Comparing Vegetation Across Topographic Positions in Two Watersheds at the Susquehanna Shale Hills Critical Zone Observatory

Quincey K. Johnson¹, Kristen M. Brubaker¹, Margot W. Kaye²
¹Department of Environmental Studies, Hobart and William Smith Colleges
²Ecosystem Science and Management, The Pennsylvania State University

Research Question
How does bedrock influence vegetation?
The Susquehanna Shale Hills Critical Zone Observatory (CZO) in central Pennsylvania includes two watersheds with distinct bedrock: one rose hill shale and one Tuscarora sandstone. Both watersheds contain second growth mixed deciduous forests approximately 100 years old.

Objectives
• To compare basal area, tree density, and species richness across three topographic positions (toe slope, mid slope, and ridge top) at the shale and sandstone watersheds.
• To assess how the rockiness of the catchments affects each of these metrics.

Methods
• 10-m wide belt transects were established at toe slope, mid slope, and ridge top positions.
• All trees >10 cm diameter at breast height were identified by species and dbh was measured.
• Rock presence or absence was recorded at every meter along the transects.
• 2,675 meters and 1,445 trees were surveyed at the sandstone site.
• 1,125 meters and 605 trees were surveyed at the shale site.

Forest Structure

Basal Area
Sandstone: Basal area remained relatively constant across topographic positions.
Shale: Basal area decreased from toe slope to ridge top, following the predicted pattern.

Density
Sandstone: Density increased from toe slope to ridge top and slightly increased from mid slope to ridge top. Basal area may be remaining constant in part because of this change in density.
Shale: Density remained relatively constant across topographic positions.

Rock Composition
Sandstone: Basal area decreased as percent rock cover increased.
Shale: Almost no rocks were found at the shale site.

Species Composition
Sandstone: Species richness decreased from toe slope to mid slope to ridge top.
Shale: Species richness remained fairly constant across topographic positions.

Acknowledgements
• The authors acknowledge financial support from NSF EAR 1263212, a project entitled “Collaborative Research: REU/RET site - Introducing Critical Zone Observatory science to students and teachers.”
• Thanks to the field crew: Celine Collett, Dakota Durcho, Lillian Hill, Christine Kim, Mieke Vrijmoet, Brian Wegman, and Mark Yeckley