

Practical

Biodiversity and Ecosystem Function in the Cape Floristic Region

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The evolution of Biodiversity-Ecosystem Function research

There's been a shift towards acknowledging the 3-way interplay between environmental drivers, the properties of biotic communities and ecosystem function.

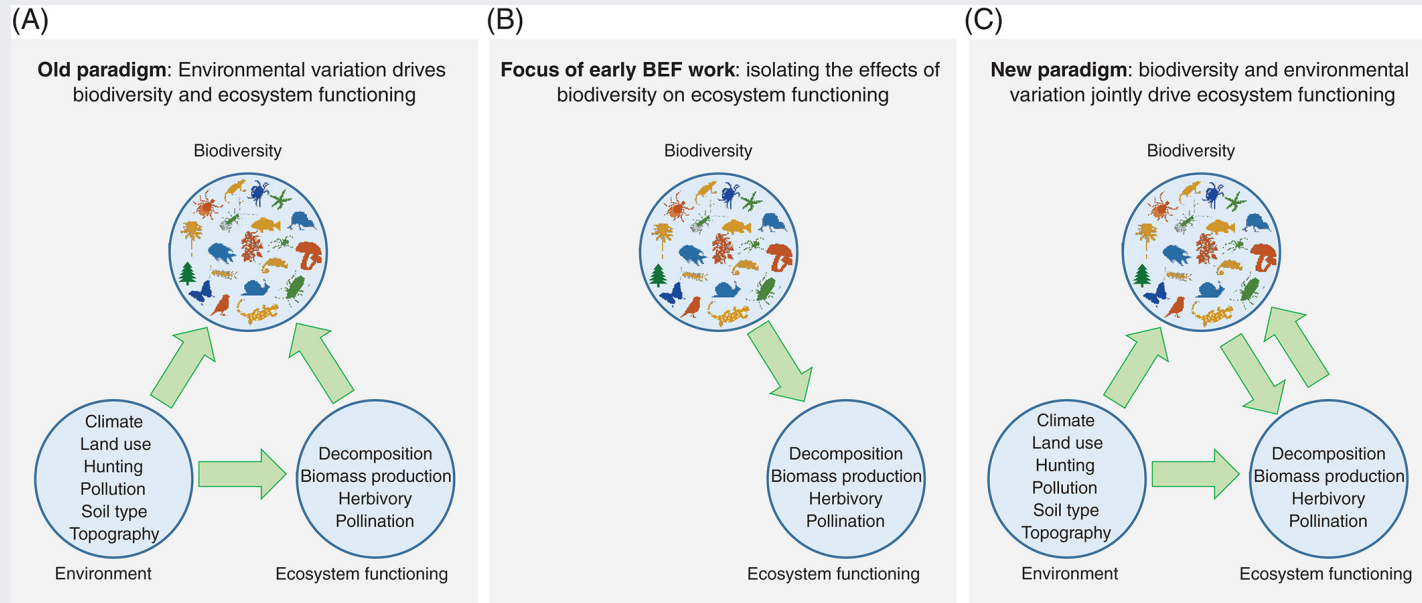
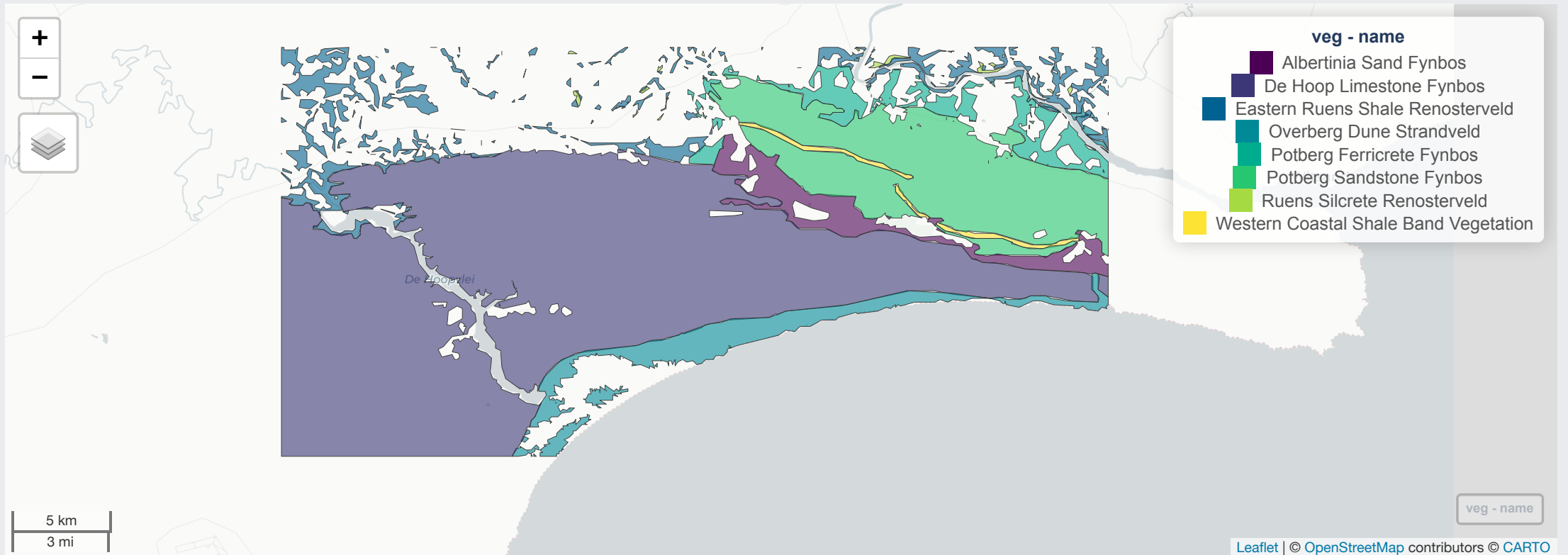
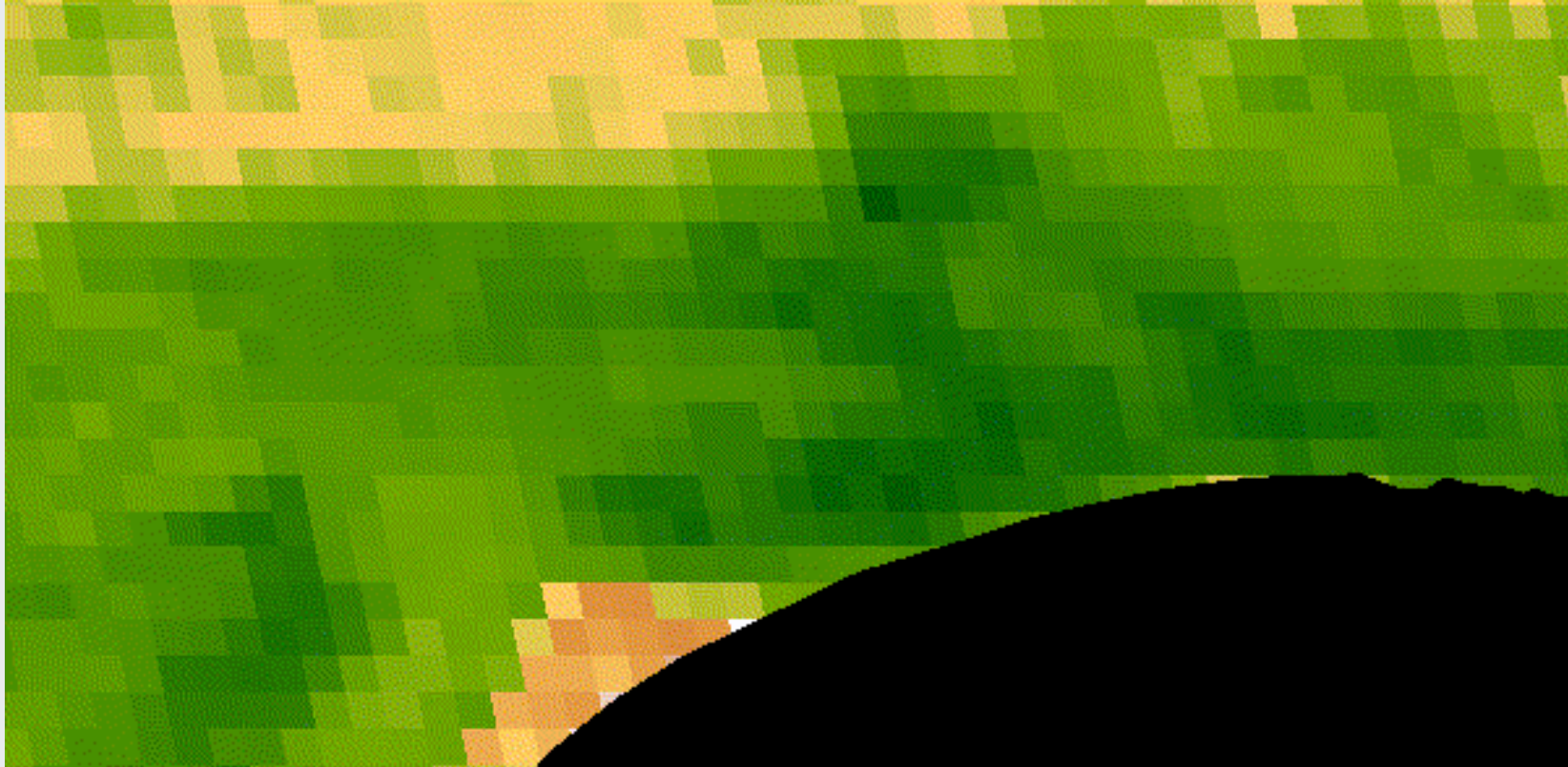


Figure from van der Plas 2019

The De Hoop landscape includes a wide range of environmental conditions and vegetation communities

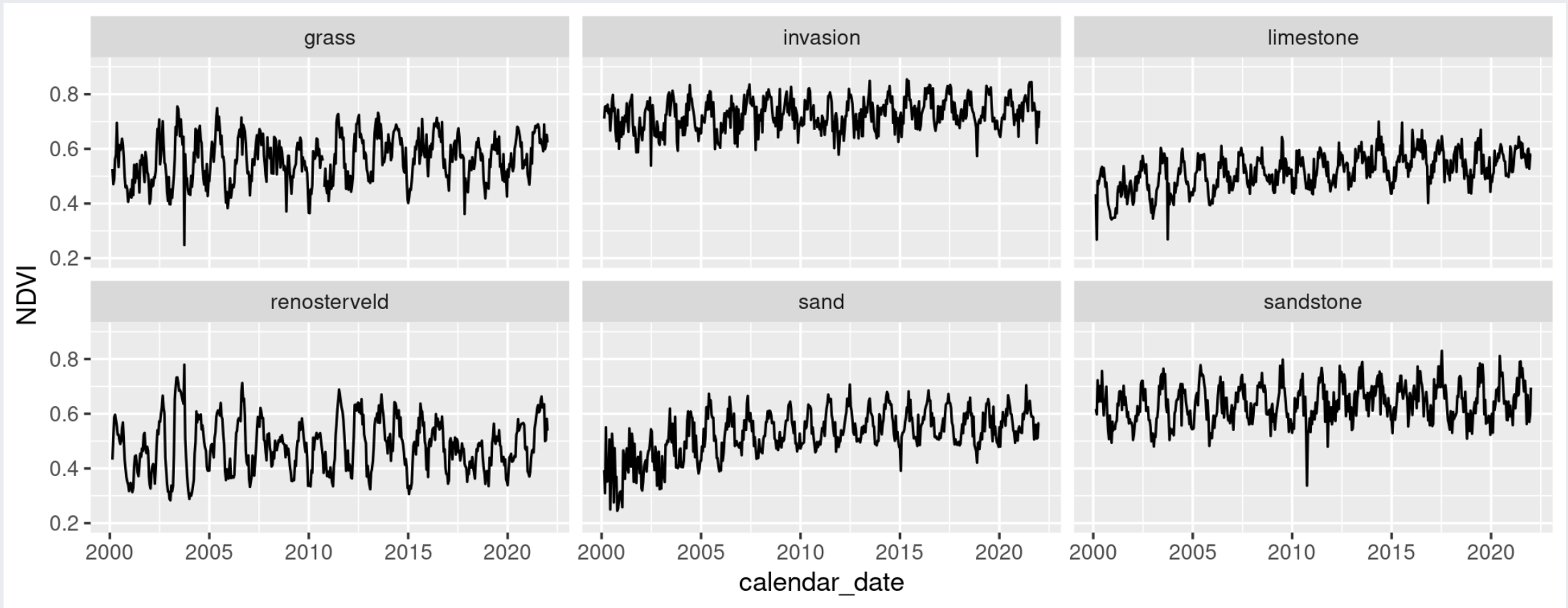


With variation in "vegetation greenness" over time



"vegetation greenness" = the Normalized Difference Vegetation Index (NDVI)

We'll look at 6 sites with different vegetation (incl. natural and anthropogenic) and varying NDVI



Aim:

To investigate the Biodiversity-Ecosystem Function paradigms presented by van der Plas (2019) by investigating the relationships among a set of ecosystem types using measures of biodiversity (species and functional α and β diversity) and exploring their relationship to various environmental conditions and a set of metrics of ecosystem function derived from satellite timeseries.

Questions (feel free to modify):

- Does the variation in environmental conditions explain the observed variation in biodiversity (species, functional and phylogenetic α and β diversity)?
- To what degree does the variation in functional and phylogenetic diversity explain the observed variation in our measures of ecosystem function?
- What is the relative role of the environment versus biodiversity in determining the observed variation in ecosystem function?

Within each site we'll sample 4 point locations



Leaflet | Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community

At each point location we'll

Sample *Environmental conditions*:

- Estimate % projected cover (think the area you would see from above) bare soil
- ~~Take a densiometer reading at ground level~~
- ~~Take a **soil sample**~~
- Do a **dung count**, scoring dung for the point location by the number of quarters where you find dung (i.e. 0-4 for the point location)
- Take a few notes (and photos) on any features you think may be interesting

At each point location we'll

Sample *Diversity*:

- Make sure your smartphone is fully charged and set to record GPS location with your photographs!
- Decide on which are the top 5 species by % projected cover (or just species that make up 80% of the vegetation).
- Take diagnostic photos for the 5 species (habit (whole plant), leaf, base, flowers and/or fruits) and score them 1-5 from most to least abundant
- For three individuals of each of your 5 target species,
 - measure the height and collect shoot for measuring leaf traits back at the Potberg centre (length, width, area and dry mass).
- Finally, set a timer and take as many diagnostic photos of new species (other than your 5 target species) within or near your plot as you can before the alarm goes off.
- Take a pic of your site label between sites so you know what photos are from where.

References

- Gotelli, N. J. and R. K. Colwell (2001). "Quantifying biodiversity: procedures and pitfalls in the measurement and comparison of species richness". In: *Ecology letters* 4.4, pp. 379-391. ISSN: 1461-023X, 1461-0248. DOI: 10.1046/j.1461-0248.2001.00230.x.
- Slingsby, J. A., C. Merow, M. Aiello-Lammens, et al. (2017). "Intensifying postfire weather and biological invasion drive species loss in a Mediterranean-type biodiversity hotspot". En. In: *Proceedings of the National Academy of Sciences of the United States of America* 114.18, pp. 4697-4702. ISSN: 0027-8424, 1091-6490. DOI: 10.1073/pnas.1619014114.
- Whittaker, R. H. (1972). "Evolution and measurement of species diversity". En. In: *Taxon* 21.2-3, pp. 213-251. ISSN: 0040-0262, 1996-8175. DOI: 10.2307/1218190.

Thanks!

Slides created via the R packages:

xaringan

gadenbuie/xaringanthemer

The chakra comes from remark.js, **knitr**, and R Markdown.