the nation's bees are trucked in from all parts of the country to pollinate the almond crop.[2] However, honeybee suppliers are struggling to maintain an adequate supply of bees because of multiple threats to bee colonies from colony collapse disorder, Varroa mites, nosema fungi, and pesticide exposure. The decrease in honeybee populations coupled with crop dependency on pollinators has made the services provided by wild pollinators more critical to maintaining stable crop yields.[3]

Native pollinators require blooming plants throughout the growing season and nesting habitat in tree cavities, abandoned insect or rodent nests, or soil of the proper texture and moisture.[4] A California study found that native bees were sufficient to pollinate the watermelon crop if the bees had native habitat available in the area.[2] Other research has shown that the diversity and numbers of wild pollinators visiting crops decline with distance from natural habitats.[3,4]

Both native and domesticated bees are increasingly exposed to systemic insecticides. Recently, the most widely-planted crop seeds (corn, soybeans, wheat, and cotton) are routinely pretreated with neonicotinoids that are lethal or debilitating to bees. A recent study of pretreated corn fields in Indiana found the insecticide in corn pollen, on blooming forage plants near corn fields, in airborne planter dust, and persisting in the soil.[5]

Realization of the importance of pollinators to global agriculture and commitment to their conservation may require tradeoffs between cultivated land area and native pollinator habitat, pesticide application and pollinator health, and monoculture and diversified crop rotation.[3] For example, in the last fifty years, industrialized farming practices have created clean fields, removing hedgerows and streamside vegetation. Restoring hedgerows and riparian woodland would increase native pollinator habitat. In addition, the Conservation Reserve Program (CRP) offers incentives to farmers to plant natural cover on marginal land. CRP acreage provides habitat and native flowering plants for native pollinators. Recently, the services of native pollinators were valued at over $3 billion in fruits and vegetables alone, which doesn't take into account cross-pollination (e.g., tomatoes, soybeans) or seed production (alfalfa, sunflower) services.[6] However, even a partial estimate of the value of the services provided by native pollinators justifies the effort to maintain their productivity and diversity.

How can I use this information?

This information can be used either alone or in conjunction with other data layers to help identify areas that have pollinator habitat to support crop production. These areas could be targeted for conservation. Conversely, map analysis may identify locations where demand for habitat is high but habitat availability is low. These areas could be targeted for restoration. One may also compare this map to other

CONTINUED ON BACK

EnviroAtlas maps such as Acres of Land Enrolled in CRP (Conservation Reserve Program) or small, medium, and large natural areas to find HUCs with remaining natural cover that may serve as pollinator habitat. An area can be more thoroughly investigated by increasing the transparency of the map and adding data for streams and water bodies (NHDPlus found under Boundary Layers) to the base map. Detailed examination of an aerial imagery base map can reveal where riparian woodland currently exists along the stream network as well as uncultivated land within the HUC.

How were these data created?

This metric is a measure of demand for pollinators that are responsible for crop production or improved yields. The metric was generated using the ESRI ArcMap Neighborhood Distance tool in conjunction with a blended landcover grid, which included the 2006 National Land Cover Dataset (NLCD) and U.S. Department of Agriculture National Agricultural Statistics Service Cropland Data Layer (CDL). Pollinator habitat is defined as trees (fruit, nut, deciduous, and evergreen) for nesting and associated woodland for additional pollen sources. Crops that either require or benefit from pollination were selected and a distance measure of 2.8 kilometers (the average bee species' foraging distance from the nest[4]) was used to assess presence or absence of nearby native pollinator habitat. The total area of crops without nearby pollinator habitat was summarized by 12-digit HUC boundaries taken from the NHDPlusV2 Watershed Boundary Dataset (WBD Snapshot).

What are the limitations of these data?

Though EnviroAtlas uses the best data available, there are limitations associated with the data. The landcover classes found in NLCD are created through the classification of satellite imagery. Human classification of landcover types that have a similar spectral signature can result in classification errors. As a result, NLCD is a best estimate of actual landcover. Periodic updates to EnviroAtlas will reflect improvements to nationally available data. Each version of NLCD is released several years after the date of the satellite imagery, meaning that the land cover patterns are several years out of date when released. Crop types and distribution also change depending on climate, management, and market influences. Accuracy information for the NLCD can be found on its website.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. The NLCD, CDL, and NHDPlusV2 data are accessible through their respective websites. NLCD data are updated every 5 years to enable change detection research.

Where can I get more information?

A selection of resources related to pollination ecosystem services are listed below. For additional information on how the data were created, access the metadata for the data layer from the drop down menu on the interactive map table of contents and click again on metadata at the bottom of the metadata summary page for more details. For more details on the updating of the HUC boundaries to the WBD Snapshot, see the metadata. To ask specific questions about this data layer, please contact the EnviroAtlas Team.

Acknowledgments

EnviroAtlas is a collaborative effort led by EPA. Megan Mehaffey, EPA, developed this map for EnviroAtlas. The fact sheet was created by Megan Mehaffey, EPA, and Sandra Bryce, Innovate!, Inc.

Selected Publications

1. Lautenbach, S., R. Seppelt, J. Liebscher, and F.D. Carsten. 2012. Spatial and temporal trends of global pollination benefit. PLoS ONE 7(4):e35954. Online paper accessed March 2021.

2. Kremen, C., R.L. Bugg, N. Nicola, S.A. Smith, R.W. Thorp, and N.M. Williams. 2002. Native bees, native plants, and crop pollination in California. *Fremontia* 30(3–4):41–49.

3. Garibaldi, L.A., M.A. Aizen, A.M. Klein, S.A. Cunningham, and L.D. Harder. 2011. Global growth and stability of agriculture yield decrease with pollinator dependence. *Proceedings of the National Academy of Sciences* 108(14):5909–5914.

4. Cane, J.H. 2001. Habitat fragmentation and native bees: A premature verdict? *Conservation Ecology* 5(1):3. Online paper accessed March 2021.

5. Krupke, C.H., G.J. Hunt, B.D. Eitzer, G. Andino, and K. Given. 2012. Multiple routes of pesticide exposure for honey bees living near agricultural fields. PLoS ONE 7(1): e29268. Online paper accessed March 2021.

6. Losey, J.E., and M. Vaughan. 2006. The economic value of ecological services provided by insects. *BioScience* 56(4):311–323.

Gallant A.L., N.H. Euliss, Jr., and Z. Browning. 2014. Mapping large-area landscape suitability for honey bees to assess the influence of land-use change on sustainability of national pollination services. PLoS ONE 9(6): e99268.