

Life on the Quarry Wall Vs the Quarry Floor: *Parthenocissus quinquefolia*

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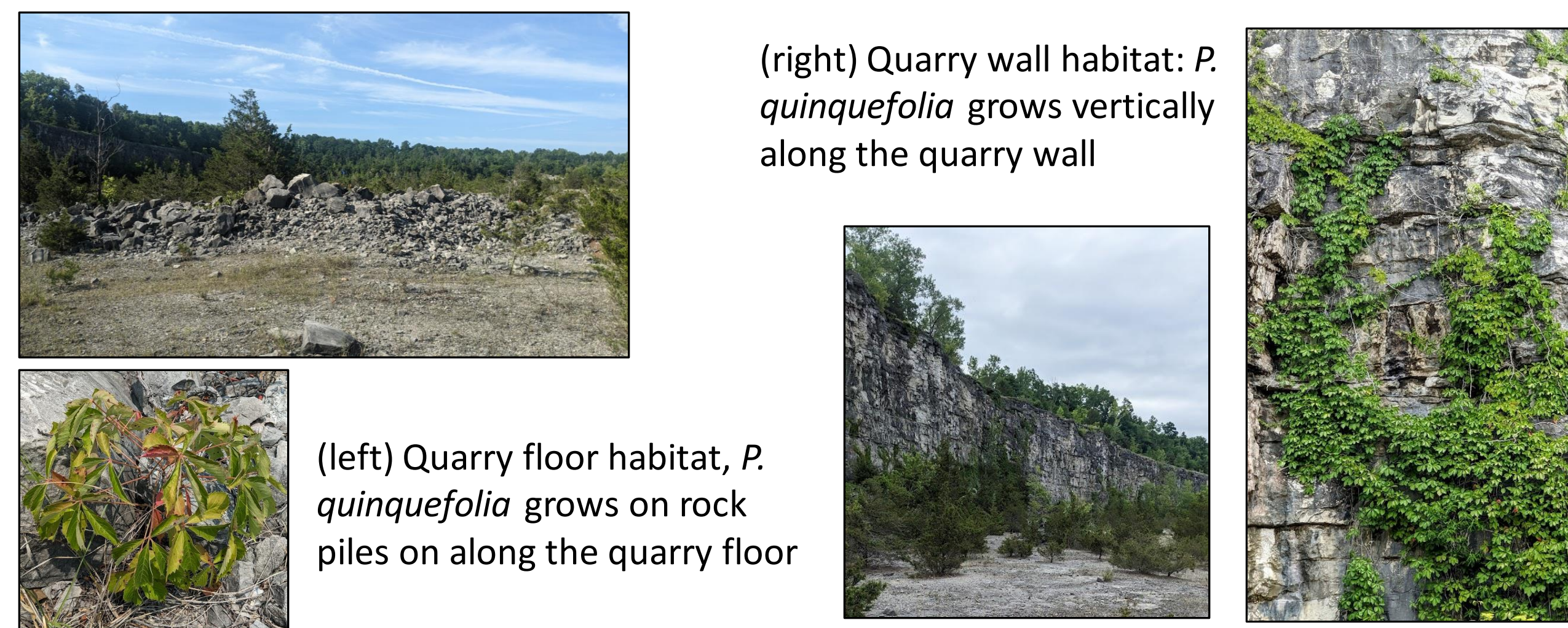
With: Quincie Simmons and Lauren Kyburz, Summer 2023

Site and Species Description

Parthenocissus quinquefolia, Virginia creeper, is a perennial, flowering, woody vine native to eastern and central North America. It is established throughout the DePauw Nature Park.

The study takes place in the former limestone quarry mine with relatively sparse vegetation. The quarry walls are roughly 20 meters tall, and the rock is relatively loose. The quarry is composed of 330–335-million-year-old fossiliferous marine limestone.

P. quinquefolia is found in two habitats in the quarry: growing vertically up the quarry walls or on the piles of large rocks on the quarry bottom.

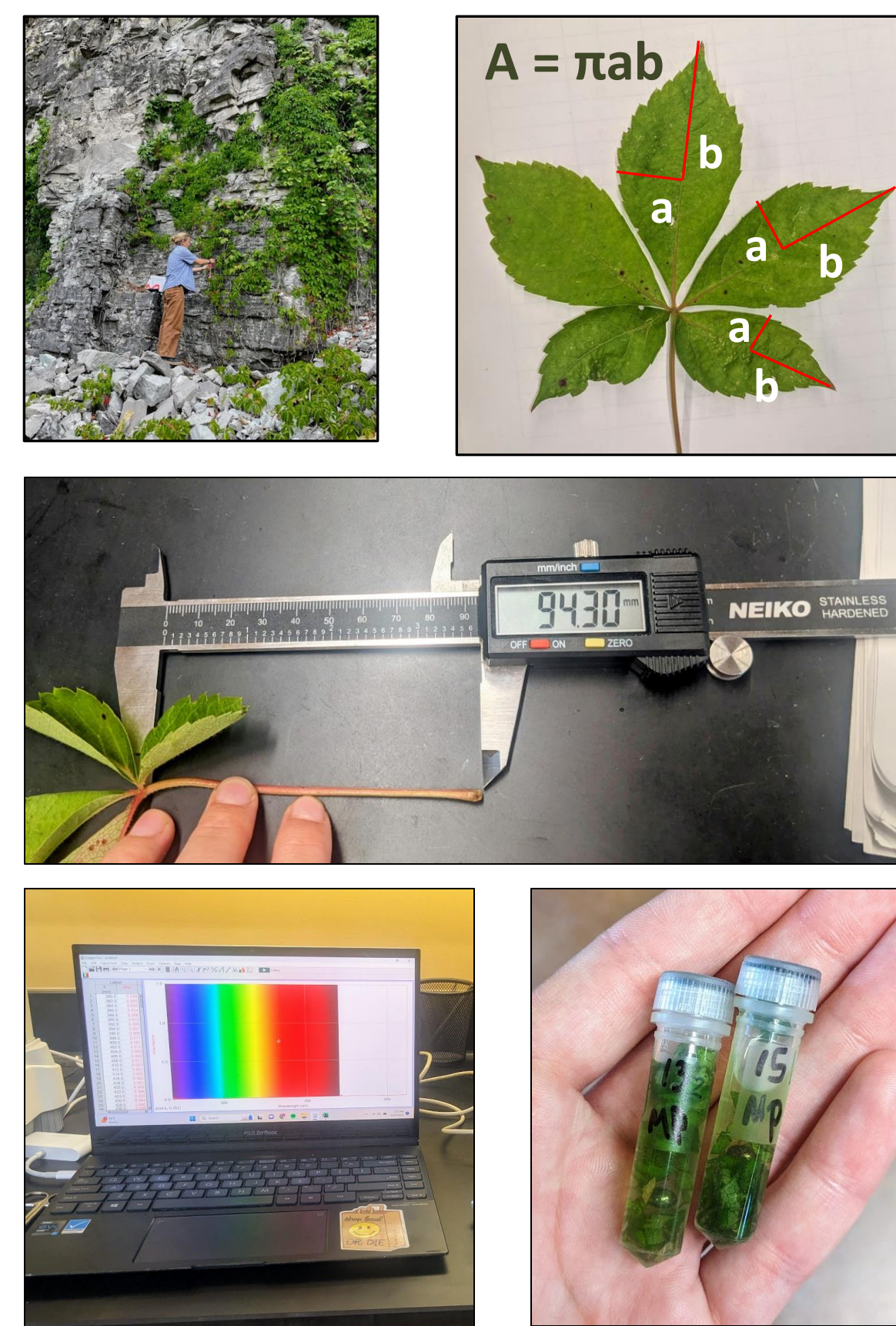


Hypothesis

The quarry presents two novel habitats for *P. quinquefolia*, quarry wall and quarry floor. I hypothesized that the *P. quinquefolia* growing on the wall would show less signs of stress and higher fitness than those growing along the quarry floor.

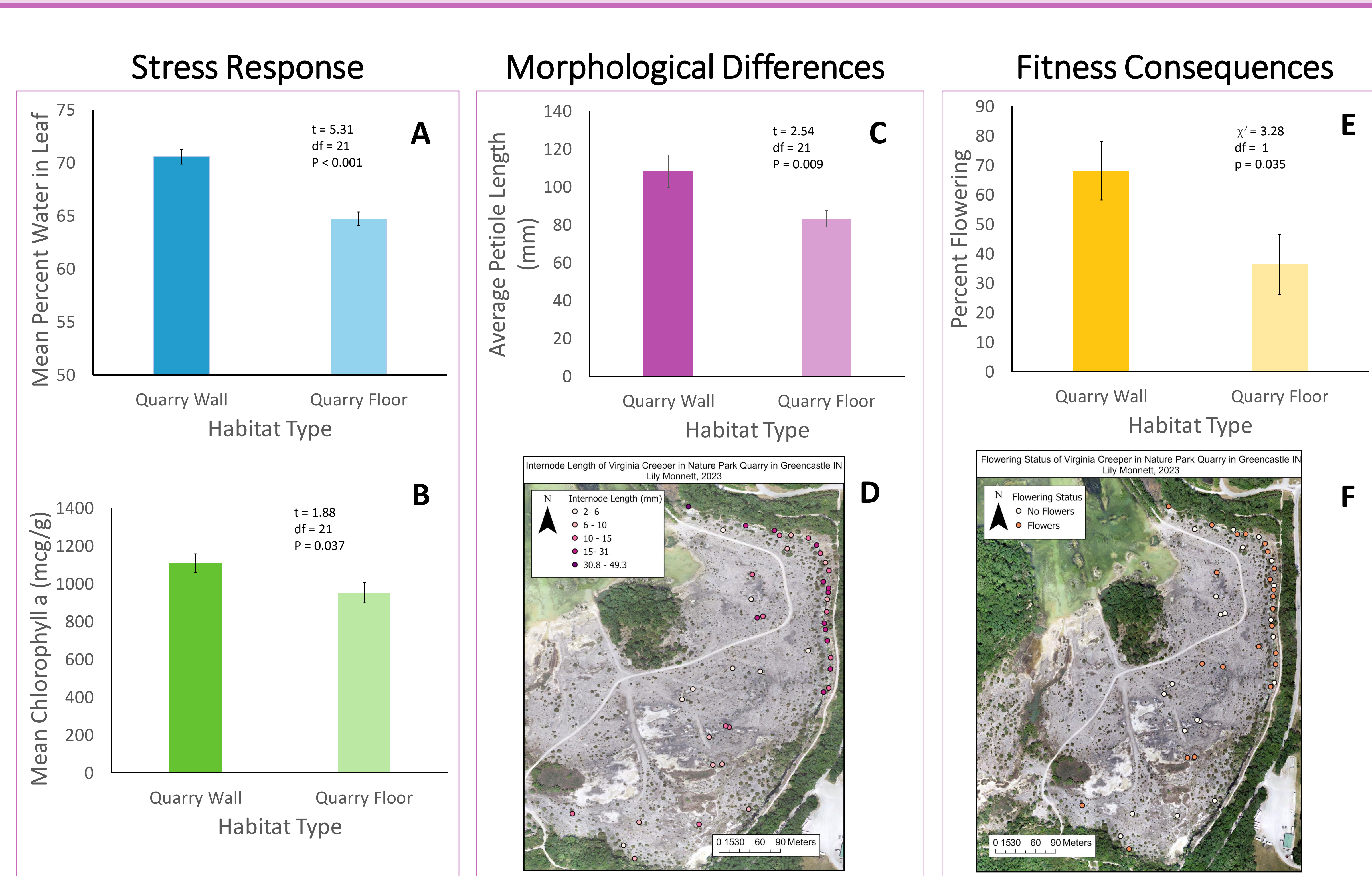
Methods

- Flagged and mapped 22 plants from each habitat
- To assess stress response:** quantified water and chlorophyll content in leaf samples
- To assess morphological differences:** quantified leaf area, stem diameter, petiole length, and internode length
- To assess fitness:** observed flowering status of all flagged sample plants



Literature cited

Larson, Douglas et al., 2000. *Cliff Ecology: pattern and process in cliff ecosystems*. Cambridge, UK ; New York : Cambridge University Press.



- Stress Response:** *P. quinquefolia* growing in the quarry floor habitat showed higher stress responses for percent water content (figure A) and chlorophyll a content (figure B), meaning they get too little water and too much sun exposure.
- Morphological Differences:** Plants growing on the quarry floor had different morphological structures, with shorter internode lengths (figure D) and petioles (figure C) than plants on the quarry wall, making the plants more compact.
- Fitness Consequences:** *P. quinquefolia* found on the quarry floor flowered significantly less than those on the quarry wall (figures E and F). Sexual fitness of plants on the quarry floor is likely reduced this year.
- Additionally, the plants on the quarry floor had statistically significantly reduced leaf area, dry and wet masses, and stem diameter compared to plants on the wall.

Conclusions and Future Work

- Parthenocissus quinquefolia* on the quarry floor experiences light, heat, and water stress and consequently demonstrates morphological differences from its typical viny growth.
- It's possible that the quarry wall habitat allows for growth similar to that in forested areas, making it more hospitable for *P. quinquefolia* growth.
- The *P. quinquefolia* population on the quarry floor is likely not self-sustaining because only 36% of those individuals flowered. This successional population likely needs to be supplemented with seeds from outside populations, including the quarry wall, which flowered much more than those on the floor, for this successional quarry floor population to persist.



Cliff Ecology

Cliff ecology is largely understudied because it can be difficult and dangerous to collect data on biotic and abiotic cliff features. However, cliffs are viable and vital habitats with unique characteristics and communities. In former quarries, cliffs can act as important successional borders that can contribute to successional communities.

Because cliffs are so difficult to access, they are some of the least human-disturbed habitats left. For this reason, cliffs can serve as havens for those less productive and vulnerable species (Larson et al., 2000). Cliff ecology needs to be further studied to understand its influence on sensitive species and ecosystems as a whole.

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