Spatial Mapping in R

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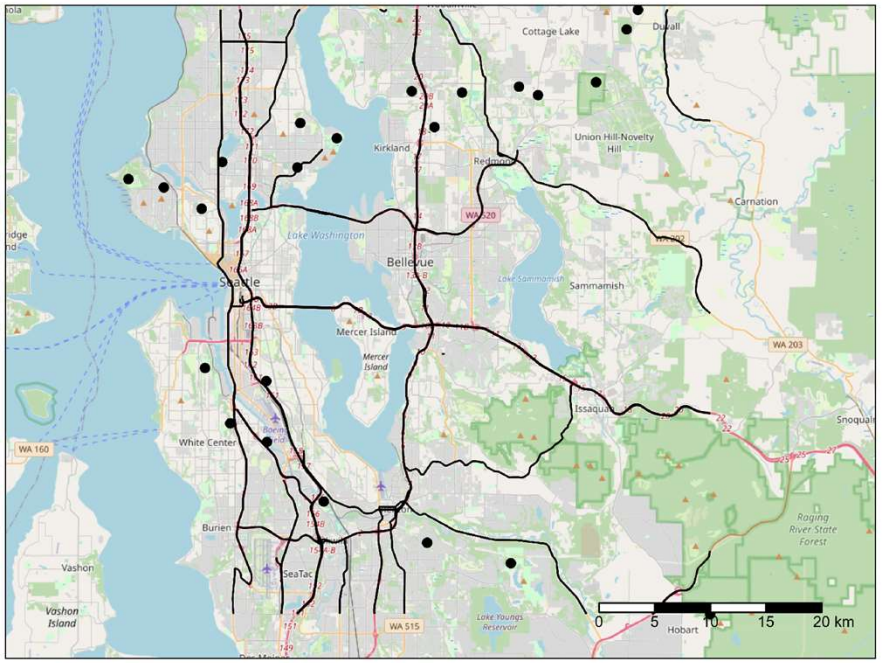
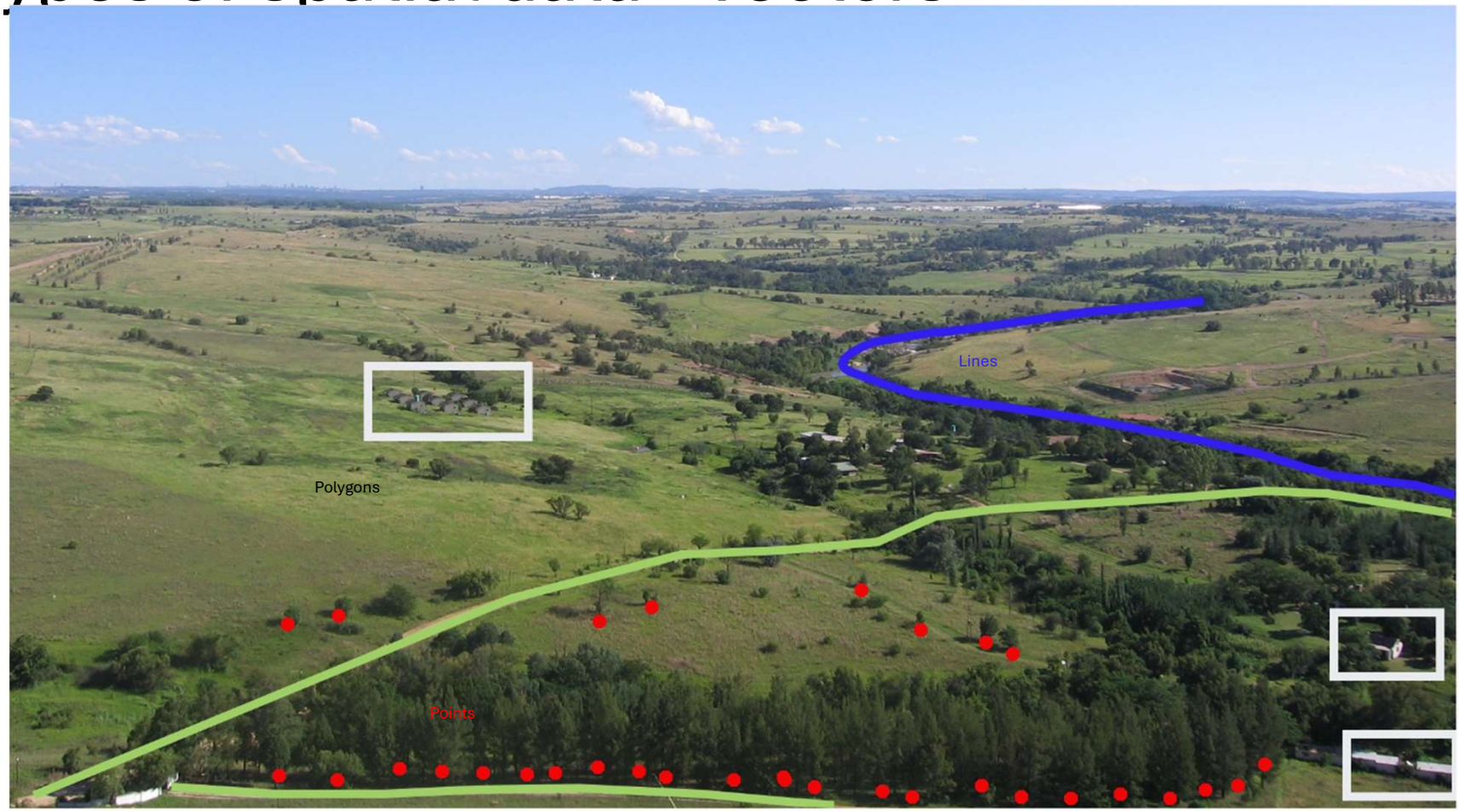
What is spatial data?

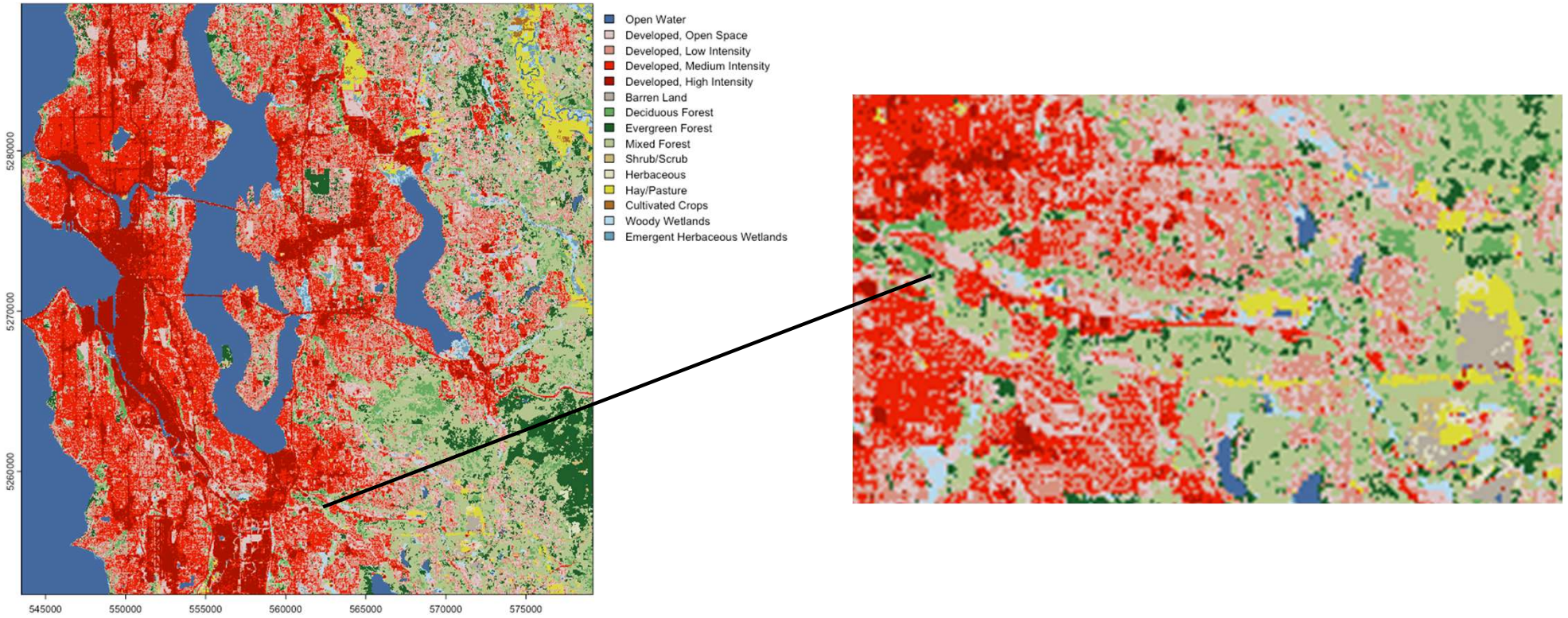
- Data that references a specific geographic location
  - Landscape features (natural or built)
  - Environmental properties (temperature, air quality)



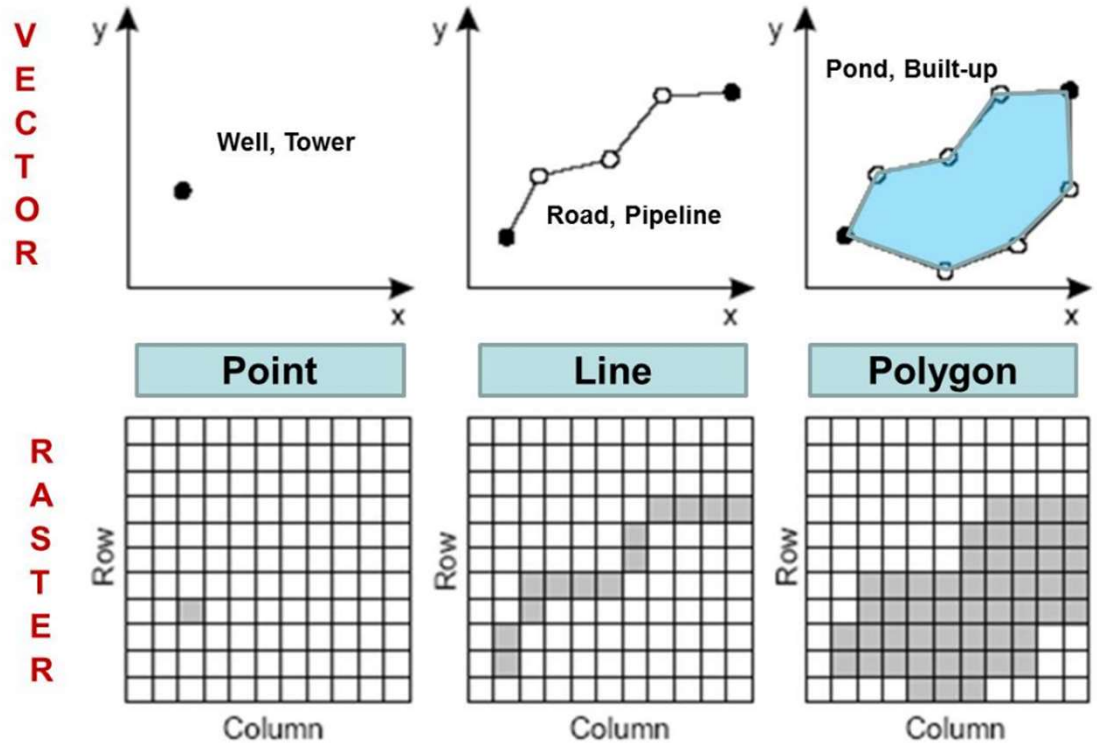
Types of spatial data - vectors



Types of spatial data - rasters

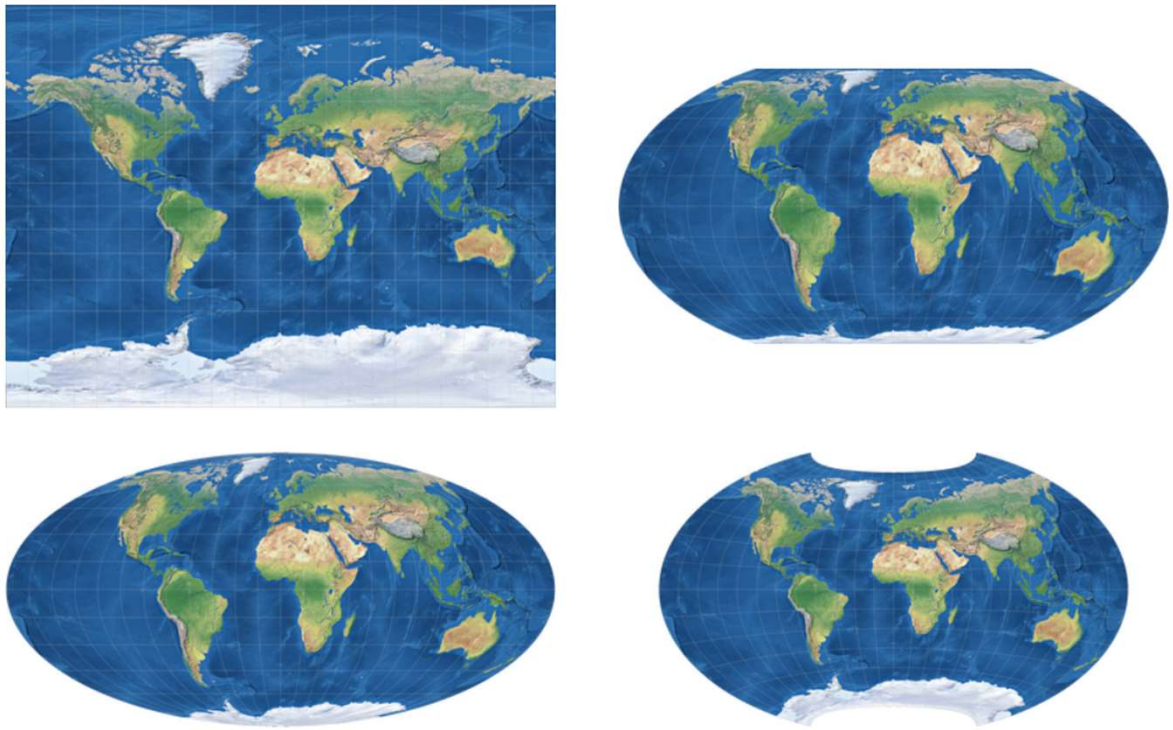


Comparison of vector and raster data



Projections and Spatial Reference Systems (SRS)

- Projection - method for “flattening” the globe
- SRS - combination of a projection and a coordinate system (x,y)



Left to right, top to bottom: Miller, Wagner IV, Mollweide, Canters W14.

Why should you use R for spatial data?

- Free and open source
- Computationally faster
- Save your work in a script file:
  - Replicability
  - Back-tracing
  - Collaboration through Github
- All analysis in one place

Using R with spatial data

- Packages: sf and terra
  - sf: traditional method for working with vector data, reads shapefiles as spatial dataframes
  - terra: newer, handles both vector and raster data, reads shapefiles as SpatVectors and rasters as SpatRasters
- Other useful packages
  - Other mapping packages we'll use: tmap and tidyterra

They have equivalent functions for most processes. (linked in tutorial)

For some functions we need to convert between sf to terra, using st_as_sf() or vect()

Tutorial outline

We will develop the full analytical process of importing, extracting and analyzing spatially explicit data from camera traps

1. Vector data
   - Points: camera trap results
   - Lines: roads
   - Polygons: forest cover
2. Raster data: NDVI and building density
3. Downstream analysis of processed spatia