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Summer 2021

### Life on the rocks: Small-scale primary succession in an abandoned limestone quarry

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# Life on the rocks: Small-scale primary succession in an abandoned limestone quarry

Sophia P. Atkinson, Diana Borse, Cedrick Chandler, Daniel L. Saltz and Dana A. Dudle  
Biology Department, DePauw University, Greencastle, IN 46135 USA

## Succession in Quarries

Abandoned quarries are highly disturbed anthropogenic landscapes, devoid of soil but with heterogenous surfaces including bedrock, gravel, and temporary ponds. Gilardelli et al. (2016) showed that shrubland communities replaced assemblages of pioneer herbaceous species in limestone quarries within 40 years. Here we report on the patterns of localized primary succession and re-vegetation of a limestone quarry in central Indiana that was retired 44 years ago.

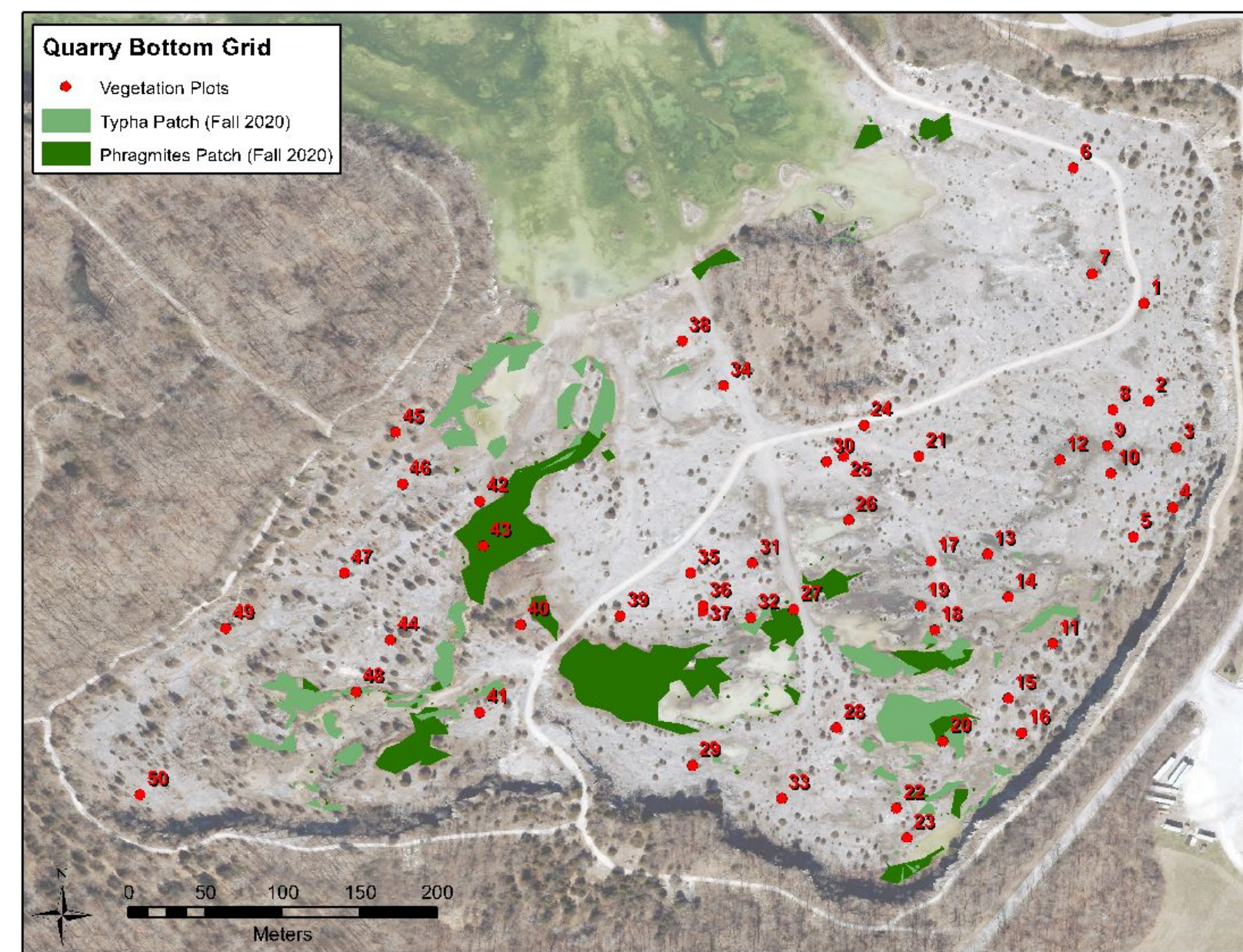


## Methods

The limestone quarry floor at the DePauw University Nature Park was surveyed in 2018 and 2020 to identify flowering plants (excluding most grasses). We recorded each species' native status, wetland status, growth form, and perennial status among other attributes, and we described several distinct habitats within the quarry.

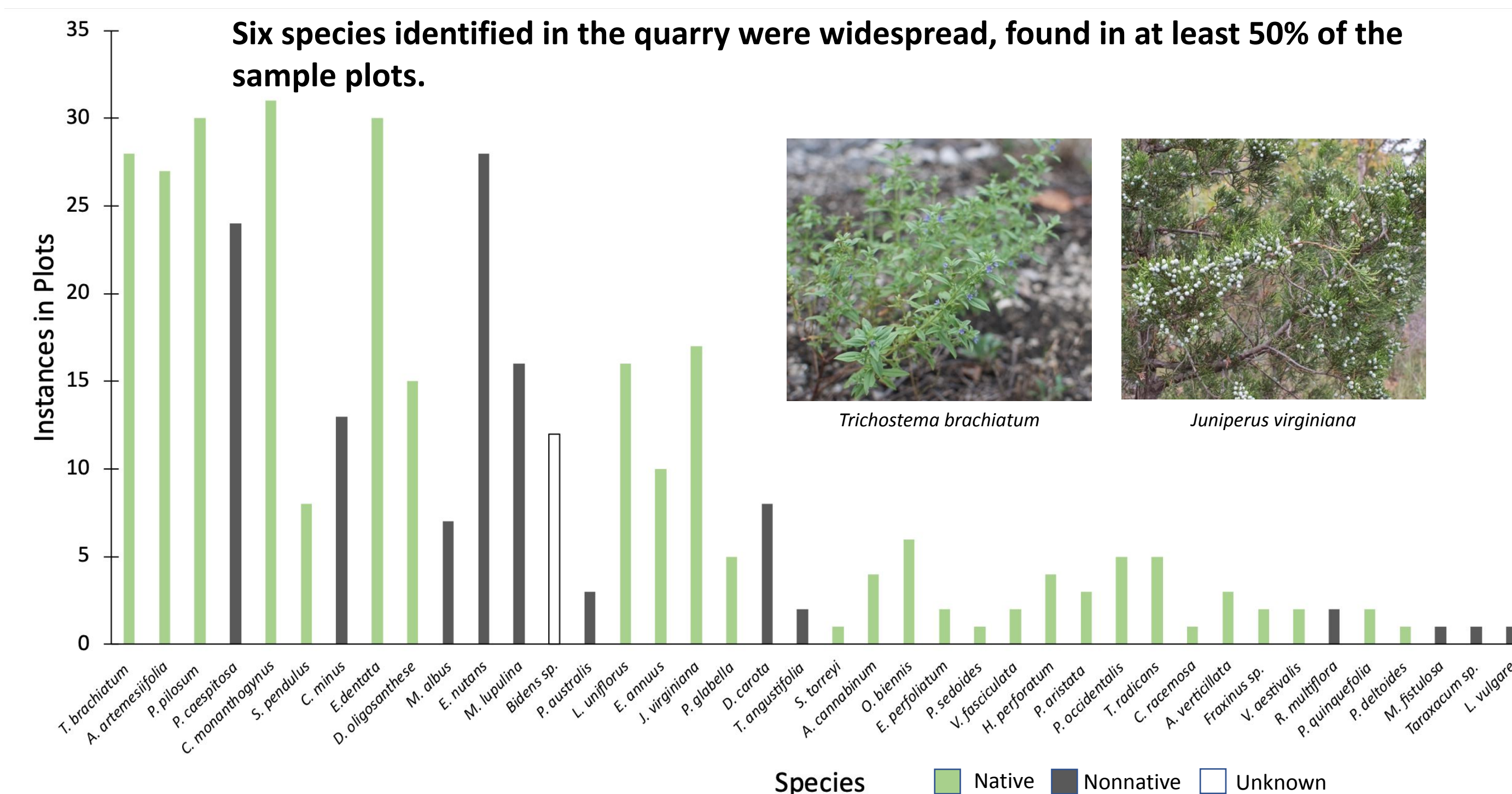
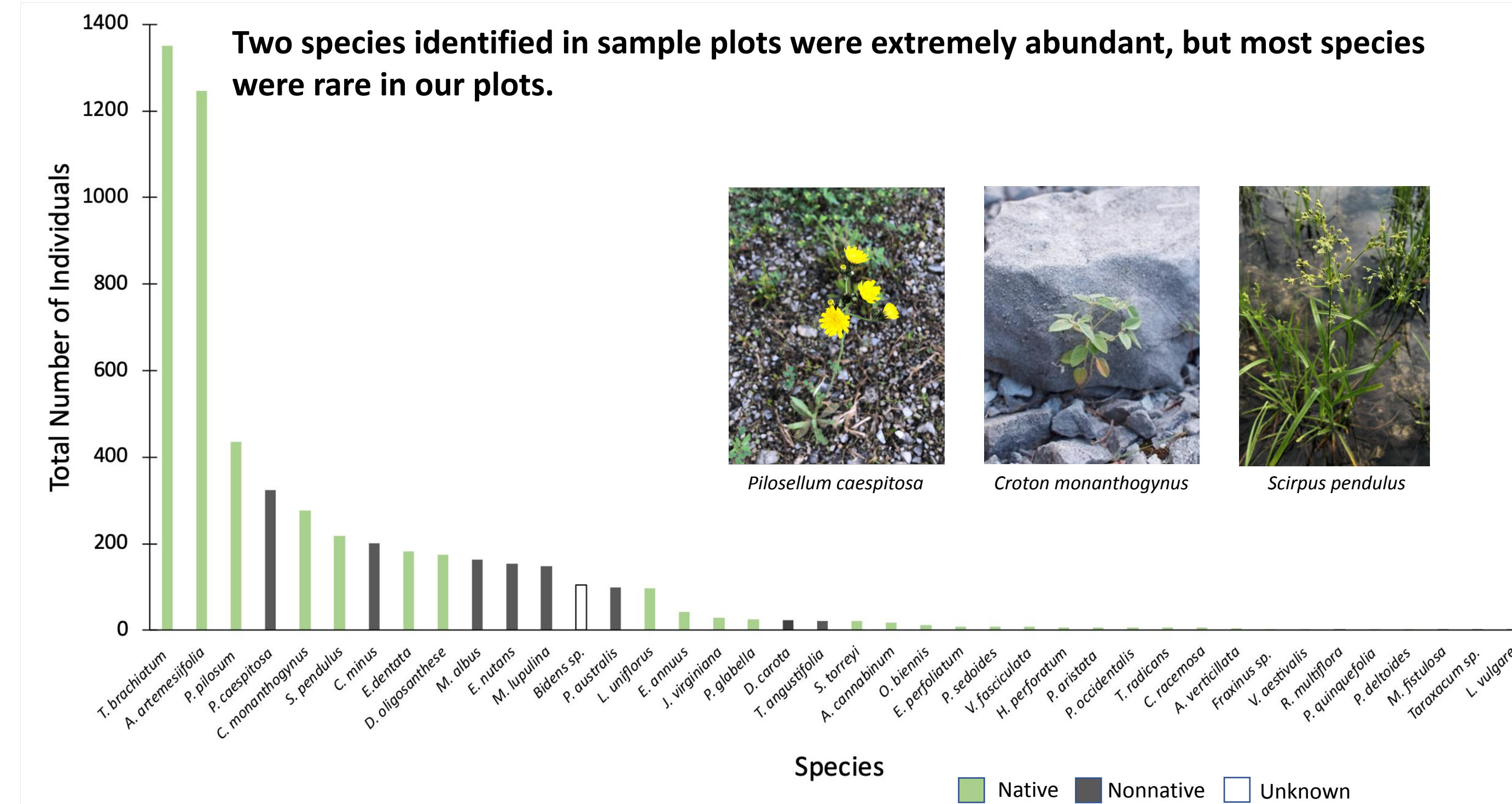
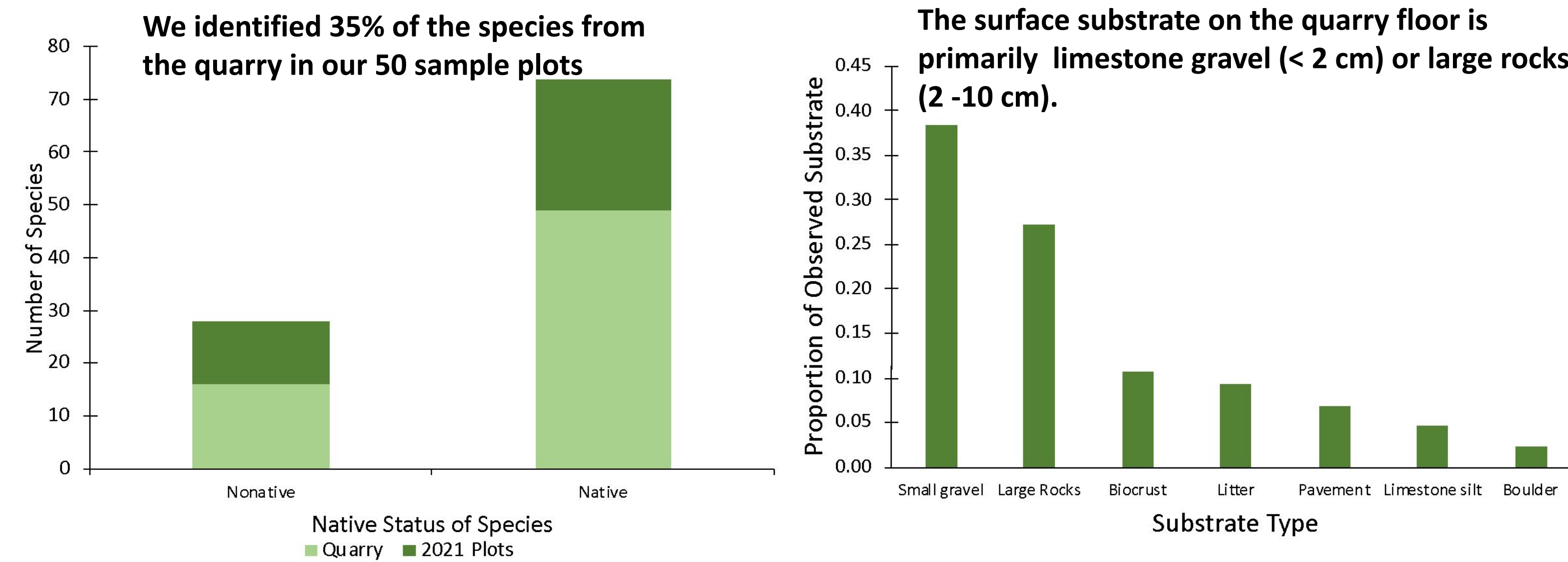


In summer 2021, we established and mapped 50 random sample plots across the quarry floor (left). To examine the distribution and abundance of flowering plants and substrate types on the quarry floor, we identified and counted individual plants, and described the surface substrate of the quarry floor in the sample plots.



Randomly chosen sample plots on the quarry floor, with monoculture stands of invasive *Typha angustifolia* and *Phragmites australis* overlaid.

## Results from Vegetation Plots



## Results from Quarry Survey

- We identified 106 species of flowering plants on the quarry floor, 72% of which are native to Indiana.
- 21% of species identified are facultative or obligate wetland species.
- Most of the wet areas are occupied by monoculture stands of two aggressive grasses.
- Only 28% of species identified in the quarry are woody perennials, and most are sparsely distributed.
- Talus slopes and rock piles occupy small proportion of the total quarry but host more than 2/3 of the woody plant species.

## Conclusions

- Portions of the quarry floor are hospitable to many native wetland species, but invasive plants may hinder establishment of wetland communities.
- Primary succession in the quarry is slower than the timeline stated in the literature.
- Shrubland communities have not yet replaced assemblages of herbaceous pioneer species in this quarry as described by Gilardelli et al. (2016)

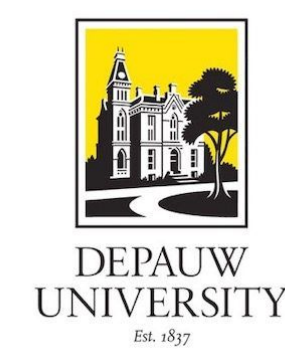
## Acknowledgements

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Above: the active quarry in 1950.

Right: the abandoned quarry in 2020.

## Results from Quarry Survey

- We identified 106 species of flowering plants on the quarry floor, 72% of which are native to Indiana.
- 21% of species identified are facultative or obligate wetland species.
- Most of the wet areas are occupied by monoculture stands of two aggressive grasses.
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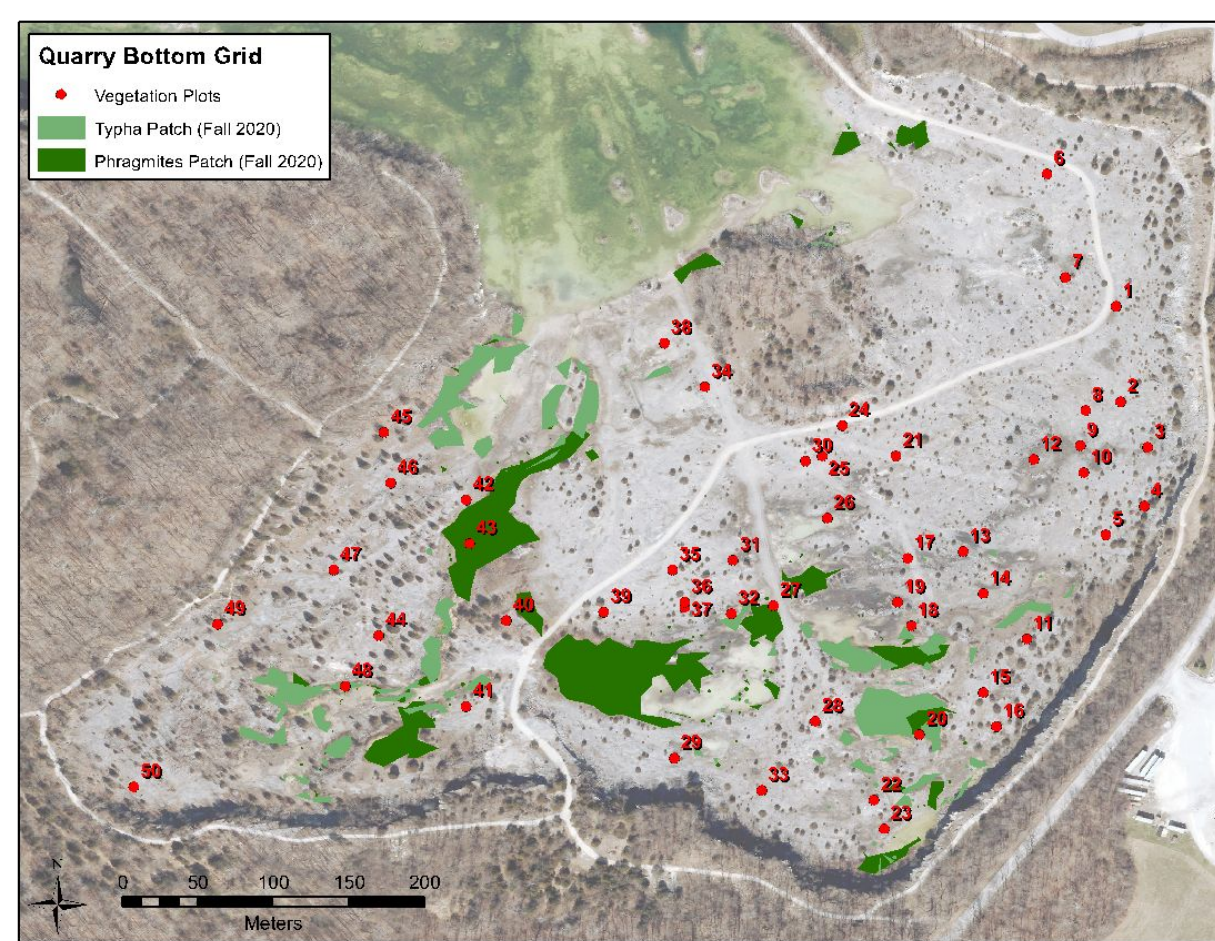
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## Methods

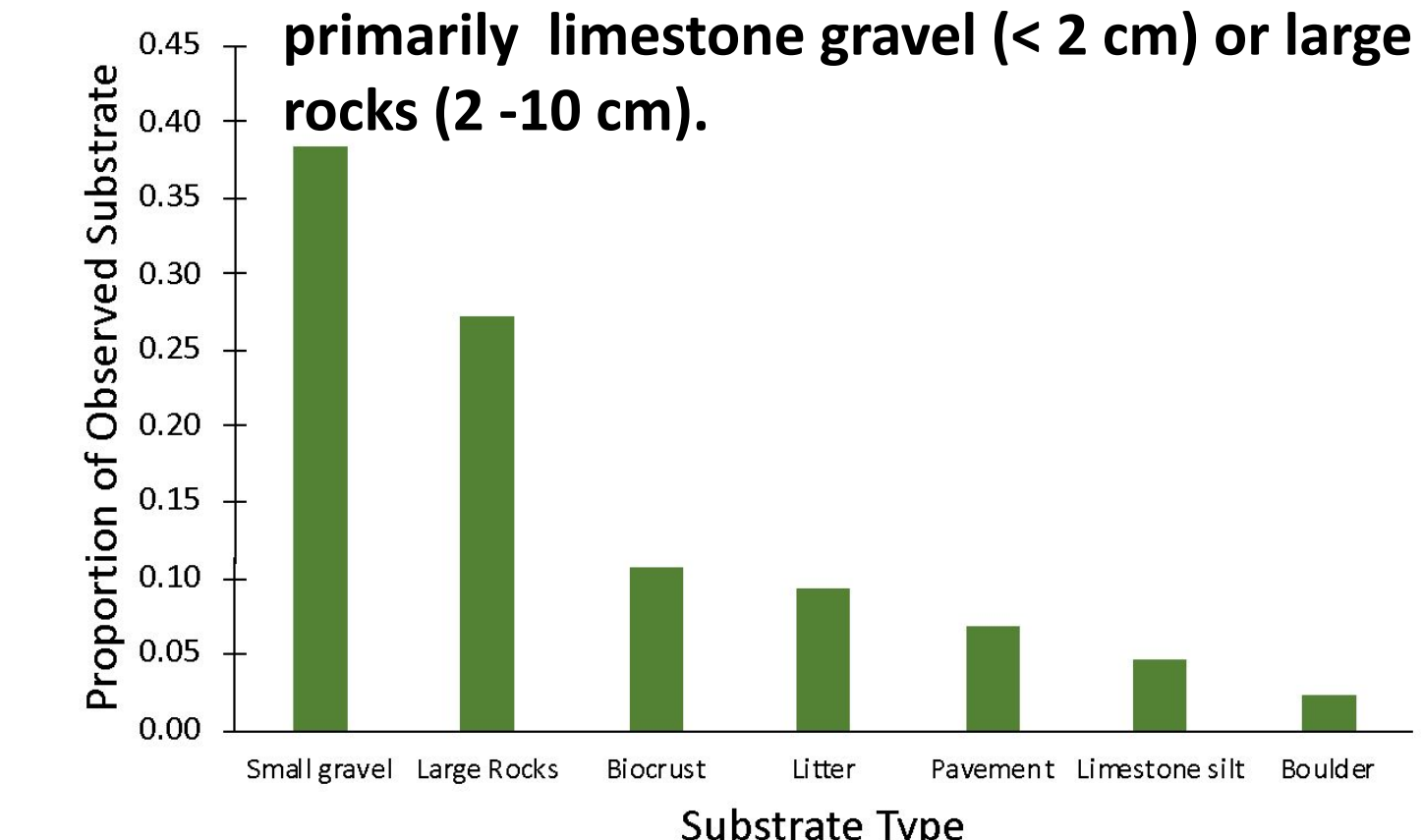
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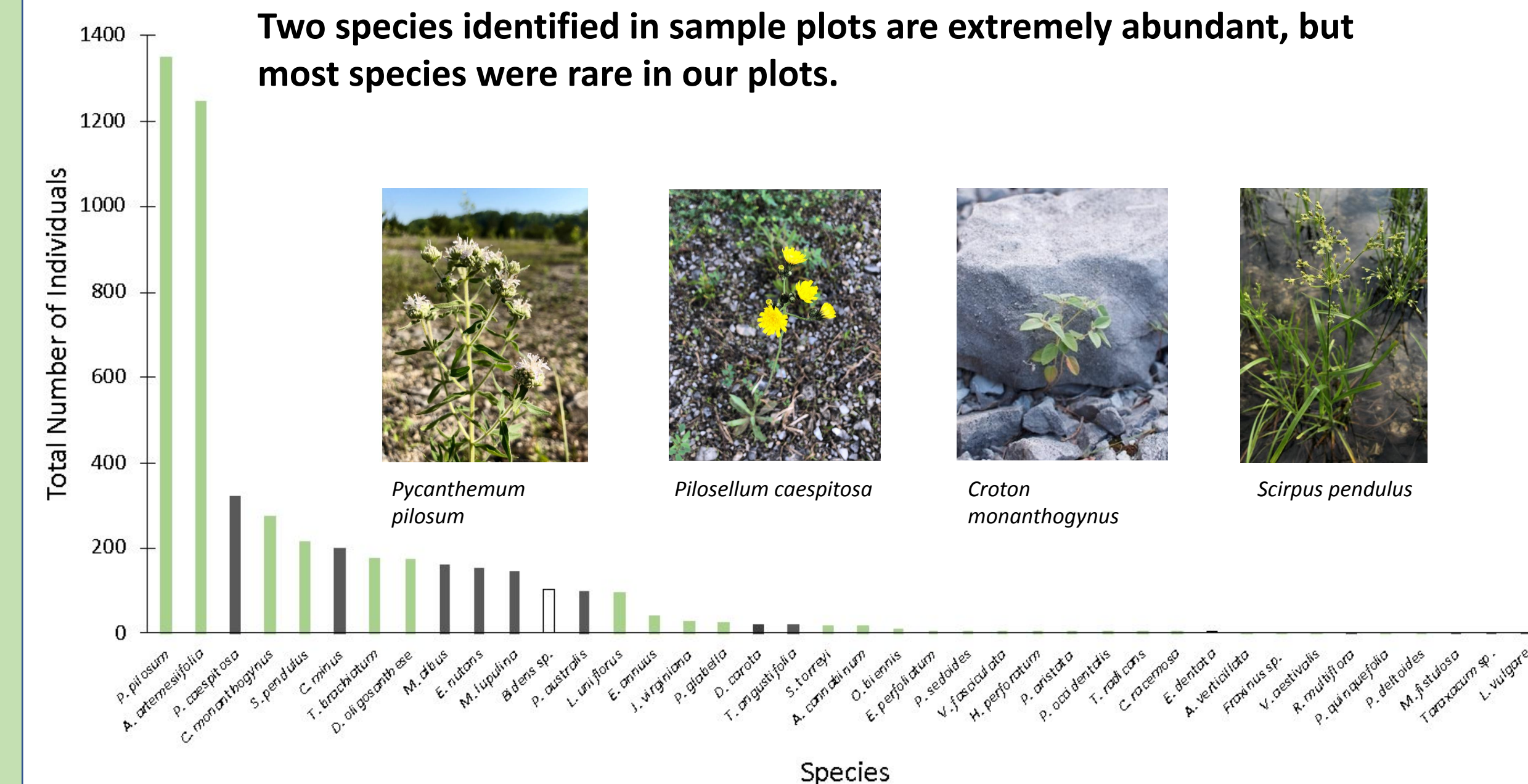
Randomly chosen sample plots on the quarry floor, with monoculture stands of invasive *Typha angustifolia* and *Phragmites australis* overlaid.

# The DePauw University Nature Park retired quarry bottom is not following the same pattern of succession as laid out in the literature.

The surface substrate on the quarry floor is primarily limestone gravel (< 2 cm) or large rocks (2 -10 cm).



Two species identified in sample plots are extremely abundant, but most species were rare in our plots.



Five species identified in the quarry were widespread, found in at least 50% of the sample plots.

