



## Bees on the Brink

Research at Cape Cod National Seashore

### Importance: Pollinators at risk in a changing climate

Bees provide a critical ecosystem service, pollination, yet we know little about their abundance, diversity, and distribution across National Park Service (NPS) lands. We know even less about the possible effects of climate change on bee populations. Coastal areas are particularly vulnerable to effects from climate change, and sand dunes are often hot spots for rare and/or endemic bee and plant species. Cape Cod National Seashore is one of 48 NPS units that are surveying the distribution of bee species in vulnerable habitats (coastal dunes, inland dunes, and alpine areas). The bee species within the targeted habitats are compared to bee species found in nearby, more common habitats. Comparing these different habitats within each park will reveal if there are rare and/or endemic bee species associated with sensitive areas which might be vulnerable to processes such as species loss, population decline, and disruption of pollination networks in response to climate change. These areas can then be targeted for future monitoring, and where appropriate, for active management.

### Sampling Location



*Lasioglossum accuminatum*, Female  
Photo: Public Domain



**Collecting bees:** Pouring the contents from one of the 30 blue, yellow, and white "bee bowls" through a strainer, and then into a plastic bag for storage and shipping.

### Methods

Four sites were sampled at Cape Cod National Seashore. One pair of sites was located near Provincetown on the north end of the Cape, and the other pair near the Park Headquarters by Marconi Beach. Bowls were filled with soapy water and left open for 24 hours on sunny days, collecting bees which are attracted to the color. The Marconi sites were sampled in August, 2010, and all sites were sampled three times between May and October, 2011, timed to coincide with peak bee activity. After each run, bees were collected (see photo above) and sent to a central processing facility at Patuxent Wildlife Research Center (USGS Maryland) for identification.



Vulnerable Site  
Near Marconi Beach



Common Site  
Near Marconi Beach

# Results

A total of 719 bees were collected across four sites at Cape Cod National Seashore in 2010 and 2011. The Provincetown sites on the north end of the Cape yielded a total of 338 bees, with the vast majority (314) of specimens collected at the common site, and almost three times as many species collected at this site compared to the vulnerable dune site (29 versus 10 species). This disparity in numbers may be due to higher floral richness at the common site. Two sand-associated species, *Lasioglossum marinum* and *L. georgeickworti*, were collected only at the dune site. The common site had a particularly high diversity of sweat bees (family Halictidae), including the genera *Agapostemon*, *Augochlorella*, *Augochloropsis*, *Halictus*, *Lasioglossum*, and the parasitic *Sphecodes*, but with just two sand-associated species, *Agapostemon splendens* and *Lasioglossum leucomum*. The rarely collected cellophane bee, *Colletes solidaginis*, was also found at the common site. As its species name suggests, this bee specializes on goldenrod (*Solidago*) pollen.



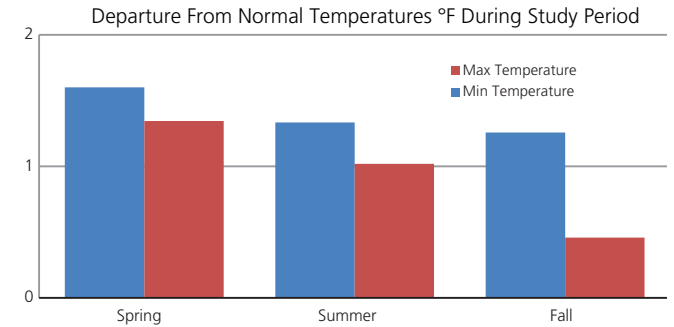
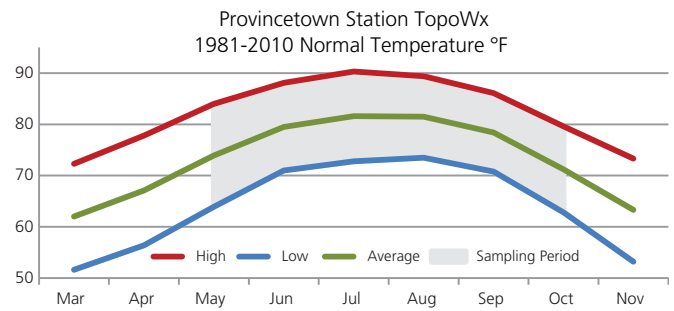
*Lasioglossum floridanum*, a sand specialist found in the vulnerable site.  
Photo: Public Domain

The two sites further south in the Marconi area yielded 381 bees, with more bees collected at the vulnerable site (243) than at the common site (138). However, the common site had slightly more species compared to the vulnerable site (20 versus 17 species). Although the vulnerable site was in a sparsely wooded area, it had a strong “sand signal”

with sand-associated bees such as *Lasioglossum marinum*, *L. leucomum*, *L. floridanum*, and *Agapostemon splendens*. The *Lasioglossum floridanum* is of particular interest because these 35 specimens represent the first records for Massachusetts and the northernmost known populations. The Marconi sites were also dominated by sweat bees (Halictidae).



*Lasioglossum marinum*, a sand specialist found in the vulnerable site.  
Photo: Public Domain



The top graph shows the 30 year normal minimum, maximum, and average temperatures from a weather station in or near the park, for the months that bees were sampled. The bottom graph shows how seasonal temperatures during the five year (2010-2014) study period departed from normal. Spring warmed the most, but all three seasons were warmer than normal, driven by both warmer maximum temperatures during the day and warmer minimum temperatures at night.  
Data source: Corrected weather station data sets, used as inputs to create TopoWx. (Oyler et al., 2014)



*Colletes solidaginis*

Comparison of bee species richness within genera in the four common and vulnerable sites in Cape Cod National Seashore

