Connecting current and future suitable climates to facilitate species movement under climate change

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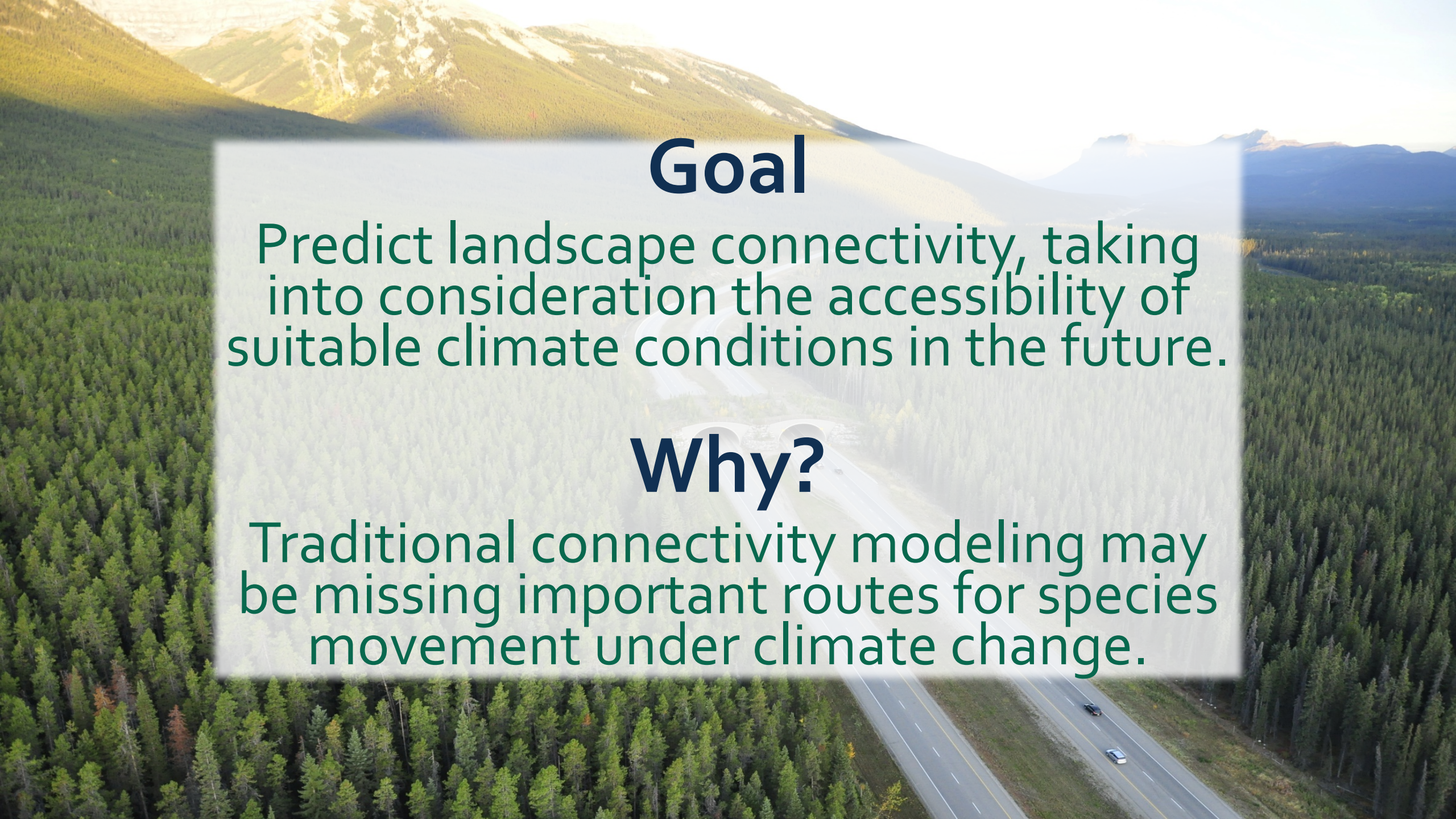


Goal

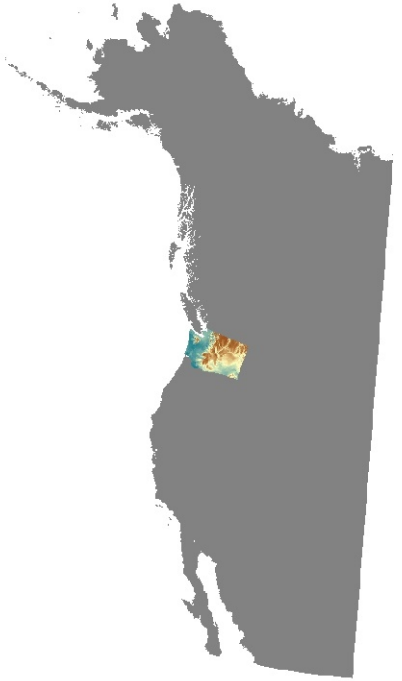
Predict landscape connectivity, taking into consideration the accessibility of suitable climate conditions in the future.

Why?

Traditional connectivity modeling may be missing important routes for species movement under climate change.

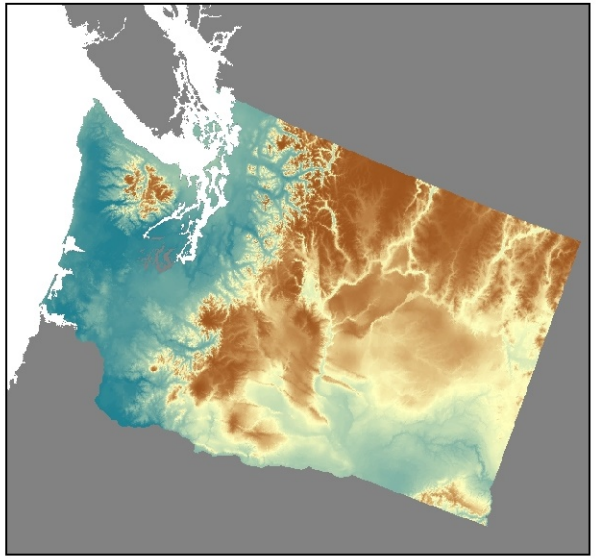
Approach:

Identify climate analogs: places in the future that will harbor today's climate conditions.



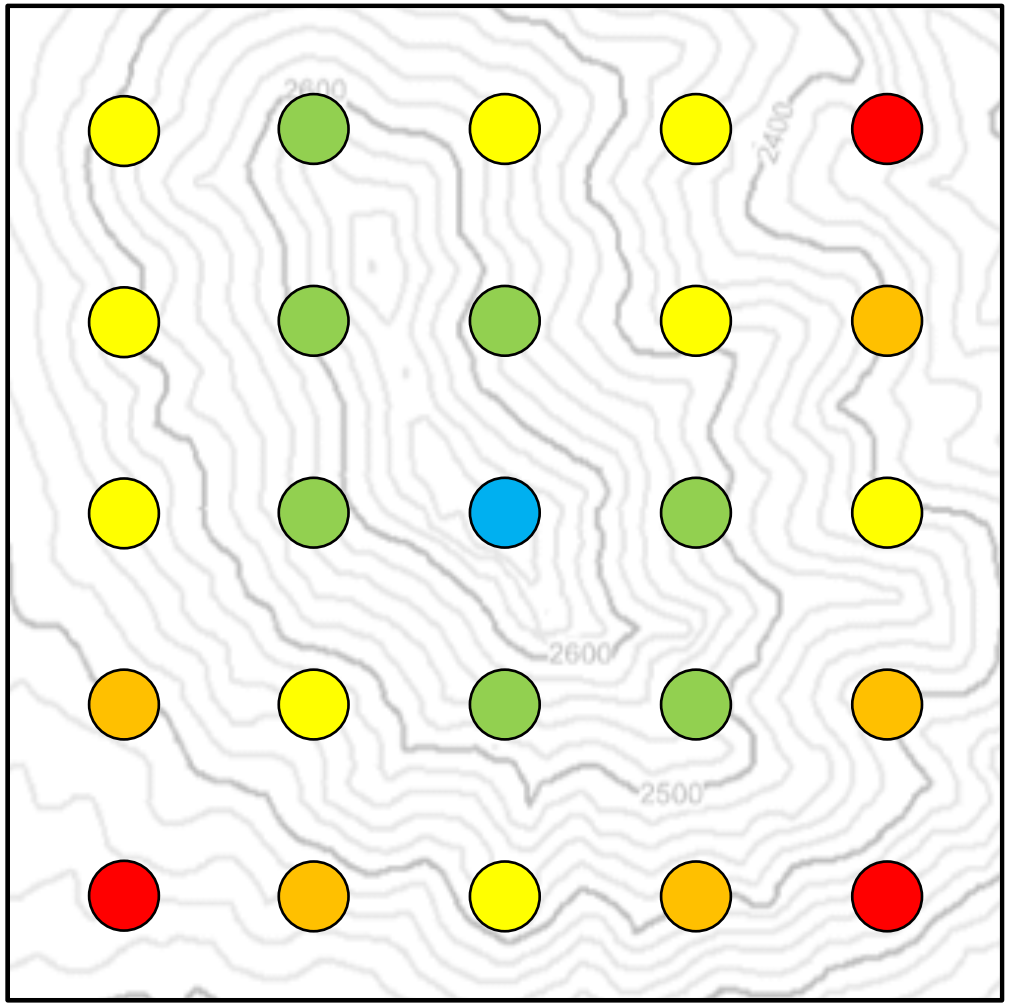
Connect climate analogs (Circuitscape), incorporating dispersal & landscape permeability

- Climate niche breadth
- 3 GCMs from CMIP5
- RCP 8.5 emissions scenario
- 2 time periods



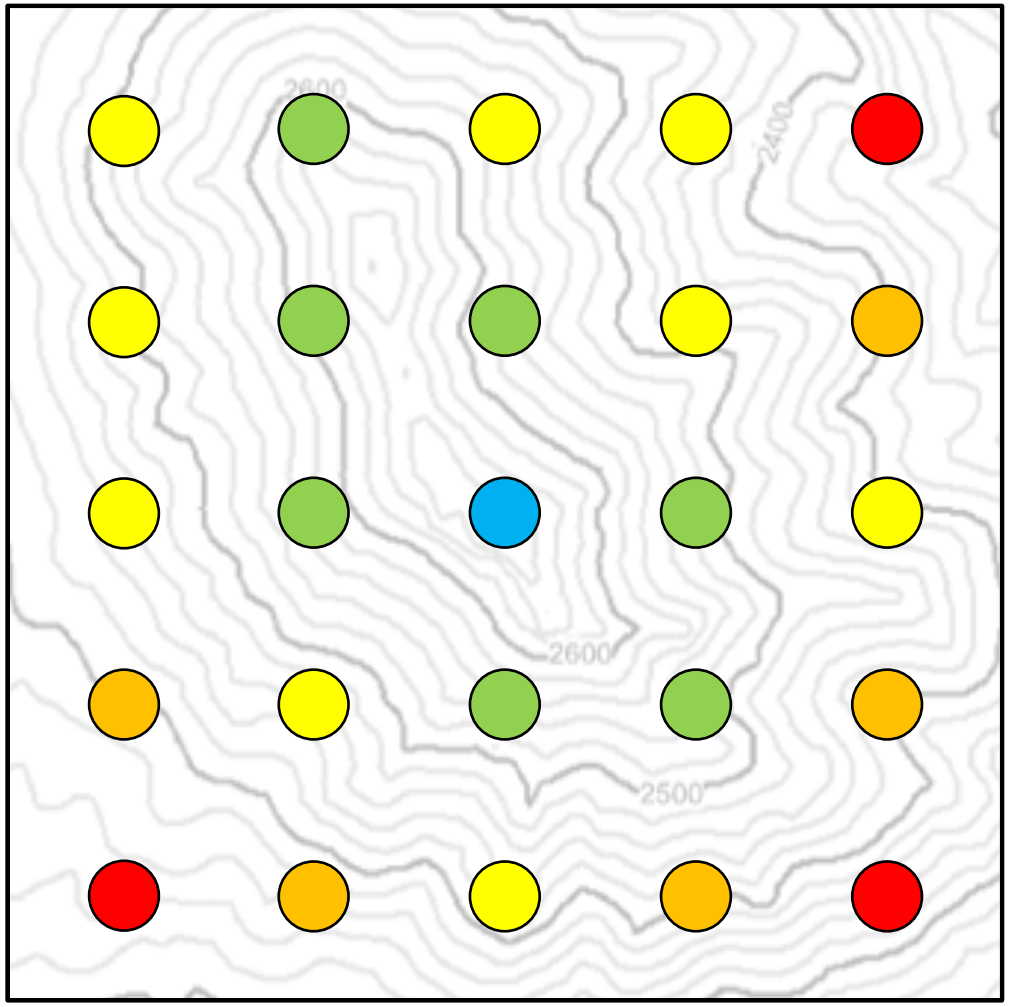
How do climate projections affect modelled connectivity? Do they shift the road map for species movement?

today

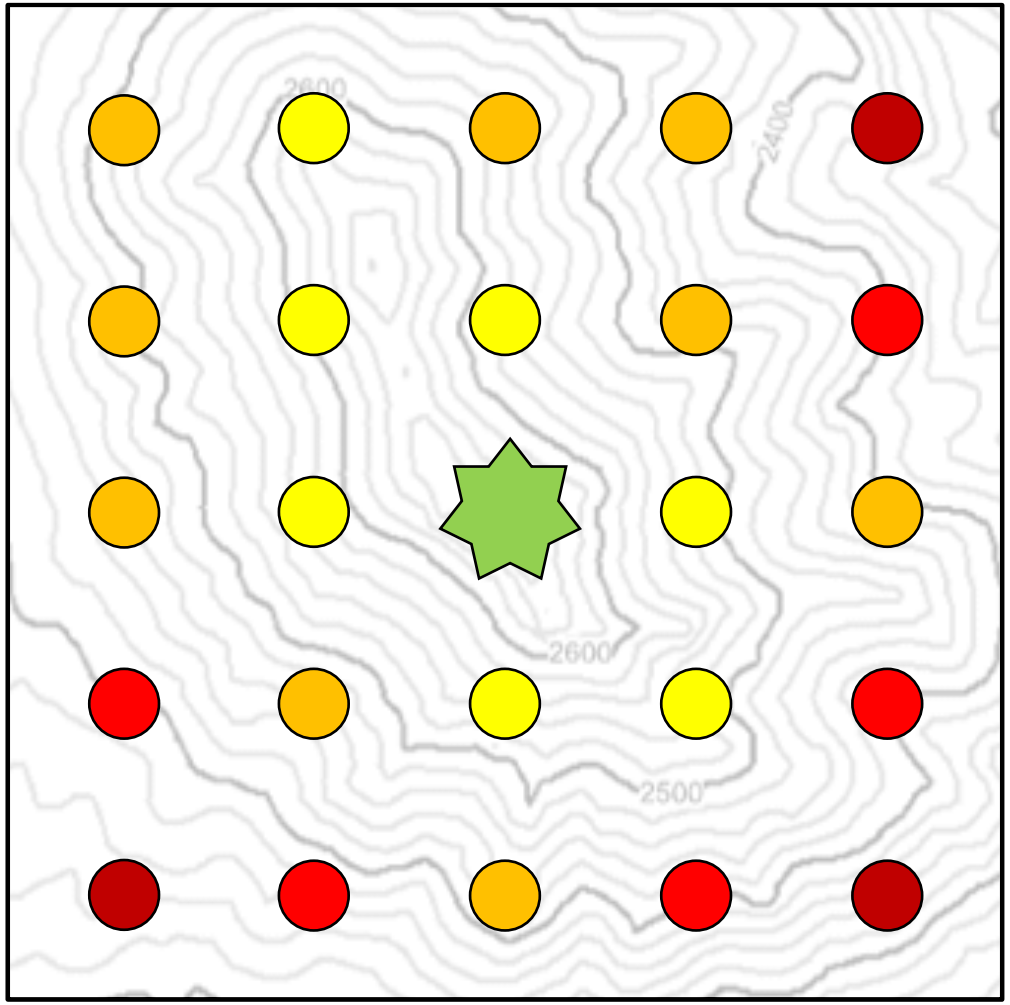


today

future

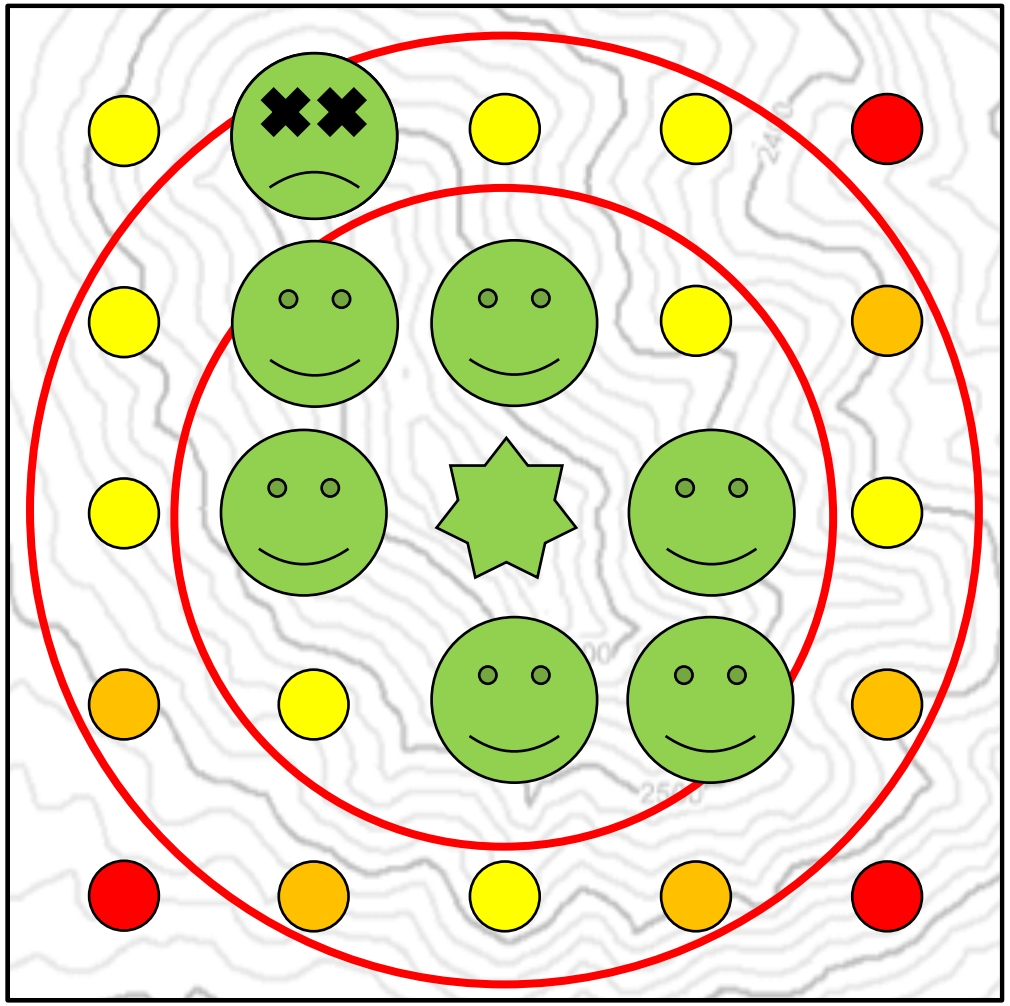


future



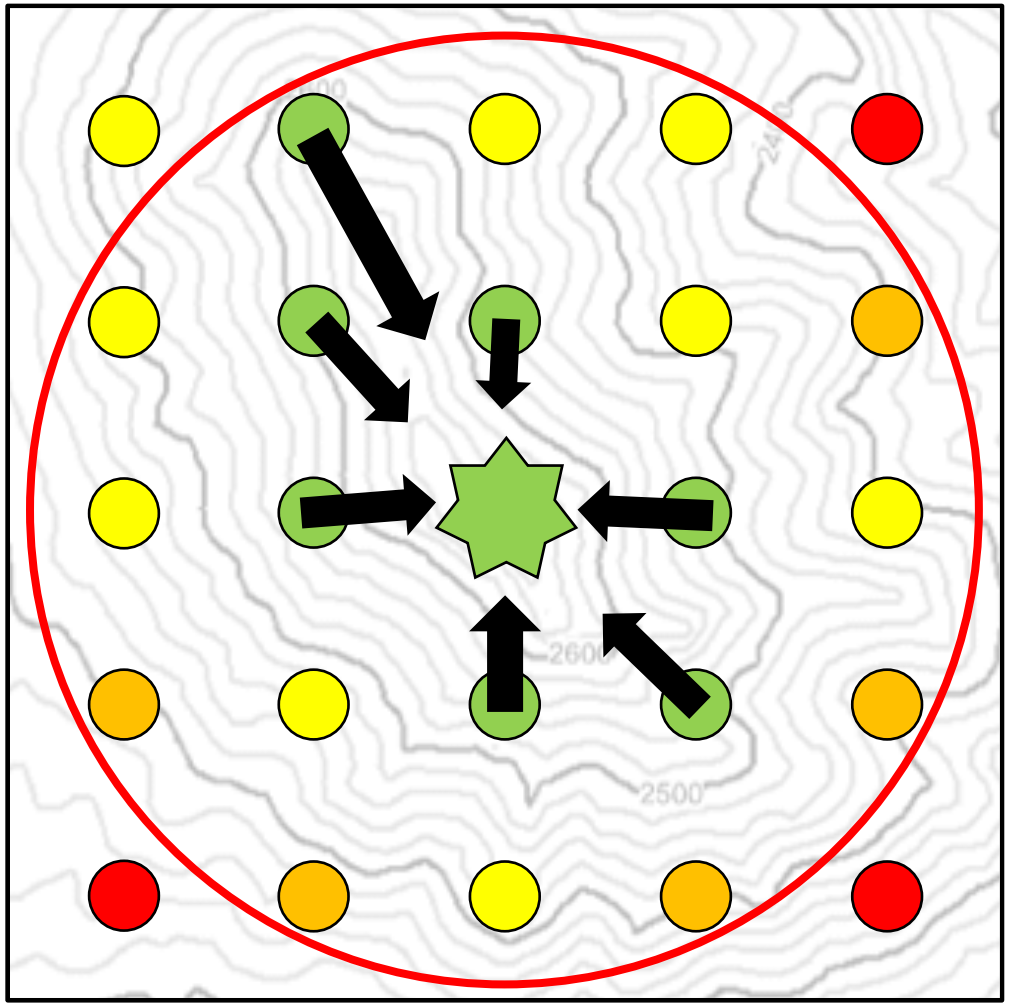
today

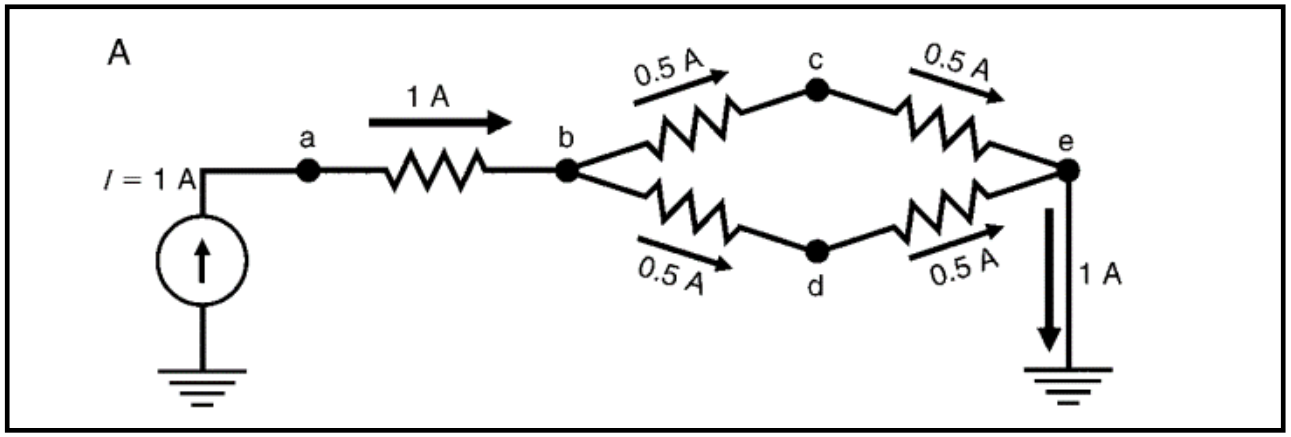
future



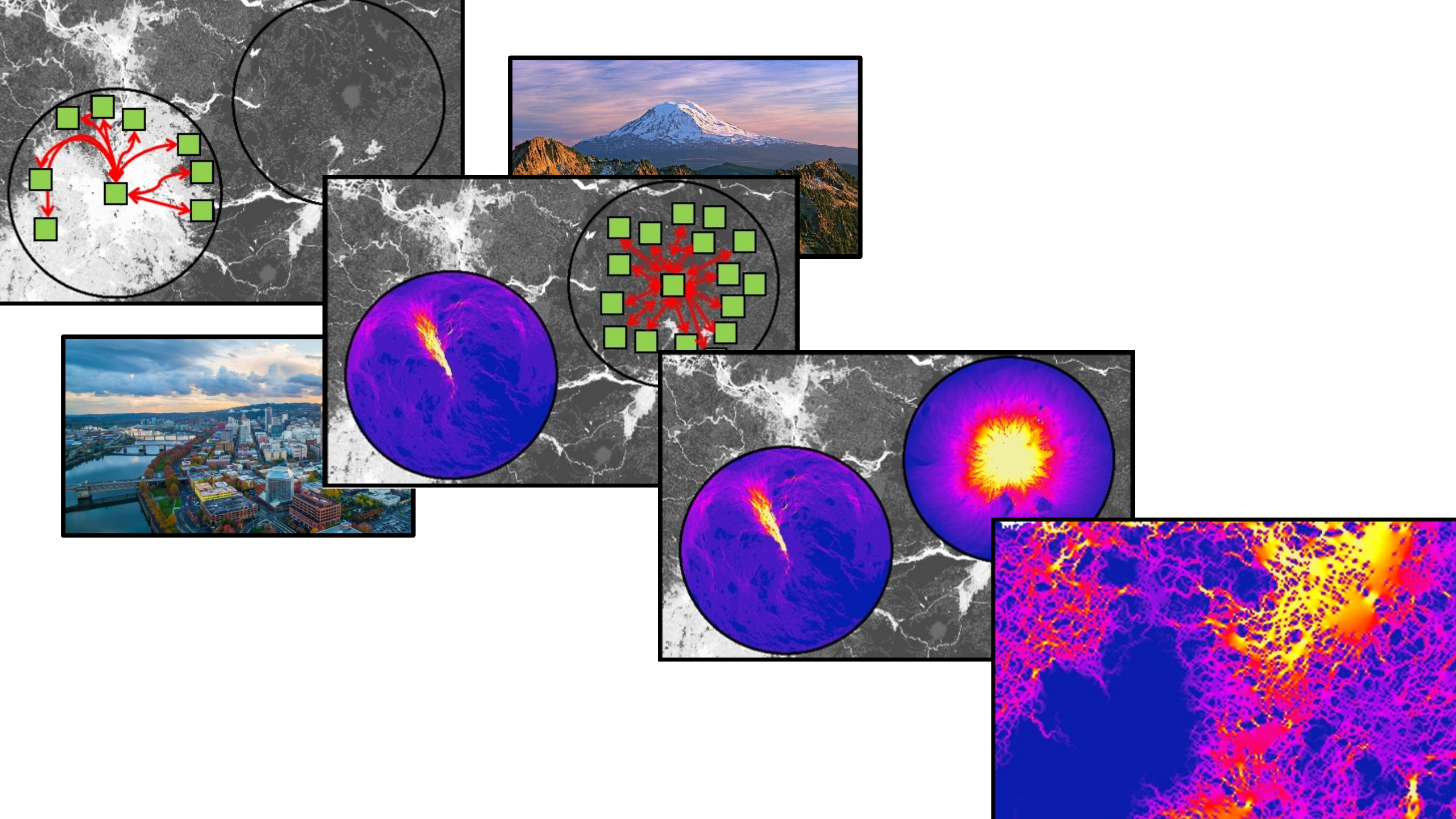
today

future





McRae et al. 2008 Ecology

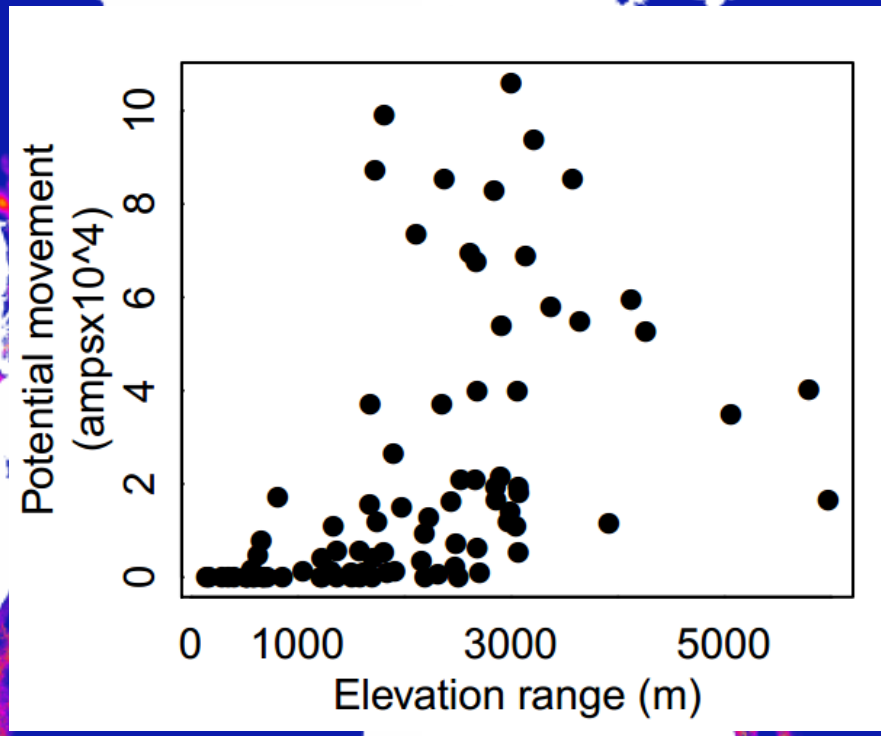


What areas are most important for climate-induced movement?

INM CM4

MIROC5

GFDL CM3



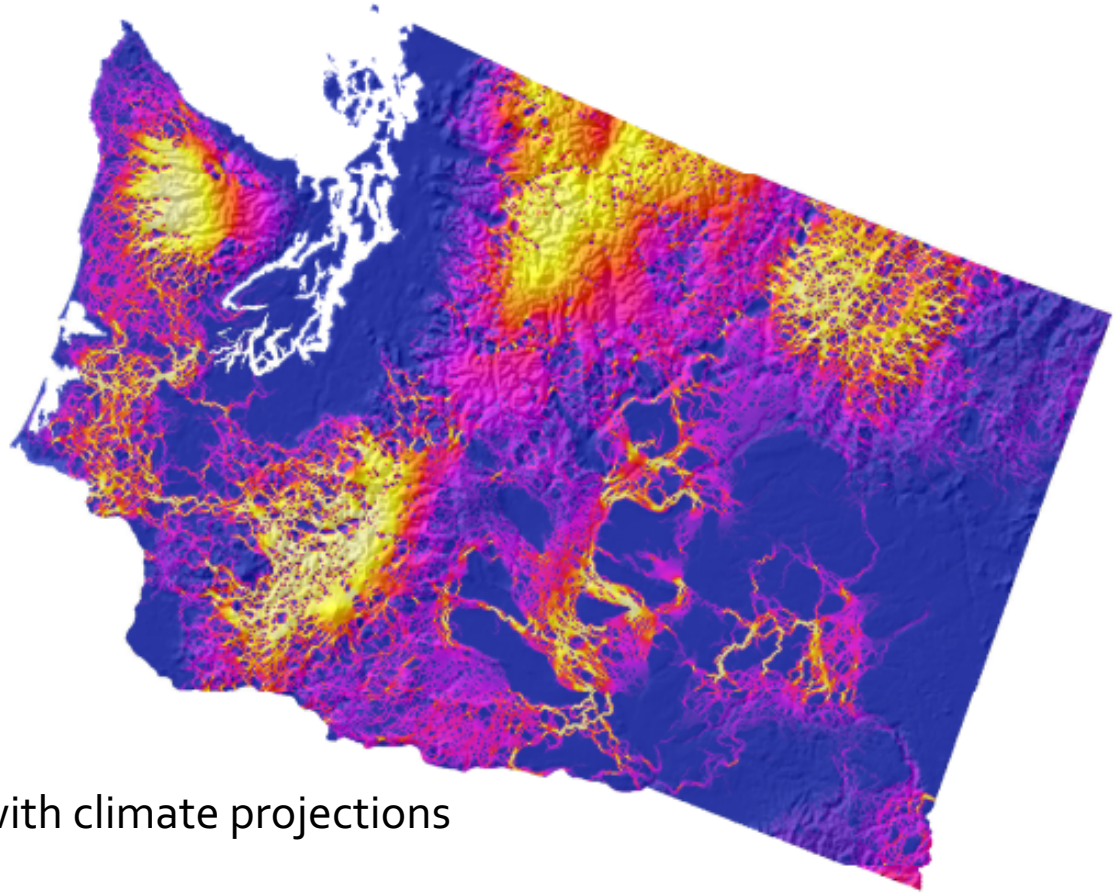
Potential movement

High

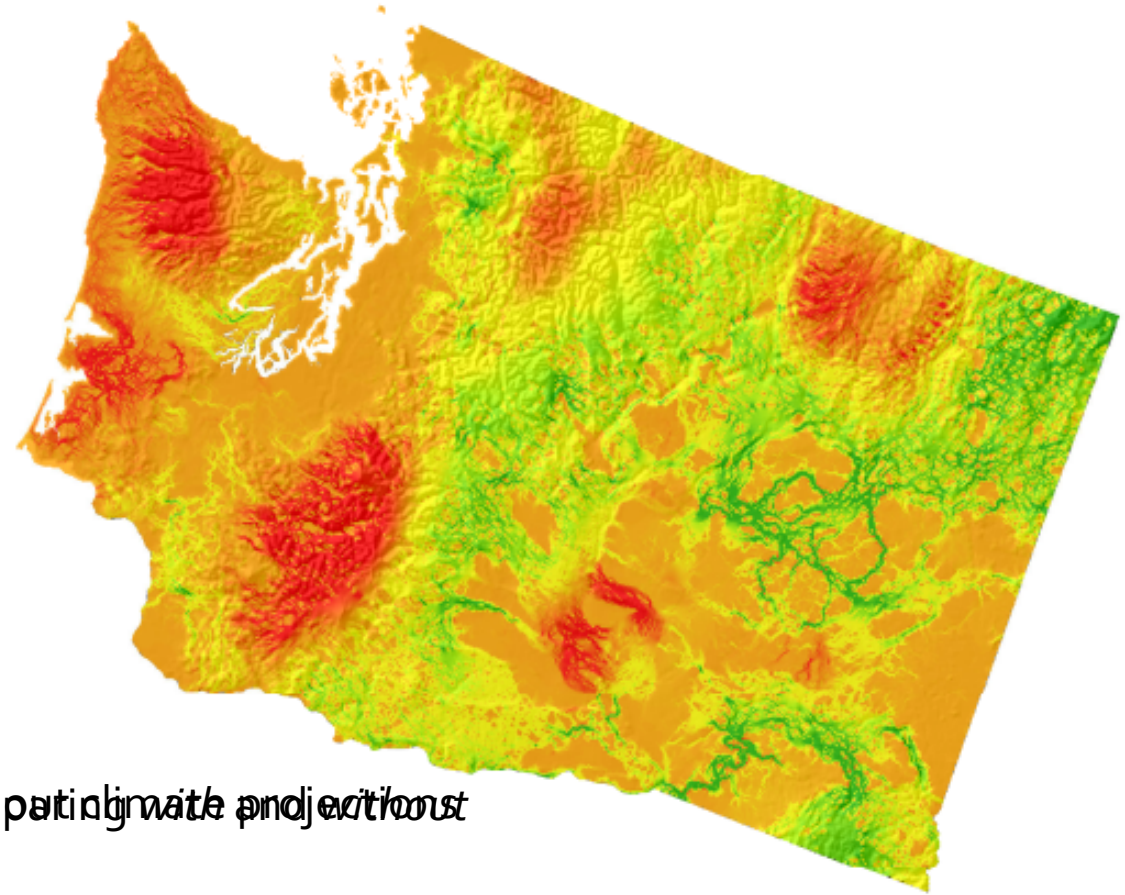
Low

→→→Severity of projected climate change →→→

How does this compare to connectivity that *doesn't* include climate projections?



with climate projections



without climate projections

Potential movement

High

Low

Connectivity impact of climate projections

More important for movement without climate change

More important for movement with climate change

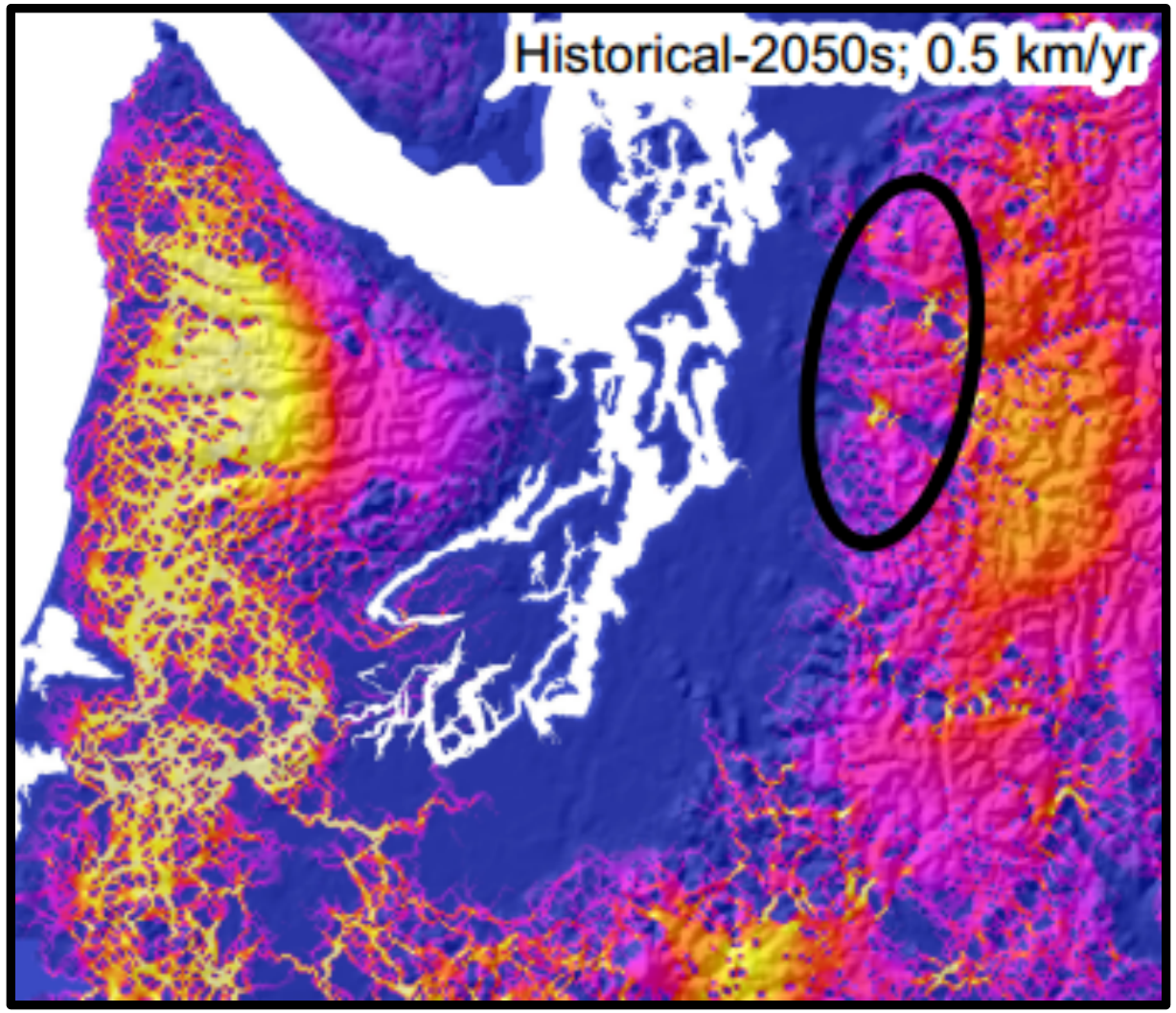
Isn’t climate change unfolding continuously?

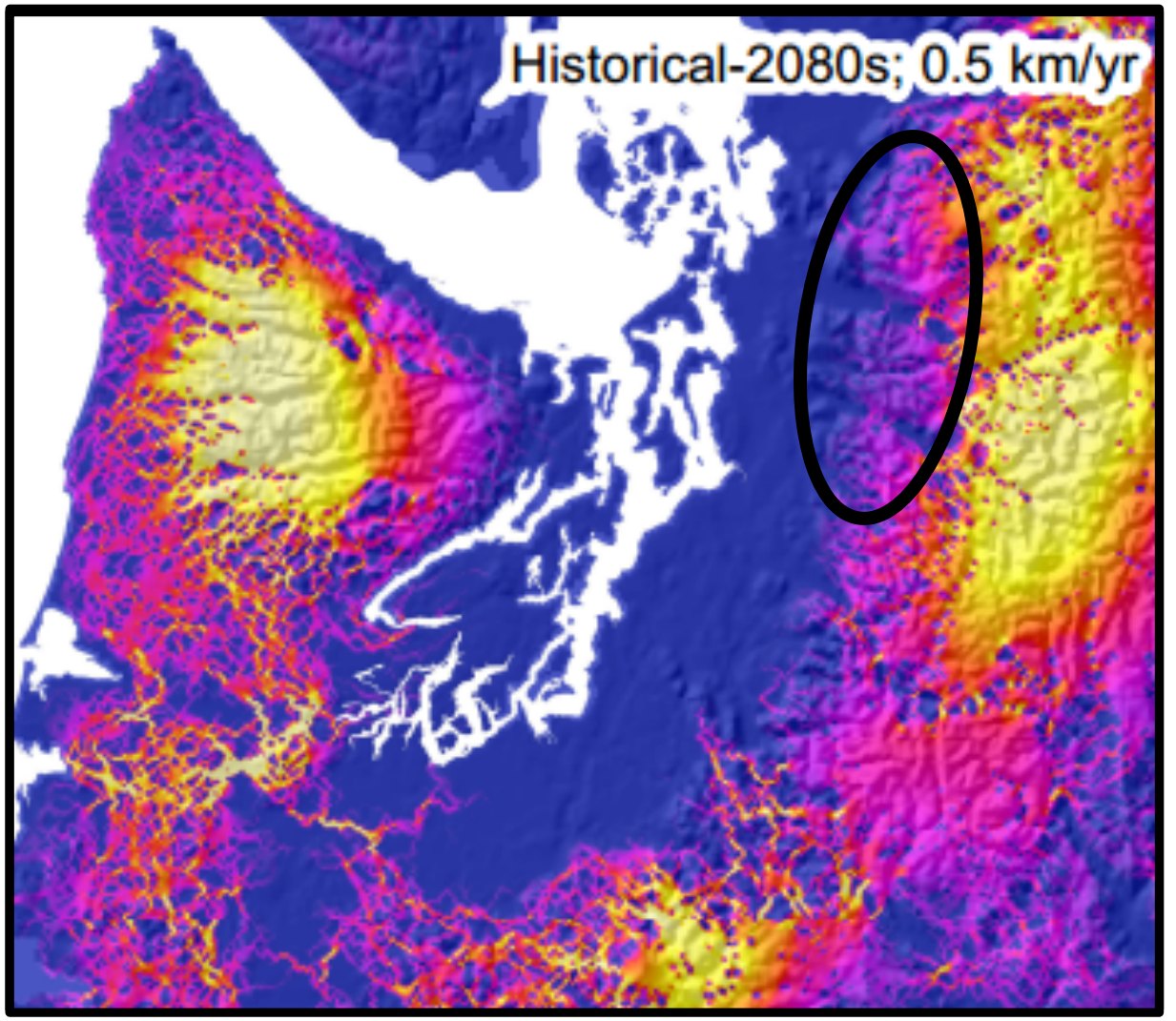
today

future

?

?



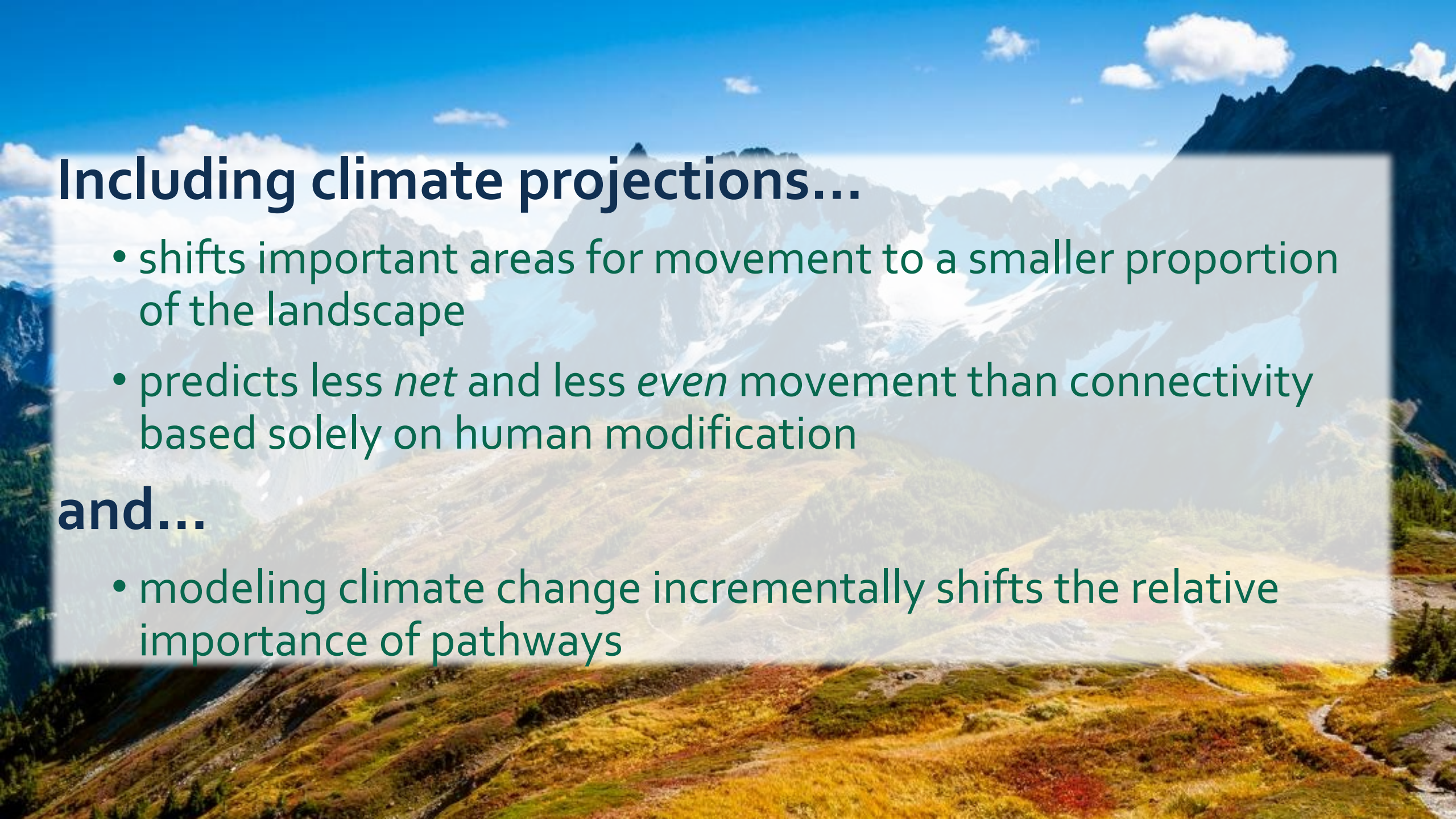


Potential movement

High

Low

Take-aways?



Including climate projections…

- shifts important areas for movement to a smaller proportion of the landscape
- predicts less *net* and less *even* movement than connectivity based solely on human modification

and…

- modeling climate change incrementally shifts the relative importance of pathways


Connectivity enhancement based on human modification alone or simplifying the temporal resolution of climate change may overestimate movement and miss critical pathways.

Questions?

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Acknowledgements

Wilburf f the
AdaptW roject

Nation tion

World Climate Resea me's Working Group
on Coupled Mo CMIP5 dataset

Brad McRae

1966-2017

Take-aways:

- Including climate projections shifts important areas for movement to a smaller proportion of the landscape.
- Connectivity maps solely driven by human modification predict more net movement, more even movement.
- Relative importance of pathways shifts when climate change proceeds incrementally in two time steps vs. in one time step.
- *Connectivity enhancement based on human modification alone or simplifying the temporal resolution of climate change may over-estimate movement and miss critical pathways.*