# Pennsylvania Pollinator Series

1. Animal Pollinated Plants and Their Importance

Since the dawn of human time, flowering plants have nurtured our bodies, challenged our intellects, and uplifted our spirits. Flowering plants provide rich and diverse sources of food, medicine, clothing, paper, fiber, and construction materials. Our ancestors developed critical thinking in part by seeking to increase their knowledge about how to use flowering plants. Today, we artistically design our surroundings using the color, texture and fragrance associated with flowering plants.
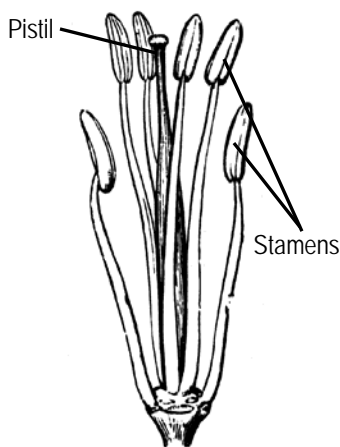
Pistil and stamens of mustard plant

All flowering plants have in common highly specialized structures for sexual reproduction, called flowers. Flowers are complete only when they contain sepals, petals, and both female and male sexual parts. When flowers lack either the male or female sexual parts, they are regarded as imperfect, female or male flowers. Some plant species have both male and female flowers on the same plant, while others have male flowers on one plant and female flowers on another.

The flower's female sexual part is represented by the pistil, which contains ovules, while the stamen, which produces pollen, represents the male sexual part. Depending upon how the pollen is transferred, there are three types of pollination: self-pollination, abiotic pollination, and animal pollination. By ensuring that the stamens touch the pistil, plants can self-pollinate without the help of external factors. In abiotic pollination, pollen is moved between flowers by wind or water.

In animal pollination, the plants depend on animals to transfer pollen from one flower to another. Most flowers use a concentrated sugar solution, called nectar, to lure animal pollinators. Pollinators, such as bees, use the flowers' shapes, scents, and color patterns as cues for accessing the nectar-producing glands. In their nectar quest, animals will brush parts of their bodies against the anthers, the flower's pollen bearing parts.

Once attached to the animals chemically, physically, and/or through electrostatic forces, the pollen granules will hitchhike a ride to another flower's female part, the pistil. There, stigma (the pistil's sticky upper part) will trap the pollen granules that come close to or in contact with it. Only

if compatible, the pollen granules will grow tubes inside the pistil, and fertilize the ovules, which will become seeds. If a flower is insufficiently pollinated, it will develop fewer seeds or drop, which means fewer or no offspring.

Animals, mostly insects, provide pollination services for a third of our food. Crop species and even varieties of the same crop differ in their requirements for animal pollination. Melons, cucurbit squashes, and most pome fruits have high pollination requirements and are entirely dependent on insects. For example, a female pumpkin flower, depending on variety, needs several hundred pollen granules in order to set enough seeds to form a healthy fruit. The pumpkin pollen is heavy and sticky, and therefore it cannot be transferred by wind. Bees have only few hours in the morning for transferring the necessary pollen from the male flower to female flower. If the bees are not present or are in low numbers, the flowers will abort or will set small and misshaped fruit that will be flavorless and have a short shelf life. Many other crops can be wind pollinated, but they will produce more and better yields when bees augment the pollination process.

In North America, the human diet is diversified and enriched with essential nutrients from more than 100 crops that benefit from insect pollination (NRC, 2007). The value of pollination services provided annually by wild and managed bees to U.S. agriculture has been estimated to be as much as 22 billion dollars (NRC, 2007). However, this value is an infinitesimal fraction of the value of the pollination services provided by animal pollinators to flowering plants, and subsequently to the environment. Animal-pollinated plant species are significant sources of food and shelter for wildlife, and act as water and air filters, while helping to minimize soil degradation by conserving moisture and stabilizing soil.

Bibliography
National Research Council. (2007). *Status of Pollinators in North America.* Washington DC: Board on Life Sciences, Board on Agriculture and Natural Resources, National Academy of Sciences.
Source: Asa Gray, *The Elements of Botany for Beginners and for Schools* (New York, Cincinnati, Chicago: American Book Co., 1887)86
Source: S. G. Goodrich *Animal Kingdom Illustrated Vol 2* (New York: Derby & Jackson, 1859)2:557

Prepared 7-09