The Nature Conservancy
Protecting nature. Preserving life.™

Conserving Nature's Stage

Resilient Terrestrial Landscapes in the Pacific Northwest

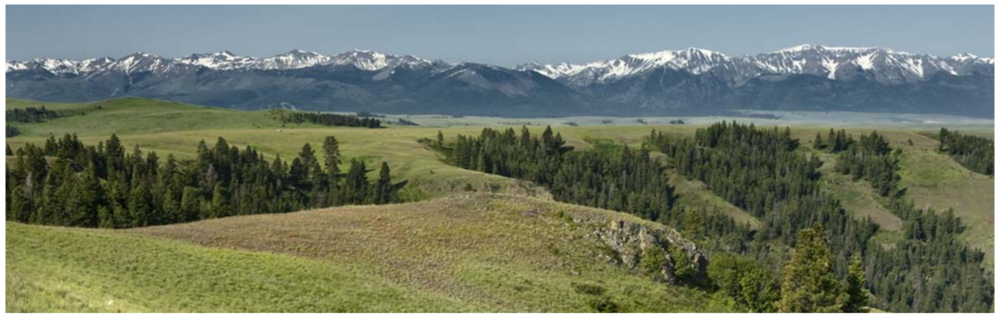
To inform future conservation investment, The Nature Conservancy completed a project to identify areas in the Pacific Northwest that collectively and individually best sustain native biodiversity, even as the changing climate alters current distribution patterns.

Funded by the Doris Duke Charitable Foundation, this project, *Conserving Nature's Stage: Identifying Resilient Terrestrial Landscapes in the Pacific Northwest,* assessed and mapped the resilience of sites to climate change across 227 million acres.

Products available

- Land Facets mapped across 11 ecoregions in the PNW.
- Topoclimate, Connectedness, and Resilience also mapped.
- Most developed and Least protected Land Facets identified.
- Download the report, maps, and GIS data at: nature.org/resilienceNW

Protecting Biodiversity in a Changing Climate



Northeastern Oregon © Rick McEwan

As the climate changes, species are moving and shifting ranges to stay within their preferred temperature and moisture conditions. How can The Nature Conservancy plan for the conservation of biodiversity at a site when those species might not be there in 50-100 years?

Current conservation approaches often focus on predicting where species will move to in the future. This is a reasonable approach but fraught with uncertainty and dependent on a variety of future-climate models. The Conservancy has developed a different, but complementary approach that aims to identify key areas for conservation based on stable land characteristics that increase diversity and resilience, and will not change in a changing climate.

The Stage: Geophysical features such as topography and soils influence not only the patterns of biodiversity but also the amount of biodiversity in a region. We refer to unique combinations of these features as land facets or the "stage." These are the templates upon which species move and communities develop. These templates are relatively permanent whereas the species and communities they harbor are transitory. The conservation of geographically dispersed, representative occurrences of all land facets can facilitate resilience across a region by maintaining the diversity of geophysical templates upon which species and communities can evolve. Thus, by conserving land facets we may be able to protect biodiversity both where it is currently found and where it may be found in the future.

Resilient Sites: With a changing climate, many places may become degraded and lose species, but some places will retain high quality habitat and continue to support a diverse array of plants and animals. Sites that have both complex topography and connected land cover are places where conservation is most likely to succeed in the long term. A complex topography provides many microclimates where species can move to adjust to a changing climate. A landscape that is "permeable" or free of barriers to movement allows species to take advantage of the diversity of local microclimates. Combining topoclimate diversity with local permeability provides a resilience metric that can be used to identify the most resilient occurrences of each land facet.

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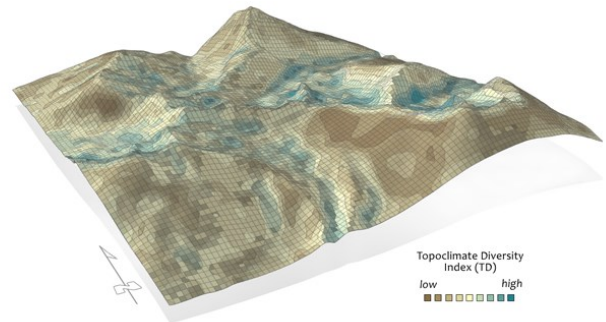
Soils + Elevation + Slope = Land Facets

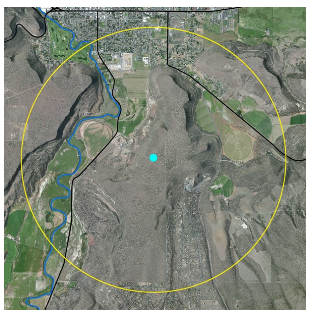
Geophysical features underlie the spatial distribution of biodiversity and a region's biological richness is due, in part, to its geophysical diversity. Using the geophysical features of soil, elevation and slope we were able to produce a wall-to-wall map of 162 land facets within the Pacific Northwest.

We defined the geophysical diversity (the unchanging Stage) by overlaying Soils (10 Orders), Elevation (7 categories), and Slope (3 categories), creating 162 land facets. For example, Mollisols at 600-1200 meters on flat ground.

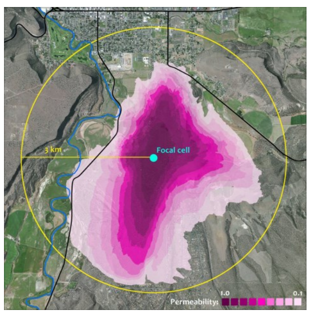
Topoclimate Diversity + Permeability = Terrestrial Resilience

Topoclimate Diversity describes the range of temperature and moisture regimes available to species within a local area. Areas rich in topoclimate diversity may increase species diversity and also increase the likelihood for species persistence over time as the climate changes. We calculated Topoclimate Diversity by looking at the range of local temperatures and the range of soil moisture potential across a 450-m radius neighborhood. The result is a relative index across the study area or a particular land facet that measures how diverse the local climate is, based on topographic qualities that are not likely to change.





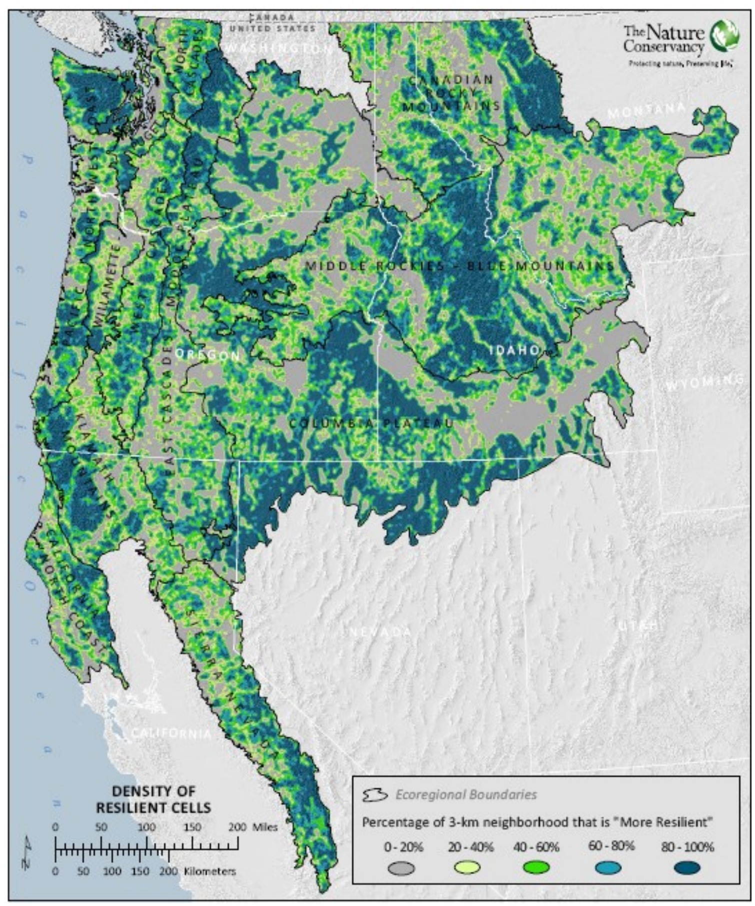
Focal cell with 3 km radius



Permeability from focal cell

Terrestrial Permeability measures the connectedness within a local area, inversely related to the fragmentation caused by development such as roads, cities, agriculture, and energy infrastructure. We mapped permeability based on the degree of development and conversion. This analysis evaluates the capacity for ecological flow outward from each focal cell into its local neighborhood up to a maximum of 3-km, then combines the results into a final, study-wide surface. In the figure from arid Eastern Oregon at left, growth around a focal cell is constrained by fragmentation associated with roads, agriculture, and housing.

Terrestrial Resilience combines Topoclimate Diversity and Permeability to identify where biodiversity is more likely to be resilient to a changing climate. By stratifying the resilience data by ecoregion and land facet with in each ecoregion, we are able to compare similar places to each other (Mollisols with other Mollisols, flat mid-elevation land facets with other flat mid-elevation land facets). We are also able to identify the places where resilience is most dense on the landscape.



Conclusion

By mapping key geophysical features and evaluating all occurrences of these features for characteristics that buffer against climate effects, we can identify representative examples of geophysical features that are most resilient to climate change.

Combining this information with biodiversity priorities will guide future conservation investments that collectively and individually sustain native biodiversity, even as the changing climate alters current distribution patterns.

For More Information:
nature.org/resilienceNW

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