

Assessing the geographic distribution and conservation status of *Heuchera alba* and *Heuchera pubescens* using field surveys, morphology and genomics methods

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Key Questions

- Which species do the populations found in Pennsylvania belong to, *H. pubescens* or *H. alba*?
- Are the populations expected to be *H. alba* genetically healthy?
- What is the identification of the primary pollinator associated with *H. alba*?

Introduction

Heuchera, a genus of 43 species in the Saxifragaceae family endemic to North America, contains a variety of species which are often difficult to distinguish morphologically. Similarities among species are sometimes due to sympatric hybridization between species, which has caused confusion in defining boundaries relating to taxonomy [1]. This uncertainty has led to challenges in determining geographic distributions of similar taxa and definitive identification of the species within the Northeast region. Within Pennsylvania, two species are historically recognized throughout the state: *Heuchera americana* and *H. pubescens* [2]. However, a third species previously unknown for the state was found by Drs. Chris Martine and Scott Schuette in 2017 and later identified by Dr. Ryan Folk through social media, and this species was the globally-imperiled *H. alba* (white alumroot) [2,4] - the morphologically-similar sister species to *H. pubescens* previously only known from parts of Virginia and West Virginia.

As *H. americana* and *H. pubescens* were thought to be the only species within Pennsylvania, *H. alba* was not listed in The Plants of Pennsylvania [3] nor has there been an update in online databases for *H. alba* to include the expanded distribution of the species. The scope of our research is something that would possibly lead to this update and help identify the locations that were overlooked for *H. alba*. In this study, we assess the geographic distribution of *H. alba* along a portion of the Appalachian Ridge in Pennsylvania by a) visiting known localities (based on herbarium records) for *H. alba* and *H. pubescens* and b) tracking appropriate habitat to find previously unrecorded *H. alba* (or *H. pubescens*) localities. We then intend to assess whether these populations are genetically healthy in order to help create a conservation plan for them.

As part of our surveys, we also conducted pollinator observations with particular focus on the alumroot cellophane bee, *Colletes aestivalis*. Until recently, this species had not been seen in Pennsylvania since 1918.



Figure 1 Example of *Heuchera alba* (A) at a site in Northumberland County (B), growing at the top of the cliff at Shikellamy State Park, and (C) *H. alba* habitat

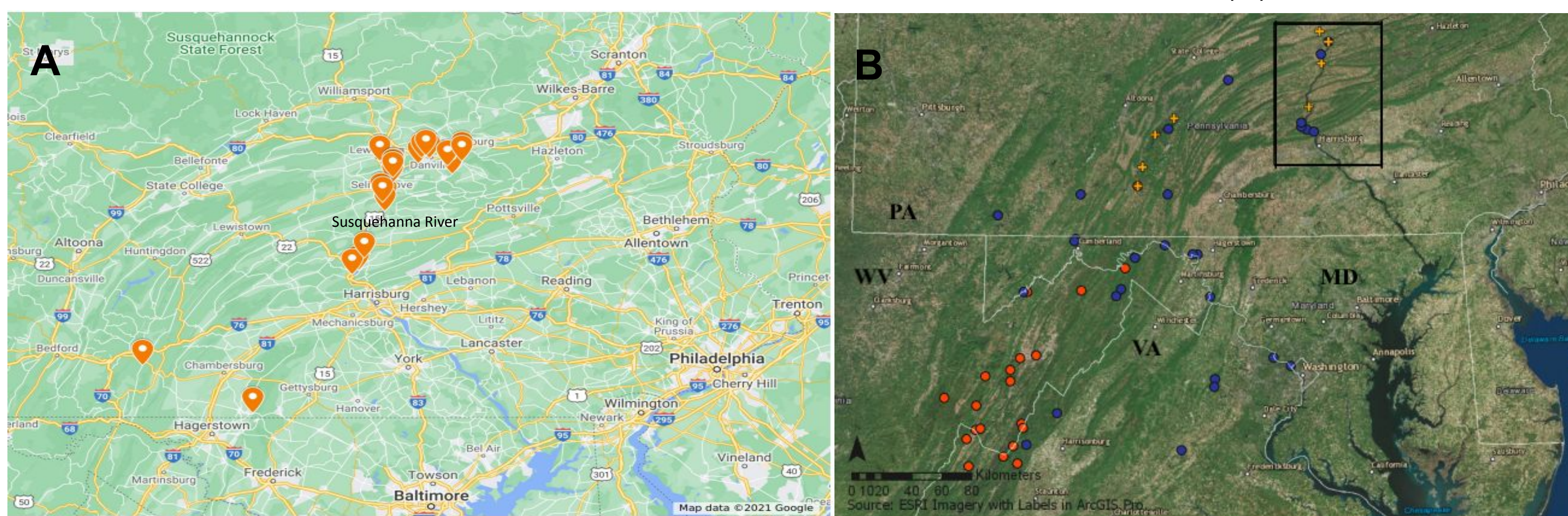


Figure 2. (A) Map of the 22 Pennsylvania collection sites visited this summer in the Susquehanna River Valley; (B) Map from Schuette, et al. (2018) showing previous understanding of distributions of *H. pubescens* (blue dots), pre-2017 *H. alba* (orange), and new 2017 *H. alba* localities. Black box shows Susquehanna Valley area covered in Map A. Note that all blue dots in the valley are now attributable to *H. alba*.

Bees

Colletes aestivalis, also known as the alumroot cellophane bee, is a ground-nesting specialist pollinator on *Heuchera*. Previous to 2019, this species had not been recorded in Pennsylvania since 1918. In June 2019, bees suspected to be *C. aestivalis* were collected from five *Heuchera alba* populations by Scott Schuette, Christopher Tracey, and Chris Martine. These specimens were eventually identified as *C. aestivalis* in the spring of 2021 by entomologist Mike Slater, confirming the first state records in 101 years and first occurrences of the bee on *Heuchera alba*. Over the summer of 2021, Anais and Maddie have collected seven bees from six different sites that were confirmed to be within the genus *Colletes*, a combination of 2 males and 5 females were collected. However, identification of the particular species for each individual is currently in progress. The identification of this species suggests that healthy populations of *H. alba* in the Susquehanna Valley are also likely to support populations of *C. aestivalis*. We suspect that our future population genetics results for *H. alba* may reflect the reliance of these plants on site-specific oligolectic bees for much of their pollination.



Figure 3. *Colletes* cf. *aestivalis* (alumroot cellophane bee) (A) foraging on *H. alba*, and (B) close-up.

Key Findings

- *Heuchera alba* is much more common in the state of Pennsylvania than previously thought. Through our research this summer it has been determined that all PA Susquehanna Valley records for *H. pubescens* appear to actually be attributable to *H. alba*. *H. alba* can best be described as a central Appalachian endemic that reaches the northern extent of its range in central Pennsylvania.
- *Heuchera alba* is associated with open, sheer rock faces/cliffs within the Valley/Ridge fold/thrust belt (deformed Paleozoic sedimentary strata) (as per Jeff Trop, pers. comm.). In the Susquehanna River Valley, the species is often encountered where this geology is exposed on riversides, roadsides, and railroad corridors.



Figure 4 Anais and Maddie at an *H. alba* field site in Pennsylvania.

Looking Forward

- Population genetics analysis
- Locating more populations based on ecological modeling informed by our new collections
- Working with the Western Pennsylvania Conservancy to update the conservation status of *H. alba*

References

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