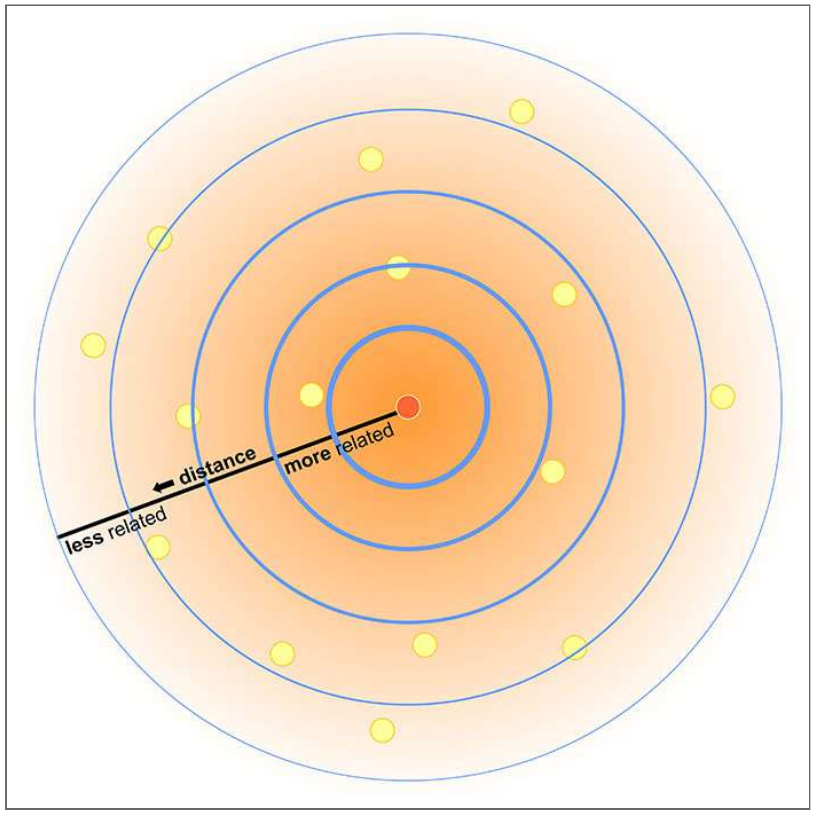
FIRST LAW OF GEOGRAPHY

"Everything is related to everything else, but near things are more related than distant things."

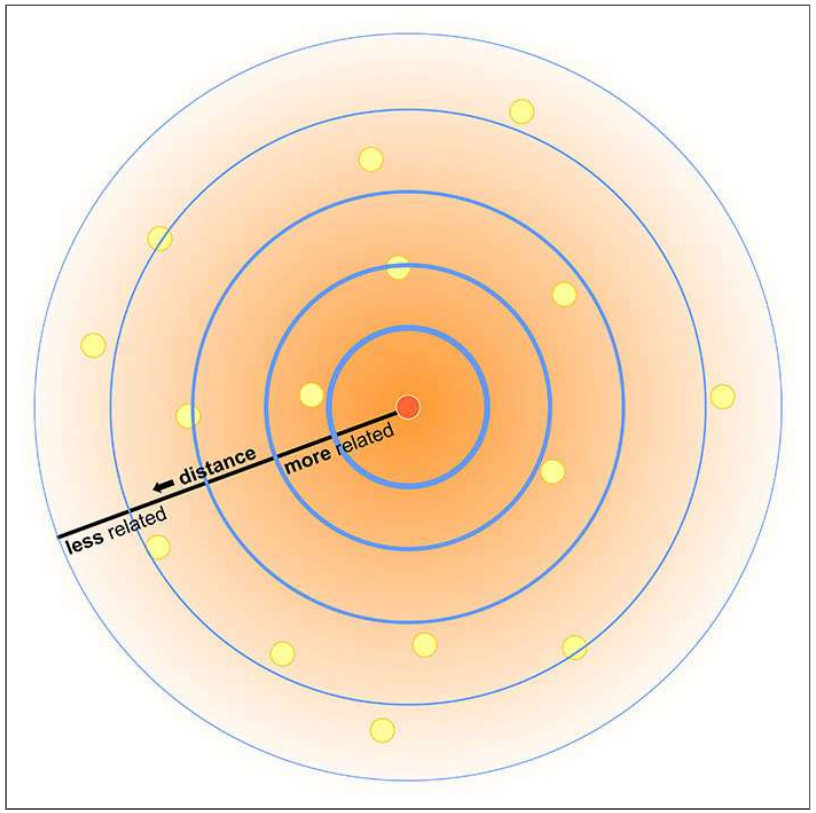
-Waldo Tobler



FIRST LAW OF GEOGRAPHY

This might seem obvious:

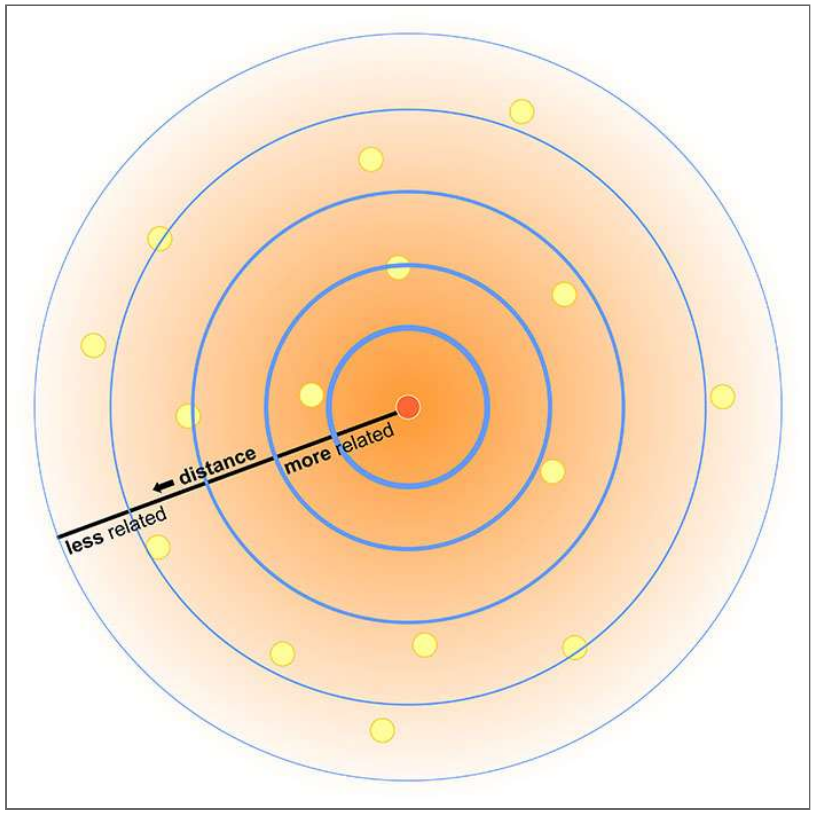
- Students in the same class interact more.
- Orca pods in different areas develop different dialects.
- Hemlocks in BC are more related to each other than to hemlocks in NB.



FIRST LAW OF GEOGRAPHY

Not a **grantee** of similarity.

- Vancouver's average snowfall is < 30 cm/yr
- Grouse Mountain frequently exceeds 9 m/yr.



SPATIAL HETEROGENEITY

Uneven distribution across space.

BONINI'S PARADOX

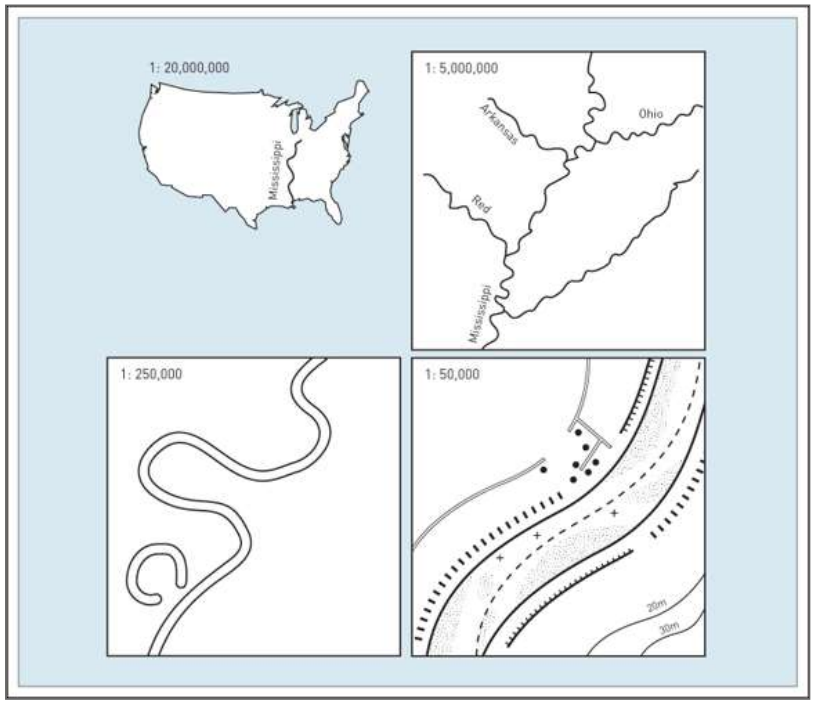
As a model of a complex system becomes more complete, it becomes less understandable.

- It will eventually be just as difficult to understand as the real-world processes it represents.
  - **e.g.** a 1:1 scale map
- At a certain point, we have to ignore the heterogeneity.

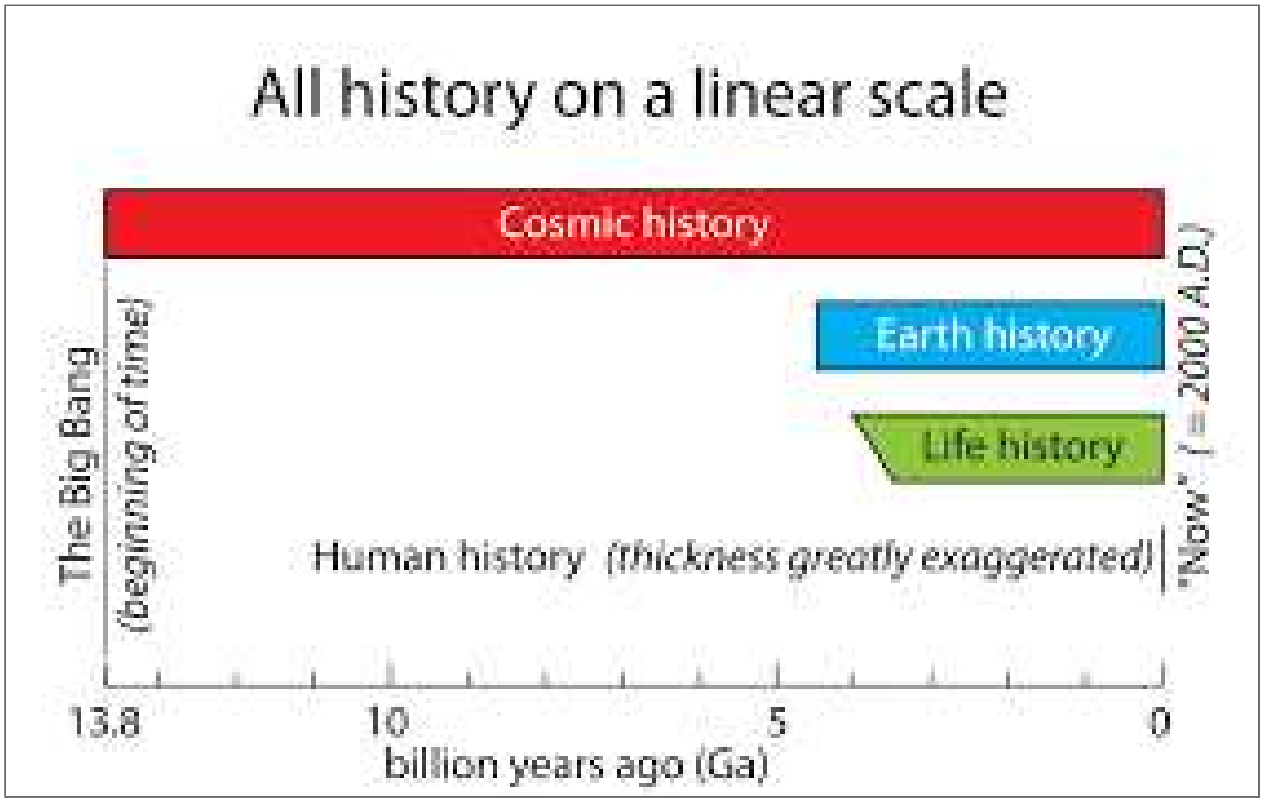
REVISITING MAP SCALE

Map scale: ratio of map units to real world units.

- Small Scale: Large area, more generalization, less detail.
- Large Scale: Small area, more detail, less generalization.



TIME SCALE

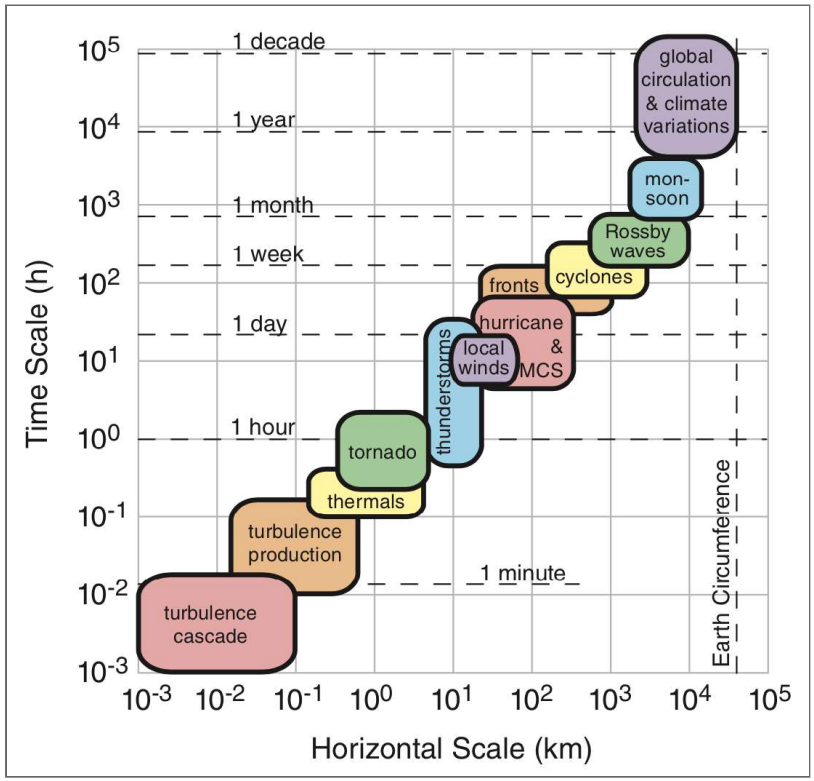


Comparison of Different Time Scales

ANALYSIS SCALE

Different phenomena operate on different temporal and spatial scales.

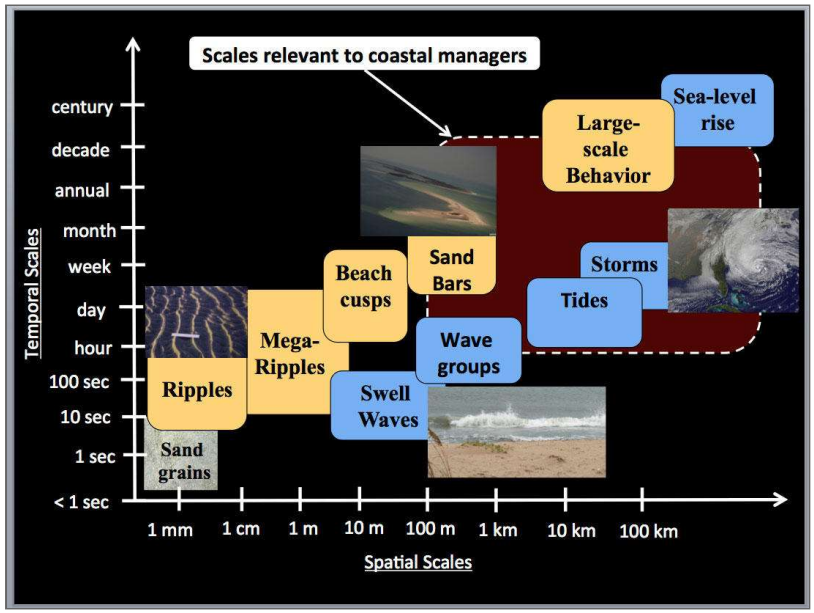
- No need to model tornadoes in a global climate model.
- Impractical to map turbulence globally.



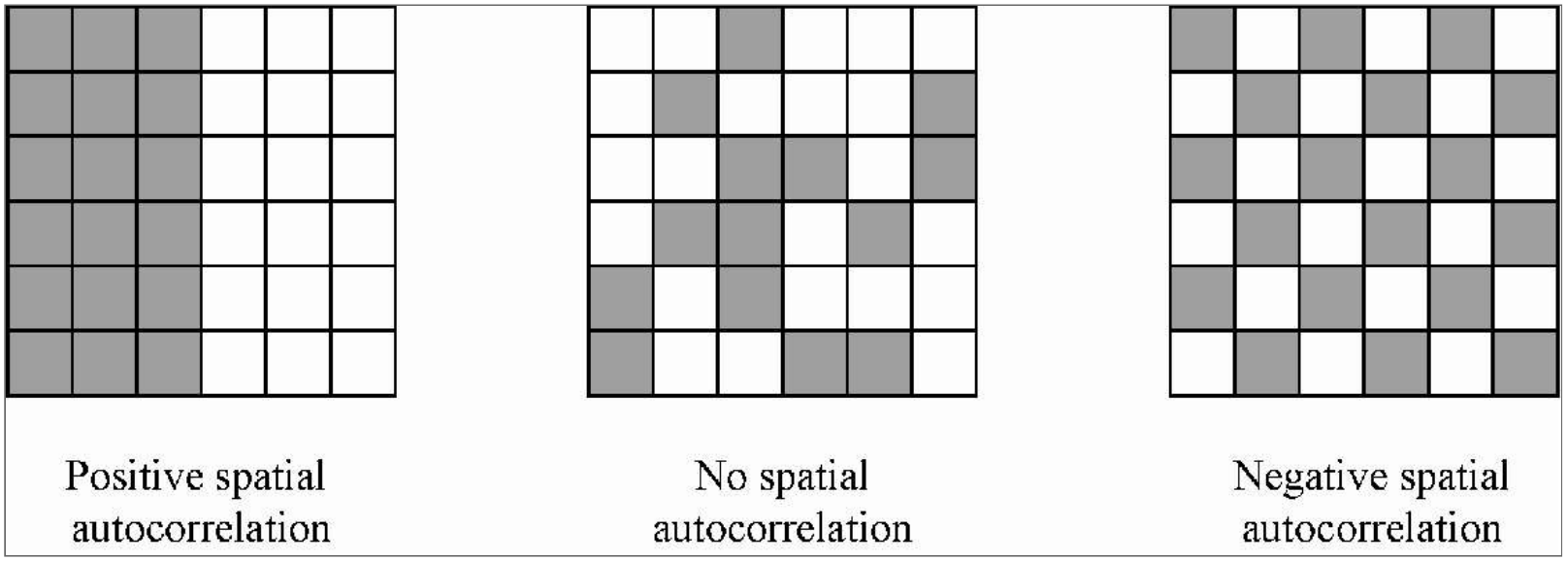
ANALYSIS SCALE

Different phenomena operate on different temporal and spatial scales.

- Identify the scale relevant to your analysis.

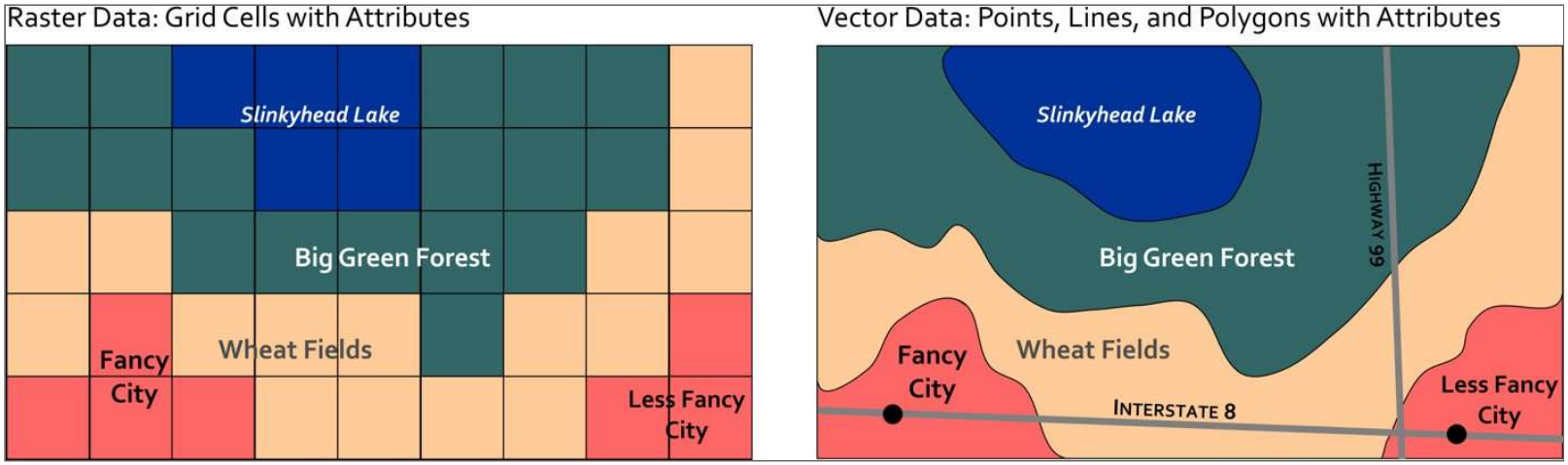


SPATIAL AUTOCORRELATION



Measure of similarity across space.

SPATIAL DATA MODELS



We can exploit spatial autocorrelation to simplify our representation of spatial data.

MAP THE FOREST NOT THE TREES

We don't need the location of every tree to map a forest.

- Use average presence of trees over a larger area.

SIMILARITY ACROSS SPACE

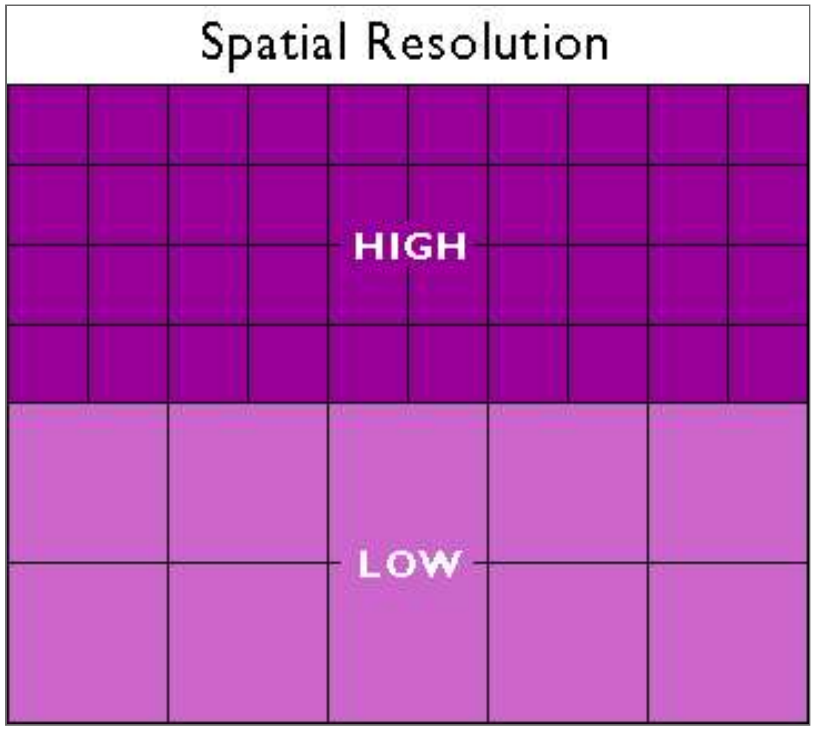
Natural systems usually exhibit degrees of spatial heterogeneity **and** autocorrelation.

- What is heterogeneous at one scale may be **homogeneous** at another.

SPATIAL RESOLUTION

Relates to the level of spatial detail in a dataset.

What is the smallest feature that is included in a dataset?

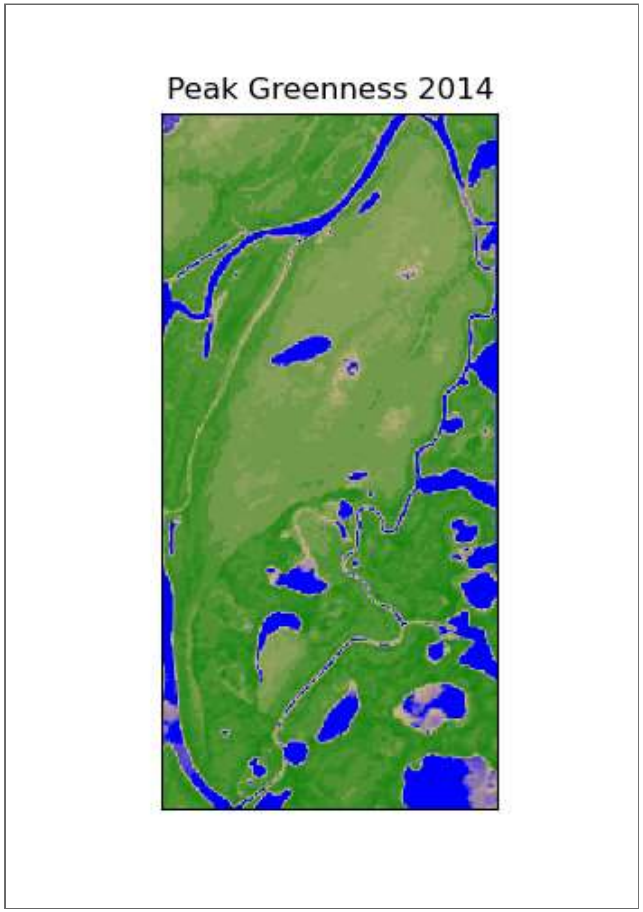


TEMPORAL RESOLUTION

Relates to the level of temporal detail in a dataset.

Over what time period is the data valid?

Are there multiple observations?

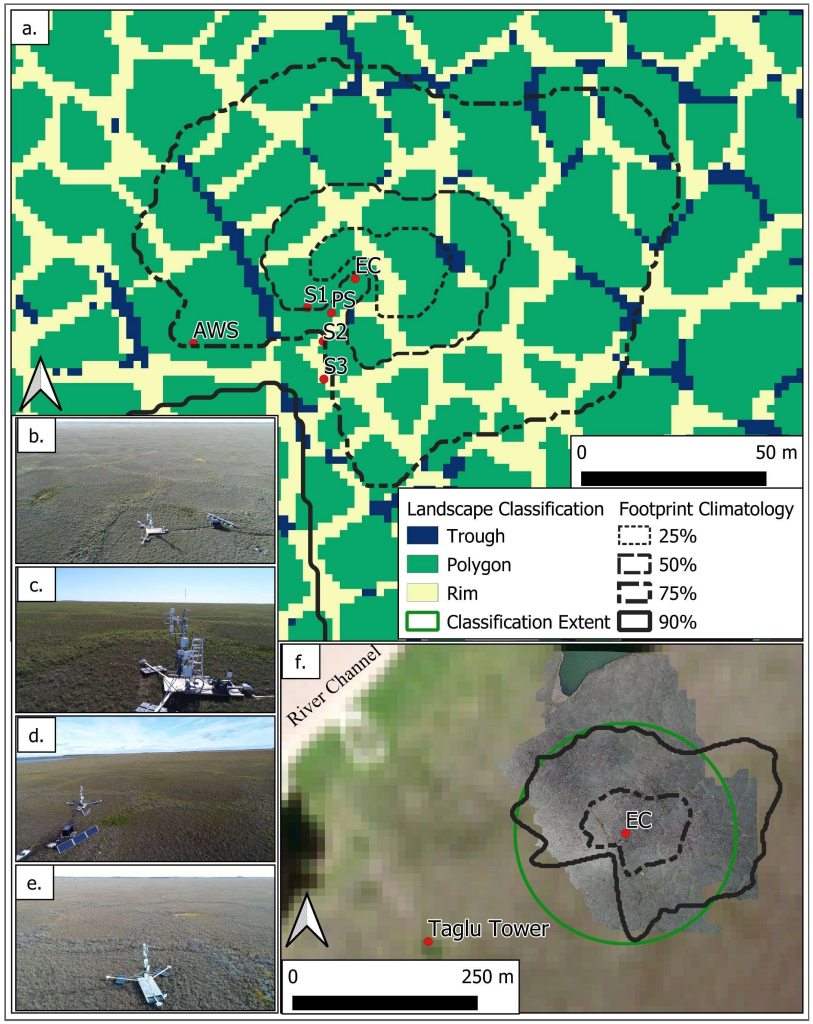


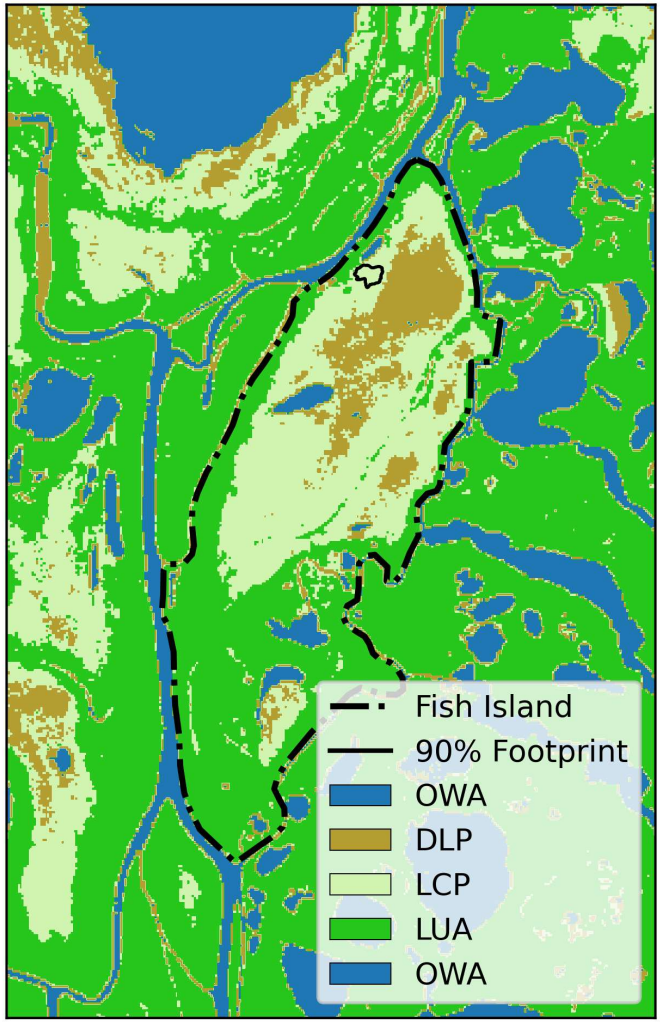
RESOLUTION VS. SCALE

The scale of our analysis dictates our desired resolution.

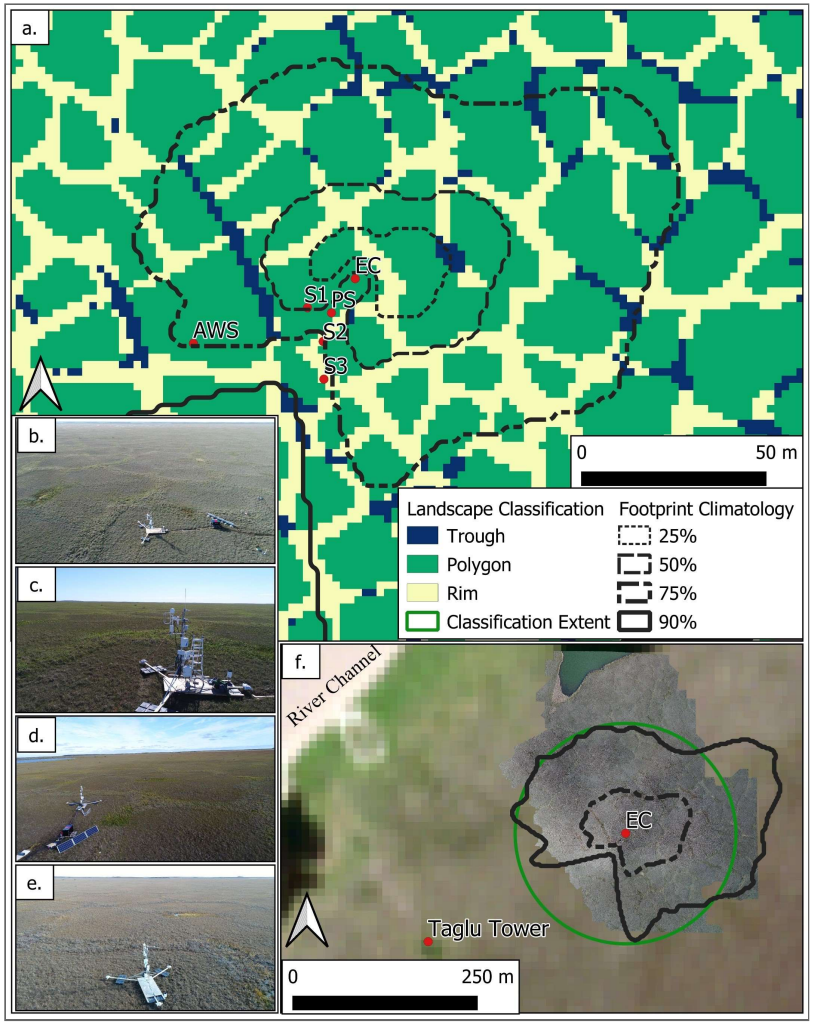
Data resolution can limit the scale of our analysis.

SCALE DEPENDENCE





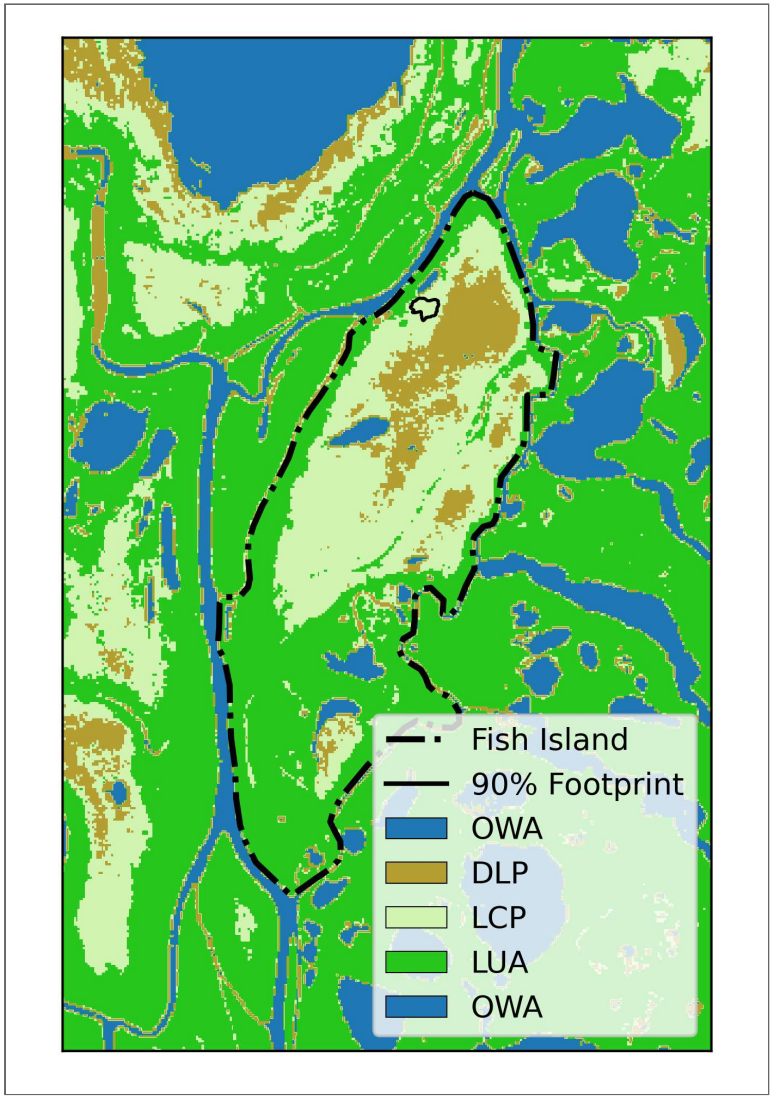
SCALE DEPENDENCE



Acknowledge the heterogeneity where appropriate.

- Large scale maps might need more attention to detail.
- Higher resolution data.

SCALE DEPENDENCE

Count on spatial autocorrelation and call a unit homogeneous where appropriate.

- Smaller scale maps can be more generalized.
- Lower resolution data.