

Exercise 7: Data Summarization

40 Points scaled to 20 Points

Introduction

In this exercise, you will learn how to extract raster cell values at point locations and summarize cell values within polygon extents. You will then use your results to answer questions.

Objectives

- *Extract raster pixel or cell values at point locations*
- *Summarize raster data relative to polygons or areas*
- *Analyze and perform analyses on values stored in attribute tables*

Prerequisite Materials

- ❖ Modules: Ratios and Enhancements
- ❖ Videos
 - Lab 7 Intro: <https://youtu.be/4BMCVHW0Doc>
 - Summarize Raster Data at Points and within Polygons: <https://youtu.be/PCZgEGm7rAc>
 - Summarize Raster Data: <https://youtu.be/DSzsrnamZfc>
 - Summarize Data: <https://youtu.be/78MtO8rye7c>

Data

The provided ArcGIS Pro project file contains one map with the following layers.

- ❖ **sample_points.shp**: Point locations representing field sites. The “Point_ID” field provides a unique identifier for each point. These points are synthetic and do not actually represent true sample locations.
- ❖ **watersheds.shp**: Hydrologic Unit Code (HUC) 12 watershed boundaries for a portion of West Virginia. The “HU_12_NAME” field provides a unique identifier for each watershed.
- ❖ **s2_2018_5_24_summer.tif**: Sentinel-2 MSI multispectral image collected on 5/24/2018. See the table below for the band designations. All included bands have been resampled to 10 m spatial resolution. Only the 10 m and 20 m bands were included in the stack.
- ❖ **s2_2020_11_29_winter.tif**: Sentinel-2 MSI multispectral image collected on 11/29/2020. See the table below for the band designations. All included bands

have been resampled to 10 m spatial resolution. Only the 10 m and 20 m bands were included in the stack.

- ❖ **wv_nlcd.tif**: Land cover categories from the 2011 National Land Cover Database (NLCD). The legend is available here: <https://www.mrlc.gov/data/legends/national-land-cover-database-2016-nlcd2016-legend>. The cell size is 30 meters.
- ❖ **wv_elev.tif**: Elevation raster grid in meters from the National Elevation Dataset (NED). The cell size is 30 meters.



Figure 1. Data used in exercise.

Band	Included	Band Number in Stack	Native Spatial Resolution
Band 1 (Coastal Aerosol)	No	NA	60 m
Band 2 (Blue)	Yes	1	10 m
Band 3 (Green)	Yes	2	10 m
Band 4 (Red)	Yes	3	10 m
Band 5 (Red Edge 1)	Yes	4	20 m
Band 6 (Red Edge 2)	Yes	5	20 m
Band 7 (Red Edge 3)	Yes	6	20 m
Band 8 (NIR)	Yes	7	10 m
Band 8A (Narrow NIR)	Yes	8	10 m
Band 9 (Water Vapor)	No	NA	60 m
Band 10 (Cirrus Cloud)	No	NA	60 m
Band 11 (SWIR 1)	Yes	9	20 m
Band 12 (SWIR 2)	Yes	10	20 m

Data Summarization

Summarize the data as necessary to answer the following questions. The Extract Multi Values to Points Tool can be used to extract raster cell values at point locations while the Zonal Statistics as Table Tool can be used to summarize cell values within areal extents. You will also need to do some math in the attribute tables, perform attribute queries, and summarize attribute tables. When the answer to the question is a specific sample point or watershed, answer with the unique identifier, "Point_ID" for the sample points and "HU_12_NAME" for the watersheds.

Question 1. Which sample point had the highest elevation? (2 Points)

Question 2. How many of the sample points occurred at an elevation above 1,000 meters? (2 Points)

Question 3. What percentage of the sample points occurred at an elevation above 1,000 meters? (2 Points)

Question 4. How many sample points occurred in evergreen forests (Code 42)? (2 Points)

Question 5. What was the most common land cover category across all sample points? (2 Points)

Question 6. How many land cover categories are represented by at least 10 sample points? (2 Points)

- Question 7. Which sample point had the highest reported summer normalized difference vegetation index (NDVI)? (2 Points)
- Question 8. Which sample point had the highest reported winter normalized difference vegetation index (NDVI)? (2 Points)
- Question 9. What sample point had the smallest difference between winter NDVI and summer NDVI? (2 Points)
- Question 10. Which watershed had the highest mean elevation? (2 Points)
- Question 11. How many watersheds have a mean elevation above 1,000 meters? (2 Points)
- Question 12. Which watershed had the largest land areas of evergreen forest (Code 42)? (2 Points)
- Question 13. Which watershed had the largest percentage of land area of evergreen forest (Code 42)? (2 Points)
- Question 14. How many watersheds had an area of evergreen forest greater than 10% (code 42)? (2 Points)
- Question 15. Which watershed had the largest land area of Hay/Pasture (Code 81)?
- Question 16. Which watershed had the highest mean normalized difference vegetation index (NDVI) in the summer? (2 Points)
- Question 17. Which watershed had the highest mean normalized difference vegetation index (NDVI) in the winter? (2 Points)
- Question 18. Which watershed had the largest difference in mean NDVI between summer and winter? (2 Points)
- Question 19. Which watershed had the largest range of NDVI values in the winter? (2 Points)
- Question 20. Which watershed had the largest range of NDVI values in the summer? (2 Points)