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## EFFECTS ON POLLINATORS AND POTENTIAL RAMIFICATIONS

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### **What is NAPPC?**

The North American Pollinator Protection Campaign (NAPPC) is a collaboration of individuals and representatives from over 80 organizations, working to promote pollinator conservation and awareness in the United States, Canada, and Mexico. NAPPC is comprised of voluntary partners representing government and non-government agencies, environmental groups, garden groups, landowners, scientists, farmers, businesses, and private individuals, each concerned with some aspect of pollinators and/or pollination ecology. Several of NAPPC's partners represent the USDA, and NAPPC encourages and welcomes new partners from the agricultural community who are interested in promoting animal pollinators and pollinated plants.

### **Ecosystem Service of Pollination**

Pollinating animals include bees (both native and managed), butterflies, moths, beetles, wasps, hummingbirds, bats, ants, and flies. The service provided by pollinators through assisting plants with reproduction is critical to the maintenance of healthy, natural ecosystems. It is estimated that over eighty percent of the world's flowering plants depend on animal pollinators to transfer pollen from plant to plant, rather than being carried by wind or water. Native pollinators have co-evolved with the plants they visit, such that their physiology is matched to most efficiently exploit the nectar and pollen resources of the flowers upon which they specialize. The adaptations that promote this symbiotic relationship between plants and animals provide a pollination service that the USDA has estimated at \$40 billion per year for food crops alone. The role that pollinators play in assisting the reproduction of countless non-agricultural native plants is difficult, if not impossible to quantify in financial terms, but we do know that innumerable species of wildlife and even fish depend on pollinators and pollinated plants for their survival.

### **Effects of Invasive Plant Species on Pollinators**

Invasive species affect both pollinating animals and pollinated plants by disrupting the structure and function of ecosystems. Non-native plants can alter the community composition of natural habitats, reducing food and shelter resources available for all species of wildlife. For pollinators that are physiologically adapted to specialize on particular plants, non-natives may present floral structures that are inaccessible to local pollinating animals, preventing them from reaching the nectar reward that lies within. In such cases, the non-native plant "steals" the reproductive opportunity to spread its pollen by attracting pollinators that unwittingly transfer pollen grains as they haplessly waste energy visiting flower after flower, seeking nectar that is physically inaccessible to them. The invasives in this case are robbing the ecosystem by propagating throughout the habitat, while returning no ecosystem benefits to the animals that depend on that habitat for survival.

In addition to inadvertently propagating the non-natives, pollinators visiting invasive species are drawn away from native plant species, which may result in reduced reproductive capacity and degeneration of native plant habitats. Introduced plant diseases can be carried from non-natives to native plants on the

bodies of pollinators seeking food, and hybrids can be unwittingly created through the genetic mixing that occurs.

Invasive plants can also directly impact pollinators, as shown in the case of the invasive species, garlic mustard (*Alliaria petiolata*). Garlic mustard threatens native plants in forests of the eastern and midwestern U.S. by out-competing native species in the mustard family, known as “toothworts” (genus *Cardamine*). Toothworts provide the primary source of food for caterpillars of the rare West Virginia white butterfly (*Pieris virginiensis*). In addition to causing local extirpations of native toothworts, the chemicals in garlic mustard have a toxic effect on the white butterfly’s eggs, keeping them from hatching on the non-native plant when butterflies unwittingly lay their eggs on the plant’s foliage. Efforts to re-establish native plant communities should consider the vital importance of specific native pollinators for each plant species in a given habitat.

### **Effects of Invasive Animal Species and Pathogens on Pollinators**

Invasive species of animal are also major concerns for the future of pollinators and ecosystems in North America and around the world. Parasites such as Varroa and tracheal mites and diseases such as Nosema have been introduced to native pollinators by invasive species, decimating pollinator populations and causing severe declines in pollination services for agricultural crops, resulting in economic problems for growers. Even introduced pollinators such as Large earth bumblebee (*Bombus terrestris*) can become a great concern for the future of native pollinating animals. The Large earth bumblebee is currently spreading its range throughout Mexico as fast as 75 km per year, out-competing native bumble bee species as it spreads. The consequences for native habitats and pollinators have been documented in Japan and other countries, and NAPPC has assigned a task force to specifically address this issue in North America.

### **Conclusion**

The negative effects resulting from the spread of invasive species are becoming evident as we witness declines in crop productivity, reductions in populations of animal pollinators needed to maintain stable ecosystems, and widespread alteration of native habitats. Failure to immediately address these issues could have dire consequences for the future viability of human and wildlife populations, as well as the structure of natural ecosystems. The North American Pollinator Protection Campaign is addressing these issues head-on, and among its numerous task forces and committees, it has spearheaded a recently-funded National Academy of Sciences proposal to determine the status of pollinator populations in North America. NAPPC works closely with the International Pollinator Initiative and other proactive efforts to research, document, and effect positive changes for the future of pollinators.

If you would like to join NAPPC as a partner in pollinator protection, please feel free to contact us at [www.napppc.org](http://www.napppc.org) or [napppc@coevolution.org](mailto:napppc@coevolution.org) for more information.



# Invasive Species: Effects on Pollinators and Potential Ramifications

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(NAPPC)





# What is NAPPCC?



- 80+ participating organizations
  - Government & non-gov't. agencies, environmental groups, gardeners, landowners, scientists, beekeepers, farmers, businesses, & private individuals.
  - Non-centralized, collaborative partnership.



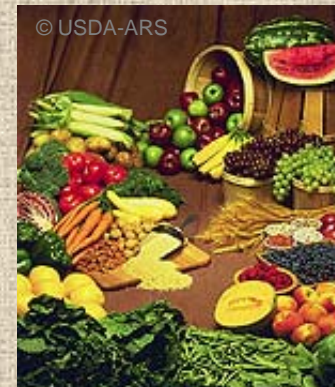
- Promotes pollinator conservation & awareness, uniting research with action
  - United States
  - Mexico
  - Canada





# Ecosystem Service of Pollination

- Bees (native & managed)
- Butterflies
- Moths
- Beetles
- Wasps
- Hummingbirds
- Bats
- Ants
- Flies
- Unusual pollinators (rare lemurs, opossums, geckos)





# Effects of Invasive Plants





# Effects of Invasive Plants





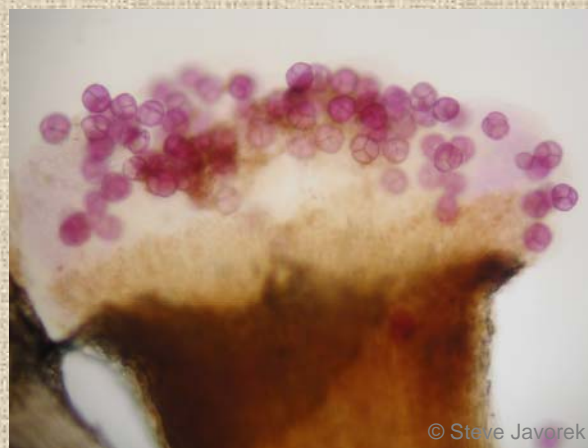
# Effects of Invasive Animals & Pathogens





# NAPPC

## North American Pollinator Protection Campaign



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