



Consequences of Native Pollinator Loss on Plant Species

Evidence of a Pollinator Crisis

- Pollinator declines have been documented on every continent except Antarctica¹
- **Natives**—Declines in native bees have been documented in 7 European countries, Canada and Costa Rica²
- In England, bumblebees have declined more than 60% in the last 70 years and 1 species has recently gone extinct³.
- **Non-Natives**—In the US, managed honeybee colonies have been declining since the 1940's; and 20% have been lost since 1990 (Fig 2)⁴



Fig 1. Pollinator declines have been documented from 6 of the 7 continents

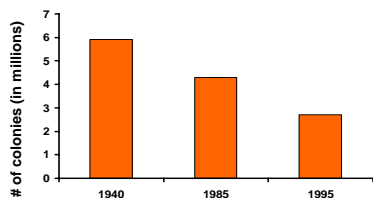


Fig 2. Declines in U.S. Honeybee Colonies

Causes of Pollinator Declines

- Loss of native foraging and nesting habitat^{1,5,6}
- Widespread use of agricultural pesticides¹
- Introduction of non-native species^{1,7}

Why are Pollinators Important?

- 90% of all flowering plants and 33% crop plants depend on animal pollinators to produce fruit^{1,2}
- 62% of all flowering plants studied are limited in fruit production by pollen receipt⁸
- Pollinator diversity has been positively correlated with fruit-set in several crop species⁹
- The estimated annual value of pollinator services is \$112 billion¹

Despite the vital importance of insect pollinators, the status of native insect populations in North America are largely unknown¹⁰. In addition, we do not know the consequences of pollinator loss on native plants.



Predicted Implications of Pollinator Loss for Native Plants

Population Level:

Loss of seed set can lead to population decline and extinction
Loss of genetic diversity in animal pollinated plant populations

Community Level:

Decline in biodiversity within a community due to loss of animal pollinated species

Research Questions

- I. What are the demographic consequences of loss of pollinators on focal plant population dynamics?
- II. Is there reduced genetic diversity in populations that are chronically pollinator limited?
- III. Does loss of pollinators result in reduced plant community diversity?

Scientific Approach

- I In conjunction with a survey on native pollinators, experiments manipulating pollinator environments will be conducted. These data will be used to parameterize demographic models to predict population growth rates of focal species.
- II. The genetic diversity of focal plant populations will be compared among environments that differ in pollinator abundance.
- III. Meta-analysis of published data on plant-pollinator interactions will be conducted to identify vital community links among plants and pollinators. These data will be used to create simulation models to examine the community consequences of pollinator loss

Literature Cited:

1) Kearns CA, Inouye DW, and Waser NM (1998). *Annual Review of Ecol. Syst.* 29:83-112., 2) Kearns CA and Inouye DW (1997). *BioScience*, 47: 297-306., 3) Press Release from May (2003) in *English Nature*., 4) Ingram M, Nabhan GP, and Buchmann S. (1996). *Tropinet*, 7:1., 5) Westrich P (1996) in *The conservation of bees* pp 1-16, ed. Matheson et al. Academic Press., 6) Richards AJ (2001). *Annals of Botany* 88:165-172., 7) Roubik DW (1978). *Science* 1032., 8) Burd M (1994). *The Botanical Review*. 60:63-139., 9) Klien AM, Steffan-Dewenter I, and Tscharntke T (2003). *Proc. R. Soc. Lond. B.* 270:955-96., 10) Cane JH and Tepedino VJ (2001). *Conservation Ecology* 15:1-10., Photograph by Clyde S. Gorsuch