



Biogeography in Richmond's Rock Pools: Creating spatial analysis curriculum for place-based community learning across disciplines and institutions

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James River Rock Pools

Geographic Distribution

Rock pools are widely distributed in river systems throughout eastern North America, including fall zones in close proximity to large urban populations, creating educational opportunities for diverse student groups.

Richmond, Virginia

The James River was dammed at Belle Isle in 1905 to divert water for a hydroelectric plant, exposing potholes created by geological abrasion. These unique but interconnected aquatic rock pool habitats serve as our research focus.

The Belle Isle Slab

Mapping of the rock pool ecosystem began in 2009 with an initial survey conducted by the Vonesh lab at VCU. Since then, mapping and data collection efforts have been enhanced by drone imagery and GIS tools.



Project Goals

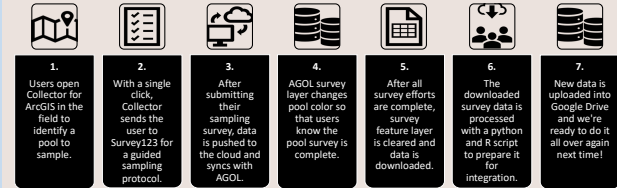
The Rock Pools Project is a **collaborative** effort to create **engaging, place-based** curricula for **undergraduate** and **high school** students in an urban ecosystem. This system enables **cross-disciplinary**, spatial data collection by students in the **field** from a variety of institution types to collect long-term **biogeographic** data.



Data Collection Workflow



Data collection is designed to be accessible for participants from varied academic and technical backgrounds. All you need to get started is a smart phone and some basic macroinvertebrate sampling tools.



Classrooms

Virginia Commonwealth University (Graduate and Undergraduate)

Testing Ecological Theory in Rock Pools
Eco-techniques, Community Ecology



University of Richmond (Undergraduate)

Physical Geography, Landscape Ecology
Ecology/Evolution



Open High School (High School)

"Science Outside"

Math Science Investigators (High School Summer Program)

"Mapping the Ecology of the James River Rock Pools"



Outcomes

Publicly Available Educational Materials

Versions of this work are publicly available as labs for beginner Geography and Biology students through online education repositories.

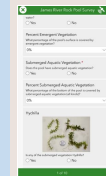


Bukach, N., Lookingbill, T., Davidson, A., Vonesh, J. R., Grayson, K. (2019). [Island biogeography, spatial ecology, and macroinvertebrate species diversity in Richmond's rock pools](https://doi.org/10.25334/Q43F14). QUBES Educational Resources. doi:10.25334/Q43F14

Example Learning Outcomes

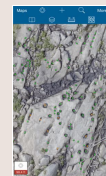
Develop Basic Skills in GIS Software
Construct Informative Maps
Perform Spatial Analyses with ArcGIS
Use T-tests, ANOVA and Linear Regression
Understand Metrics of Species Diversity
Apply Principles of Island Biogeography Theory

GIS Tool Close-up



Survey123

Guides researchers and community members through a step-by-step process to sample macroinvertebrate communities in the rock pools.



Collector for ArcGIS

Provides access in the field to high-resolution drone imagery and georeferenced rock pools to orient public users and direct data collection

Acknowledgements

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Rock Pool Data



Tabular data is stored on Google Drive for easy collaboration.



New survey data undergoes checks in R before integration.



Rock Pool Spatial data is hosted in ArcGIS Online.