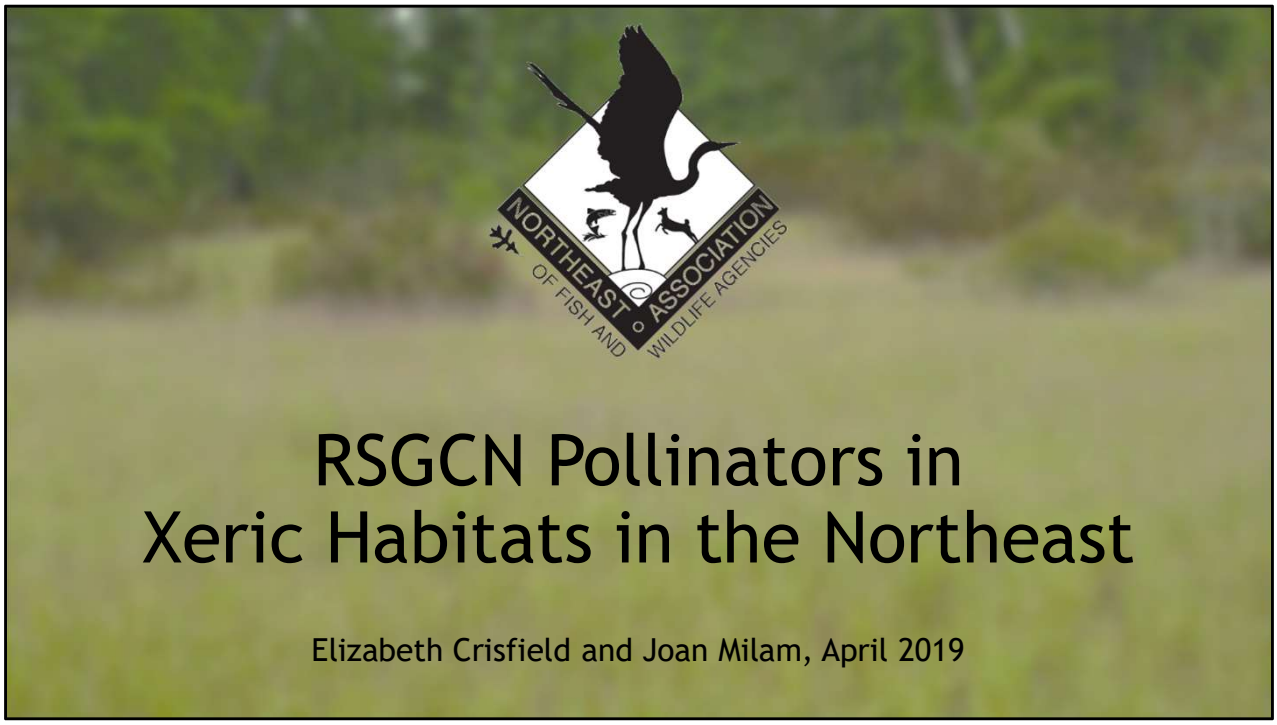
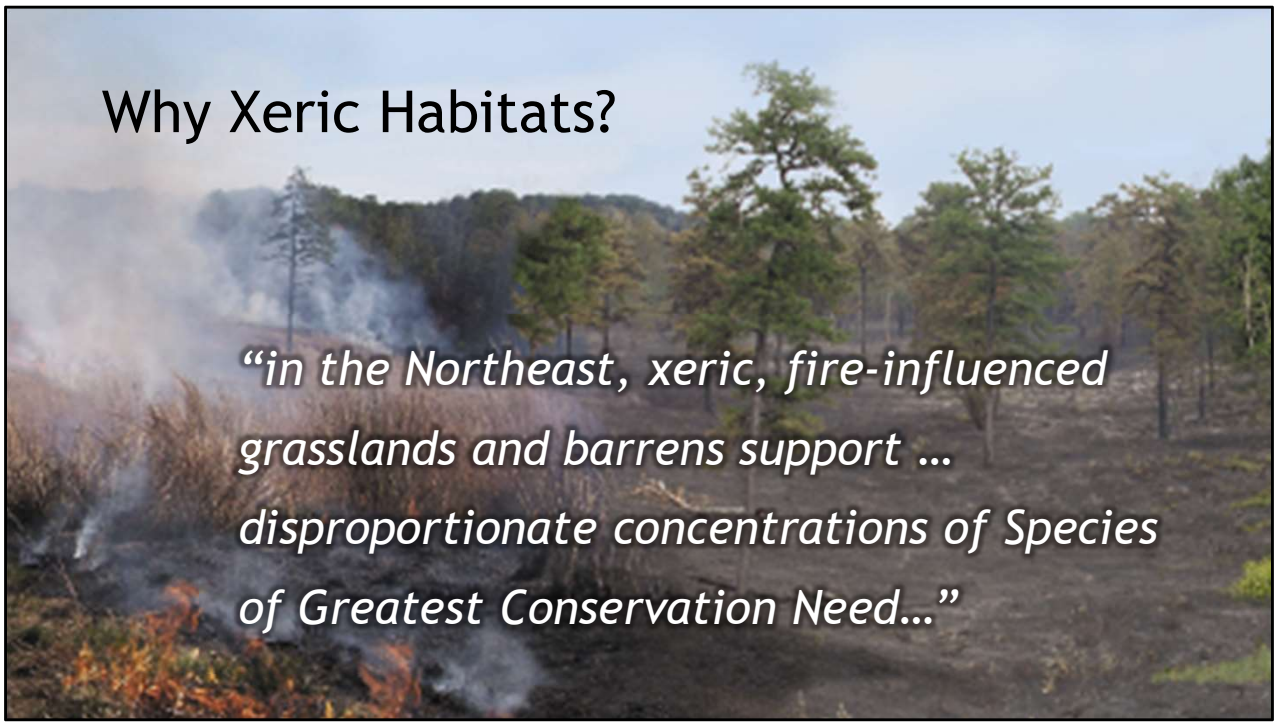


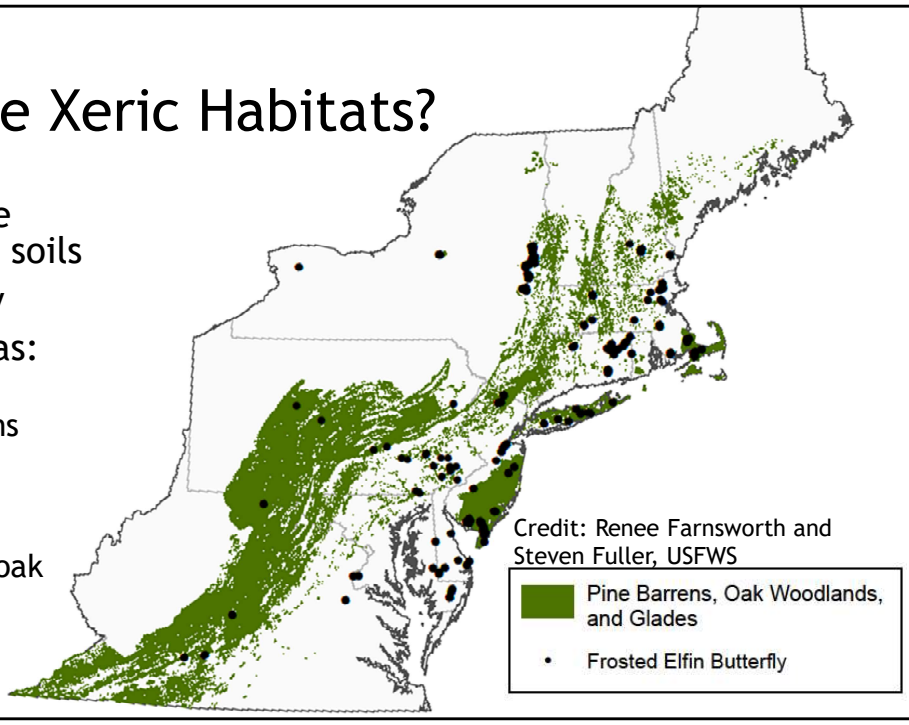

We're telling a who-what-when-where-how-why-story (emphasis on who) about conservation of pollinators in Xeric habitats.
This project was developed by the NE Fish and Wildlife Diversity Technical Committee and is funded jointly by States through NEAFWA's Regional Conservation Needs Grant Program, which pools State Wildlife Grant Funds.


Why Xeric Habitats?
"in the Northeast, xeric, fire-influenced grasslands and barrens support … disproportionate concentrations of Species of Greatest Conservation Need…"


Why Xeric Habitats?
"in the Northeast, xeric, fire-adapted grasslands and barrens support … disproportionate concentrations of Species of Greatest Conservation Need…"

# Where are Xeric Habitats?

- Sand or shale well-drained soils
- Open canopy
- Referred to as:
  - sandplains
  - sand barrens
  - heathlands
  - scrub oak shrubland
  - pitch-pine oak woodland




Credit: Renee Farnsworth and Steven Fuller, USFWS

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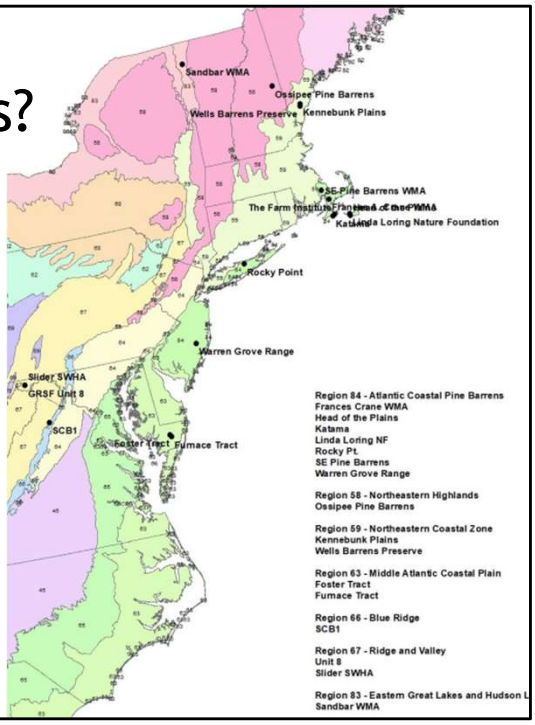
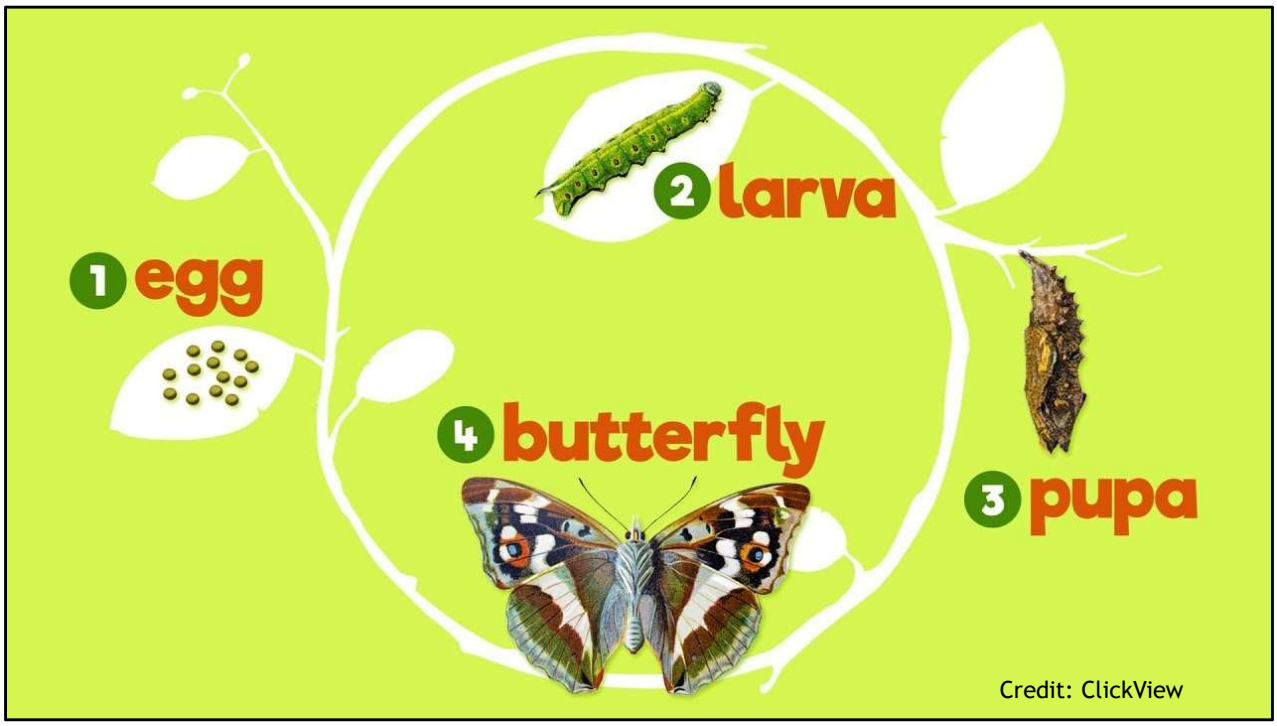
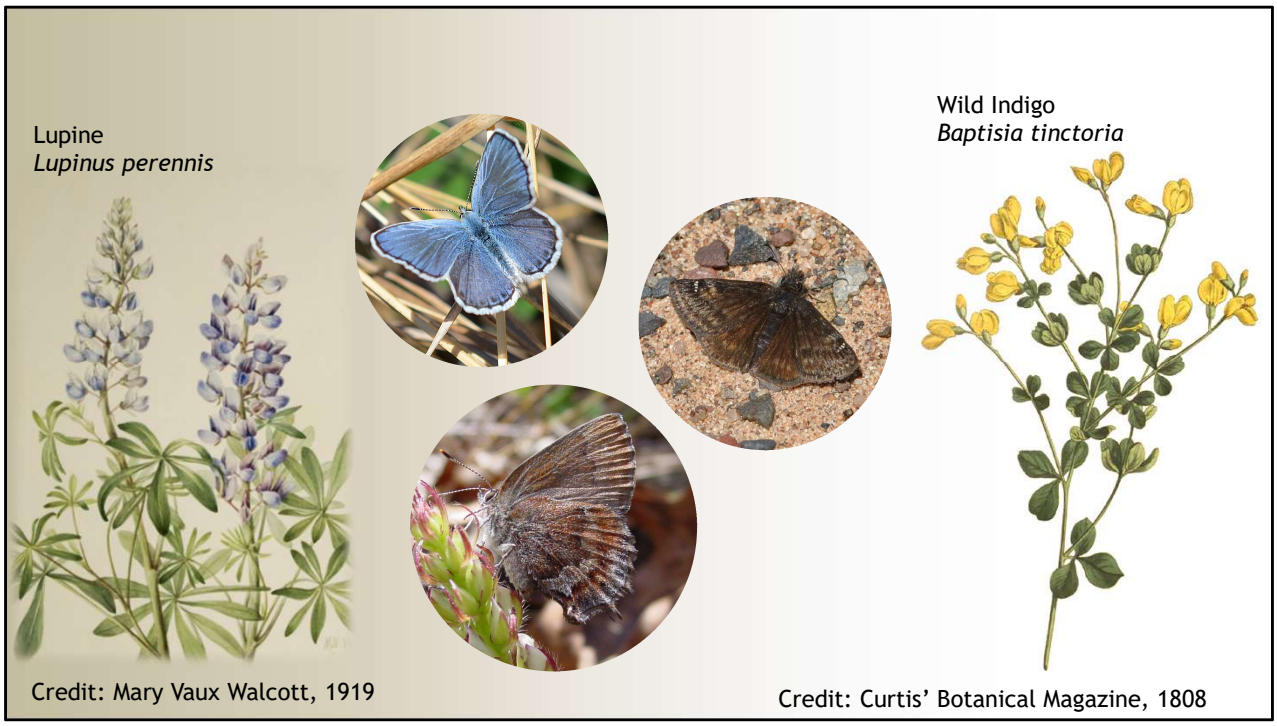


Who are the target species?




Thanks to books like the Hungry Caterpillar by Eric Carle and media attention for the monarch butterfly, we're all pretty familiar with this life cycle. But unlike the monarch – few of the butterflies and moths in Xeric habitats migrate – this entire life cycle occurs on site. As butterflies become more endangered their life cycle constrains habitat management. One of the goals of our project is to understand how managers can work with this life cycle to enhance habitat condition and limit impacts to the species.

All butterflies and moths (the scientific Order Lepidoptera) have preferred "host plants" where they will lay their eggs, because their larva will grow strong by eating the plant – some are very specific and require a single plant species, or a small group of related plant species. So host plant conservation is a major focus in butterfly conservation. All butterflies and moths will create a chrysalis or cocoon (respectively) in which to undergo metamorphosis – many of the species at Xeric sites overwinter in this phase of the life cycle, and often these pupa are in the soil or leaf litter at the site. Emergence from the pupa is triggered by light, temperature, chemical signals, or hormones and occurs in a known time period that is different for different species. Opportunities to monitor for these species are best during the adult flight period, or by searching host plants for larva.




Three Very High Concern RSGCN rely on lupine and wild indigo in the pea family plants as host plants.

# Karner Blue

*Plebejus melissa samuelis*

- 3 sites
- Statuses:
  - Federally Listed Endangered
  - NY/NH SGCN
  - Very High Concern RSGCN
- Host Plant: Lupine
- Overwinters as: eggs
- Lifecycles: 2

Credit: Timothy Stanley NativeBeeology

The Karner Blue is found at 3 sites participating in this project in NY and NH where it is a SGCN. It is federally listed as “endangered” and is a Very High Concern NE RSGCN. It uses lupine exclusively.

# Frosted Elfin

*Callophrys irus*

- 9 sites
- Statuses:
  - Under review
  - 12 state SGCN
  - Very High Concern RSGCN
- Host Plant: Lupine or Wild Indigo
- Overwinters as: larva
- Lifecycles: 1

Credit: pondhawk, Flickr

The Frosted Elfin is an important one at many of the Xeric sites, though it has been extirpated from many of them. The species is currently under review for Federal Listing.

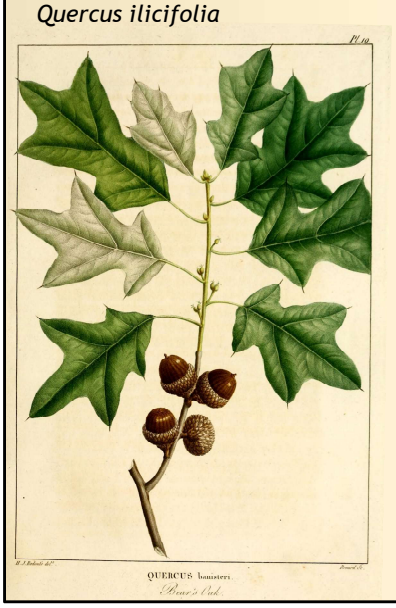
# Persius Duskywing

*Erynnis persius persius*

- 2 sites (known)
- Statuses:
  - 8 state SGCN
  - Very High Concern RSGCN
- Host Plant: Lupine and Wild Indigo
- Overwinters as: Pupa
- Lifecycles: ?

Credit: Aaron Carlson

7 RSGCN associated with
Bear Oak or Scrub Oak
*Quercus ilicifolia*



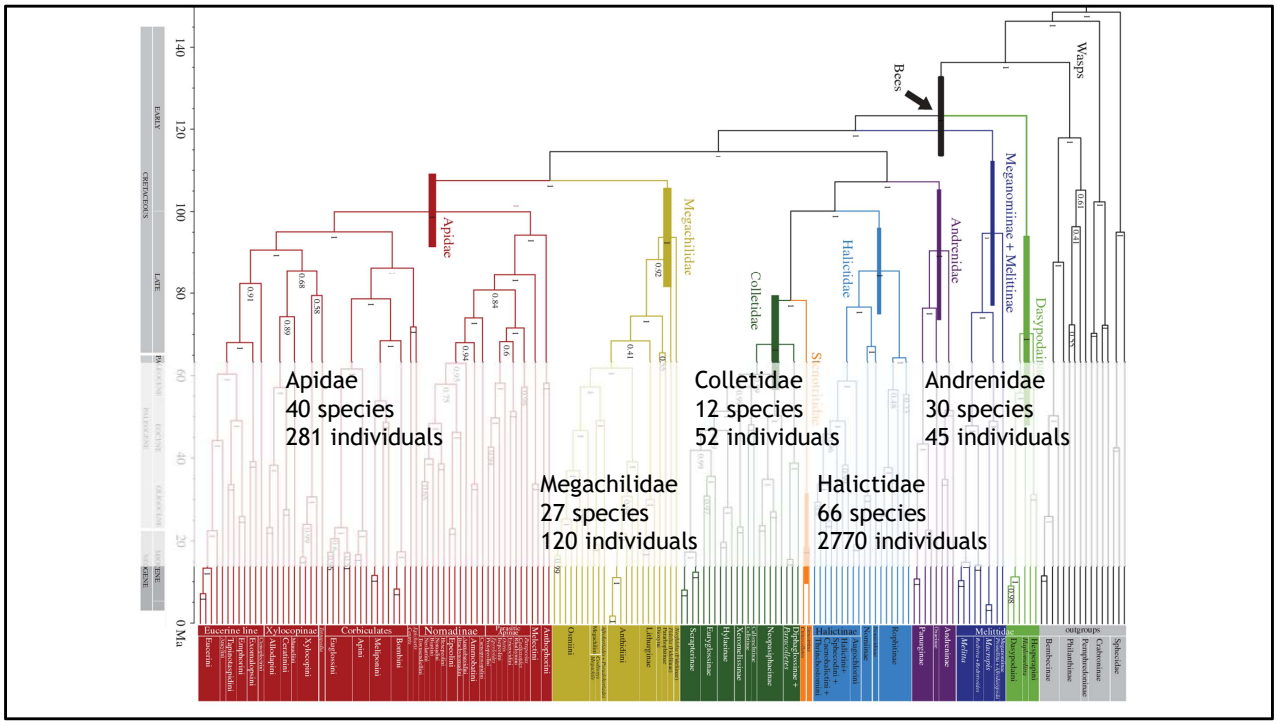

- Eward's Hairstreak (Satyrium edwardsii)
- 5 sites
- Moderate Concern RSGCN
- 8 state SGCN
- Overwinters as: eggs

- Pine Barrens Zale (Zale lunifera)
- 5 sites
- High Concern RSGCN
- 6 state SGCN
- Overwinters as: pupae

- Barrens Dagger Moth (Acronicta albarufa)
- 2 sites
- Moderate Concern RSGCN
- 4 state SGCN
- Overwinters as: pupae

Other RSGCN rely on scrub oak as a host plant.

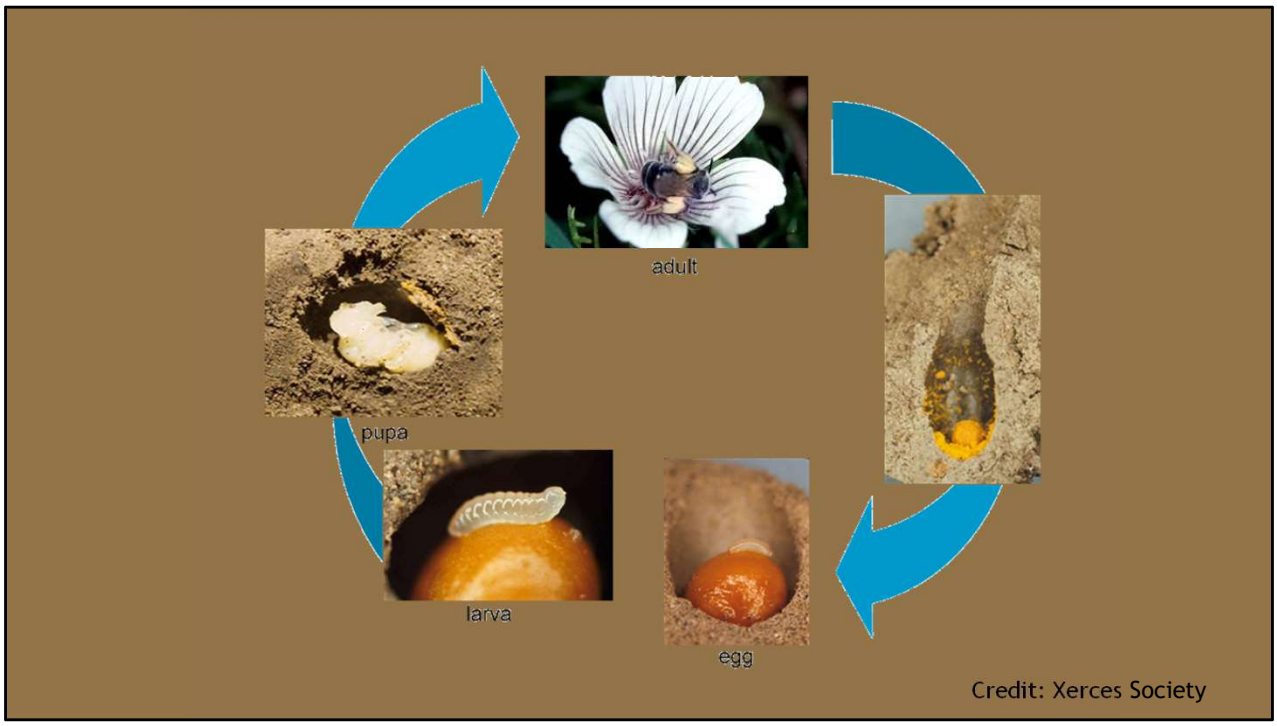

OK, now let's take a look at some bees. Nearly all the photos in this section are from the USGS Bee Inventory and Monitoring Lab – with great appreciation for sharing their work.




This is the phylogeny, as currently understood, of bees. This branch of the tree of life started about 120 million years ago, and our most recent bee families (Colletidae) originated about 65 million years ago. **[CLICK]** When we combine what we know from previous survey work and what we learned in 2018, we find that Xeric Sites have species in 5 of these families. In this slide, the number of individuals just represents the 2018 monitoring effort. The very large number of Halictidae is skewed by just 1 very common species.


Augochlorella aurata was the most abundant bee found in 2018 at 11 Xeric Sites – all told, Joan Milam ID'd 1556 of these – close to half of all bees collected at sites! This species seems to be a generalist with respect to pollen collection. It nests on flat ground, underground, in clusters of horizontally oriented cells.

This is interesting, but since we want to learn more about our rare bees, we'll move on.




First, let's talk about how these species live… we all know the adults visit flowers to collect their food – pollen. The queens lay eggs in nests, that they provision with pollen for the larvae to eat. The larvae typically pupate in the nest before emerging.

But let's talk about some other details. Bumble bees have social order, but most of the bees are solitary, or live close to other bees, sometimes even in the same nest – but most of them aren't really working together.

About 70% of bees nest underground, in tunnels and chambers, and sometimes in burrows left by other animals. The rest nest in wood or stems.

About 20% of bees are cleptoparasitic – they don't make their own nests and provision them, they go into another bees nest and lay their egg, and the larvae eat the other bees babies and live on their pollen before emerging. These bees are typically more rare compared to their hosts.

Some species are specialists with respect to plants and pollen, others are pretty indiscriminate. We don't have plant associations for all of the species at these sites yet – this kind of information about species and their life histories is an expanding frontier for researchers, but we know some of these plants, and I'll mention them as we proceed.

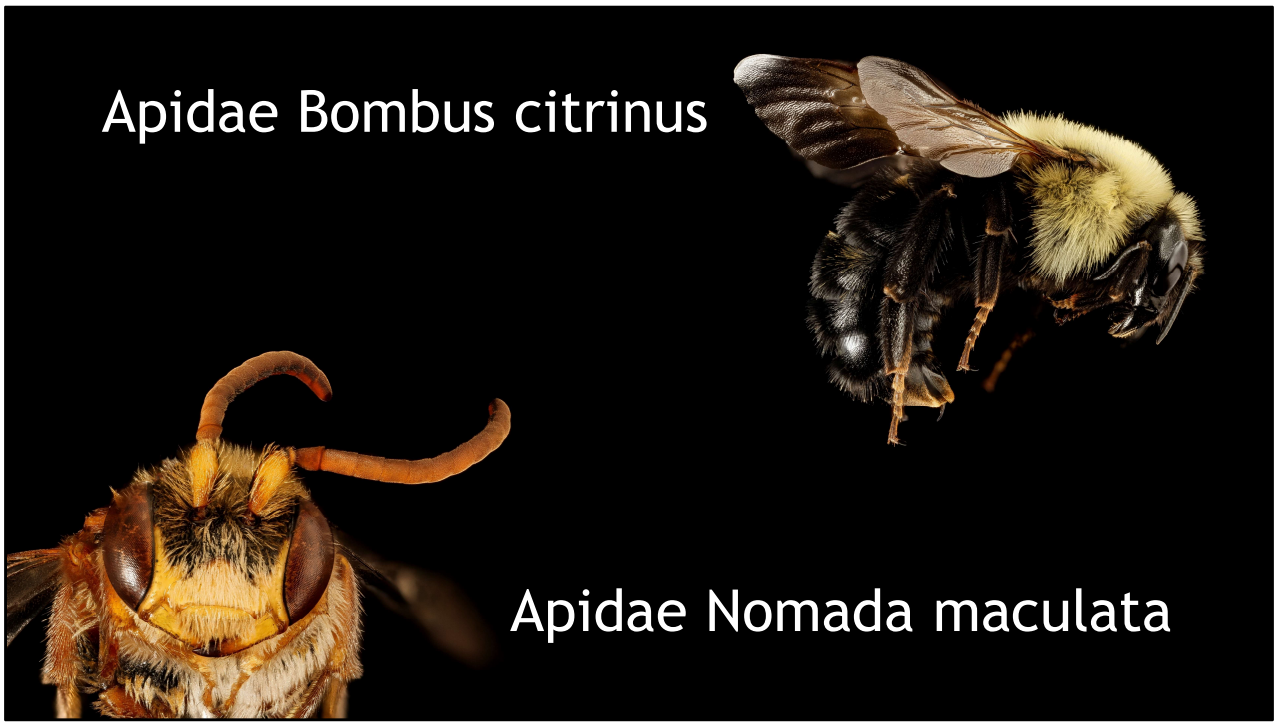
We are telling you all this, because it helps explain why these sites are managed to leave open bare soil – better habitat for ground-nesting bees. As with many other species, dead standing wood and downed wood are also good nesting habitats for bees.

Dave King putting bee bowls out at Montague Plains. Bee populations at this site have been studied for years. Several rare bees are found here: L. katherineae, L. georgeickworti, Macropis. Bee fauna differ at this site, than, for example, NY's Albany Pine Bush, which is also well-studied.


Our sites have at least 66 species in the family Halictidae and they fly throughout the season. Most are ground nesting. Some are communal – but they don't have social orders. Two species, Lassioglossum arantium and georgeickworti, are NE RSGCN, Moderate Concern, and believed to be associated with Xeric sites. In fact, 16 sites have one or another of the Lassioglossom species. Some of these species are VERY small, just a few mm long. This species, Agapostemon virescens, has been found at 11 of our sites.


7 Osmia species (mason bees) have been found on these sites, including the famous blue orchard bee which pollinates fruit crops. We believe this genus may be strongly associated with conditions like we find at Xeric sites. This species, pumila, has been found at 8 of our sites – it seems to be a generalist with respect to flowers, and likely nests, like other mason bees, in cavities or stems, separating each egg cell with packed soil.


We have 12 species in this family. The species can be found throughout the season and are solitary ground nesting bees. Several species seem to be plant specialists, associated with Asters, Goldenrod, blueberries for example. Colletes Validus has been found at 4 sites, which is actually the most of any of the Colletes bees. If these bees are xeric associated (they do nest at the Concord Pine Barrens) they seem to be rare.




There are 40 species in the Apidae family at our sites. These include the bumble bees, but also 8 other genera. 5 RSGCN bumble bees have been found at the sites – B. citrinus is RSGCN data deficient. It is not found often, but was found on Nantucket at one of our sites last year.

But Apidae also includes 14 Nomada species that have been found on our sites. Nomada are cleptoparasitic and use the nests of the Andrena Genus of bees. Nomada maculata has been found at 6 sites.

So I hope that gives you a taste of the pollinator biodiversity we have identified so far. We have just finished the first year of a 5-year project. Based on analysis of species requirements for butterflies, moths, and bees – we are building an understanding of important plant species, vegetative community structure, soil conditions, and other habitat requirements for these diverse target species.

In these habitats, and with these target species, we are fighting a lot of data deficiency issues right now. In the last RSGCN review cycle, our expert group for native solitary bees really struggled to assess many of the species – we just don't know enough about their historic and modern population size and geographic ranges. And generally, across the U.S., so few people are trained to identify bee species, that we lack the capacity to adequately survey and monitor these species. Yet from the few we know well – we have reason to be concerned about significant declines. The situation for lepidoptera is slightly better, because species id is possible from photos and doesn't require as much training. Still, many of those species can be hard to find and notice – they don't all have bright colors and flit around in the sunlight.

While we are not actively monitoring butterflies and moths, we have the benefit of 4 more monitoring seasons for bees at these sites. At the end of the project, we should have built a much better understanding of the habitat requirements of these species, and how to

manage habitats for the best conditions.