

## Estimating Prevalence of Leaf Miners on White Snakeroot in New York City using Citizen Science data from iNaturalist

### Introduction

The New York Botanical Garden's New York City EcoFlora sponsors a monthly EcoQuest Challenge, encouraging New Yorkers to observe a particular plant species (and animal interaction) for a month and upload their observations to iNaturalist. Each monthly challenge has a collection project in iNaturalist that presents a map of observations and statistics on the number of observations, observers, identifiers and species for that month's activity. The purpose of the EcoQuest challenges is to document species occurrences in New York City and to enhance plant awareness among the population. These objectives contribute to a greater appreciation for nature in New York City and strengthened capacity for biodiversity conservation. Watch the video [here](#).

The EcoQuest Challenge for September 2018 was [WATCH FOR WHITE SNAKEROOT](#), during which 180 citizen scientist observers made 16,370 White Snakeroot observations. Combined with observations made before and after, there are now over 17,000 observations of this native plant species from New York City recorded in iNaturalist.

Reviewing these observations we noted that a great many showed evidence of Leaf Miner activity. And we wondered whether we could use these observations to illuminate just how strong the link between insect and plant really is.

### White Snakeroot Plants



White Snakeroot is a plant species in the sunflower family (Asteraceae) native throughout eastern North America from New Brunswick to Saskatchewan south to Florida and Texas; usually in partial sun to shade in rich, moist, neutral to basic soils. The species is found throughout New York City from pristine woodlands to walls, sidewalks and abandoned lots. The species is very abundant and widespread throughout New York City. It persists in moderately degraded natural areas and colonizes new areas where there is some shade and competition is not too great. Several factors probably contribute to its abundance in the urban environment of New York City. It is shade tolerant; tolerates wet to moderately dry soils; prefers neutral to basic soil (higher pH), which characterizes urban soils in general with high inputs of concrete, masonry rubble, plaster, road salt, etc.; it is pollinated by a wide range of insects; and its seeds are wind-dispersed. As European settlers moved into the Midwest, the cows they brought with them foraged in what were Native American hunting grounds, settlements and farm lands—areas where White Snakeroot was abundant. Well-known to indigenous peoples as a powerful medicine, the plant was used by them to treat snakebite and other conditions.

When cows eat the plant, a toxin called Tremetol is metabolized in their gut and causes vomiting, trembling and severe intestinal pain. It also poisons the milk. Humans who consumed the milk succumbed to the same symptoms and sometimes died. One of the most famous victims was Nancy Lincoln, mother of the sixteenth president of the United States who drank milk tainted with Tremetol and died in 1818. A pioneer in more ways than one, the Illinois doctor, midwife and herbalist, Anna Pierce Hobbs Bixby (1808–1869) was the first to experimentally demonstrate the connection between the White Snakeroot plant and the illness known then as Milk Sickness, but neither she, nor the indigenous woman who taught her the plant received any professional recognition for their discovery during their lifetimes.

### Leaf Miner Insects

Insects are apparently unharmed by the chemicals in White Snakeroot plants. Insects observed visiting, nectaring or collecting pollen on White Snakeroot plants in [New York](#) include Monarch Butterflies (*Danaus plexippus*), Blue-winged Scoliid Wasps (*Scolia dubia*) and Black-shouldered Drone Flies (*Eristalis dimidiata*). Another Fly associated with White Snakeroot is the White Snakeroot Leaf Miner (*Liriomyza eupatoriella*) in the Leaf Miner family (Agromyzidae), a family of over 2,600 species that feed exclusively on plant tissue (phytophagous). Agromyzidae occur throughout the world from the tropics to the high arctic. Adult females pierce the plant tissue and deposit their eggs at preferred sites on the plant, such as the leaf, leaf stalk, stem, seed or root. The eggs develop into larvae inside the plant, usually within a few days. Most Agromyzidae species are monospecific, meaning that each Fly species will lay eggs exclusively on a single species of plant. The larvae feed on tissue inside the plant, leaving excavations behind that are often visible as trails (called mines).

Species in the *Liriomyza* genus number about 500, with more being described recently. In 2011, twelve new species of *Liriomyza* were described from California.



*Napomyza lateralis*, adult.  
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### The LOOK FOR LEAF MINERS AT HOME Research Project



We are leveraging the large number of White Snakeroot observations from New York City to ask a simple scientific question: *How many White Snakeroot plants in New York City show evidence of Leaf Miner activity?* Our hypothesis is that a significant number (maybe more than half) of plants in New York City will show evidence of Leaf Miner activity. To test our hypothesis, we are asking for help evaluating the 17,266 observations of White Snakeroot from New York City. Participants are asked to review each observation and mark it as either showing evidence of Leaf Miner activity; not showing evidence of Leaf Miner activity; or unclear (data deficient).

These data will illuminate dynamics of this unique plant-animal interaction in New York City, and help conserve the insect and its host plant, both of which are native to the City and have important ecological roles.

### **Preliminary Results (ongoing)**

[All New York City White Snakeroot observations](#)

[Observations reviewed for Leaf Miner activity](#)

[Observations with Leaf Miner activity](#)

[Observation without Leaf Miner activity](#)

[Observation where Leaf Miner activity is unclear](#)

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