

The importance of landscape context in invasive plant patterns within conservation linkages

A landscape photograph showing a residential area with a green field and a hill in the background under a cloudy sky. Yellow flowers are in the foreground.

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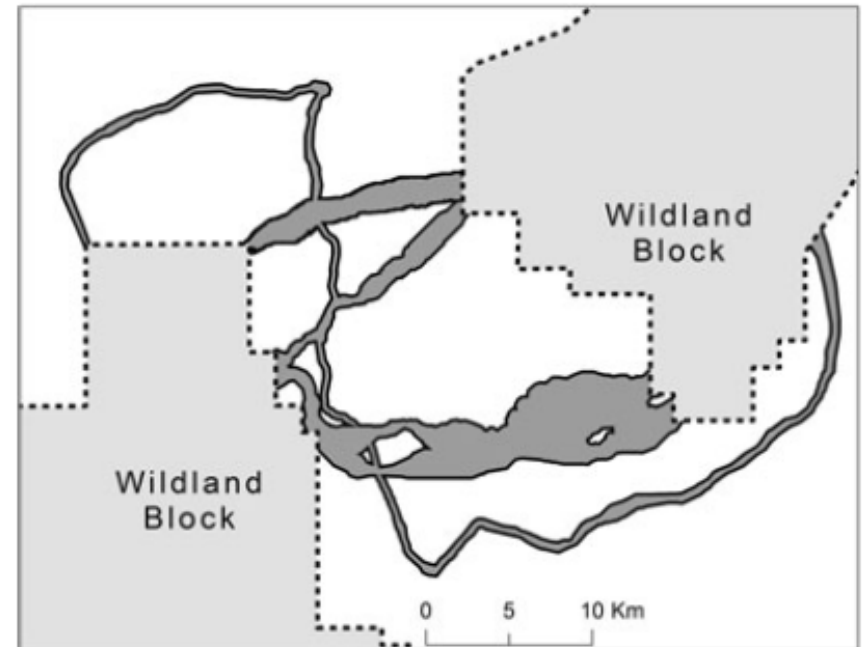
Roadmap



- Background
- Main questions
- Research area and methods
- Preliminary results

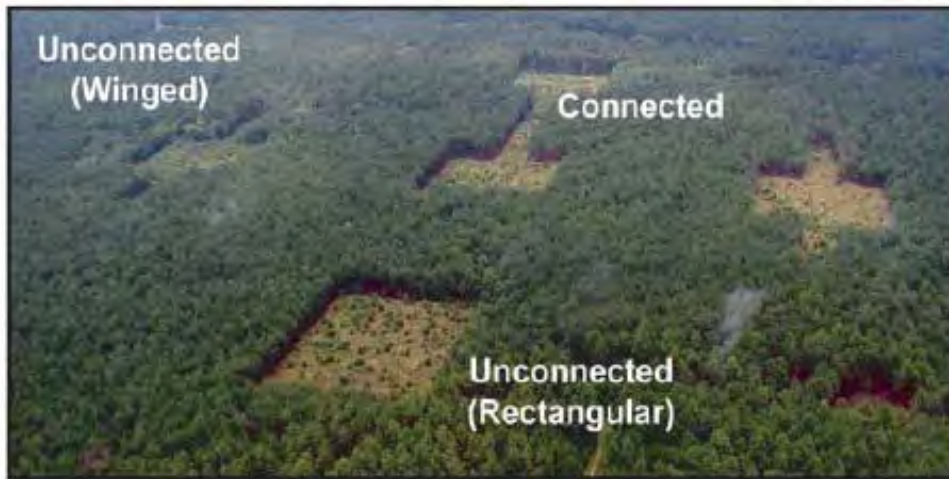
Linkage rundown

- Linkage: “**connective land intended to promote movement of multiple focal species or propagation of ecosystem processes**” (Beier et al. 2008)
- Connectivity important for conservation
 - Habitat fragmentation problems
 - Climate-change induced range shifts

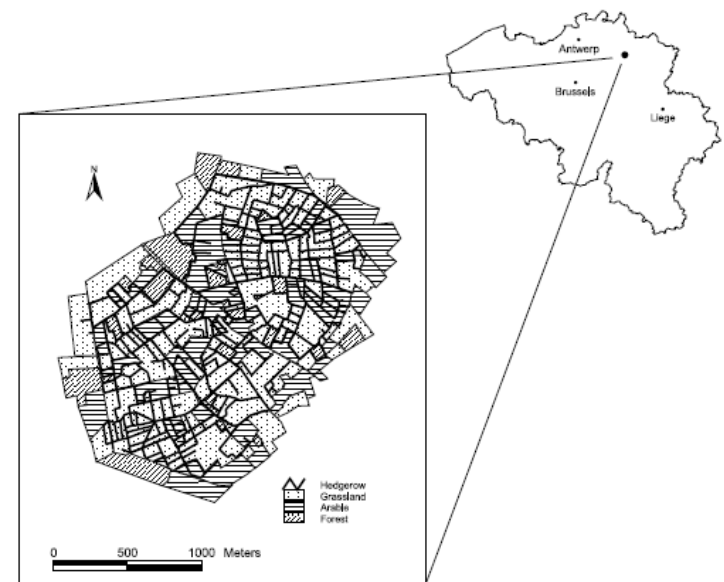


Linkages sound great but...

- What about invasive species, diseases, wildfire?
- Hypothesized but little studied
 - 2 empirical studies explicitly looked at invasive plants (Damschen et al. 2006, Deckers et al. 2008)



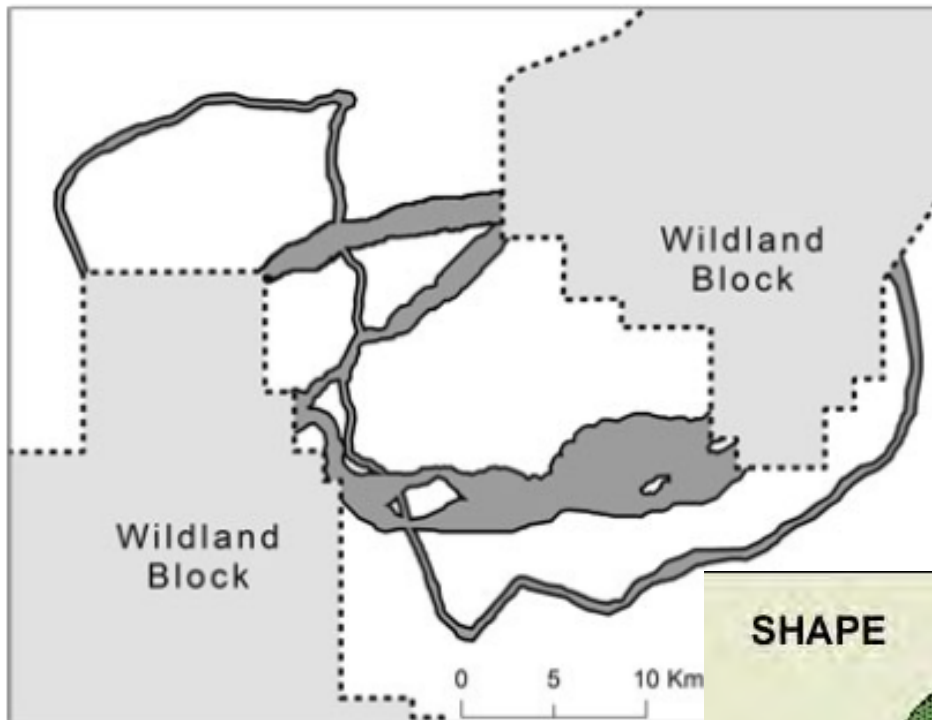
Savannah River Site (South Carolina)



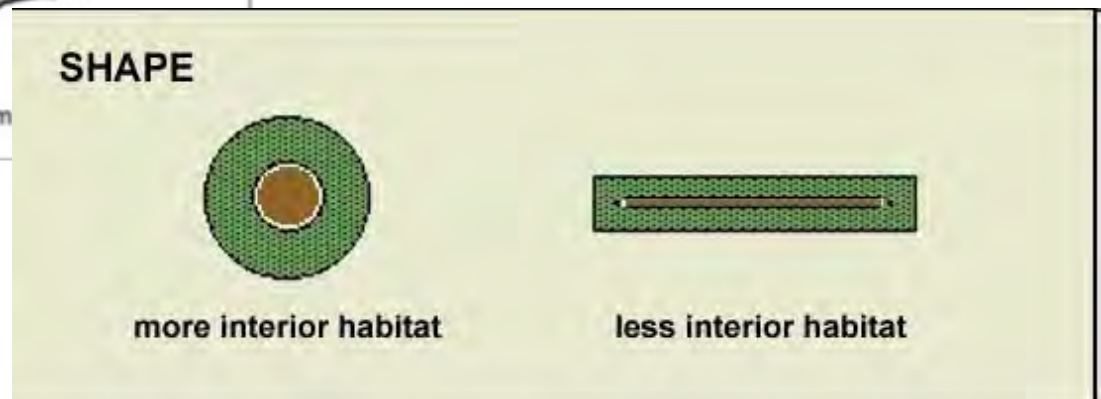
Belgian hedgerows

What's so special about invasive plants and linkages?

- Higher edge to area ratios

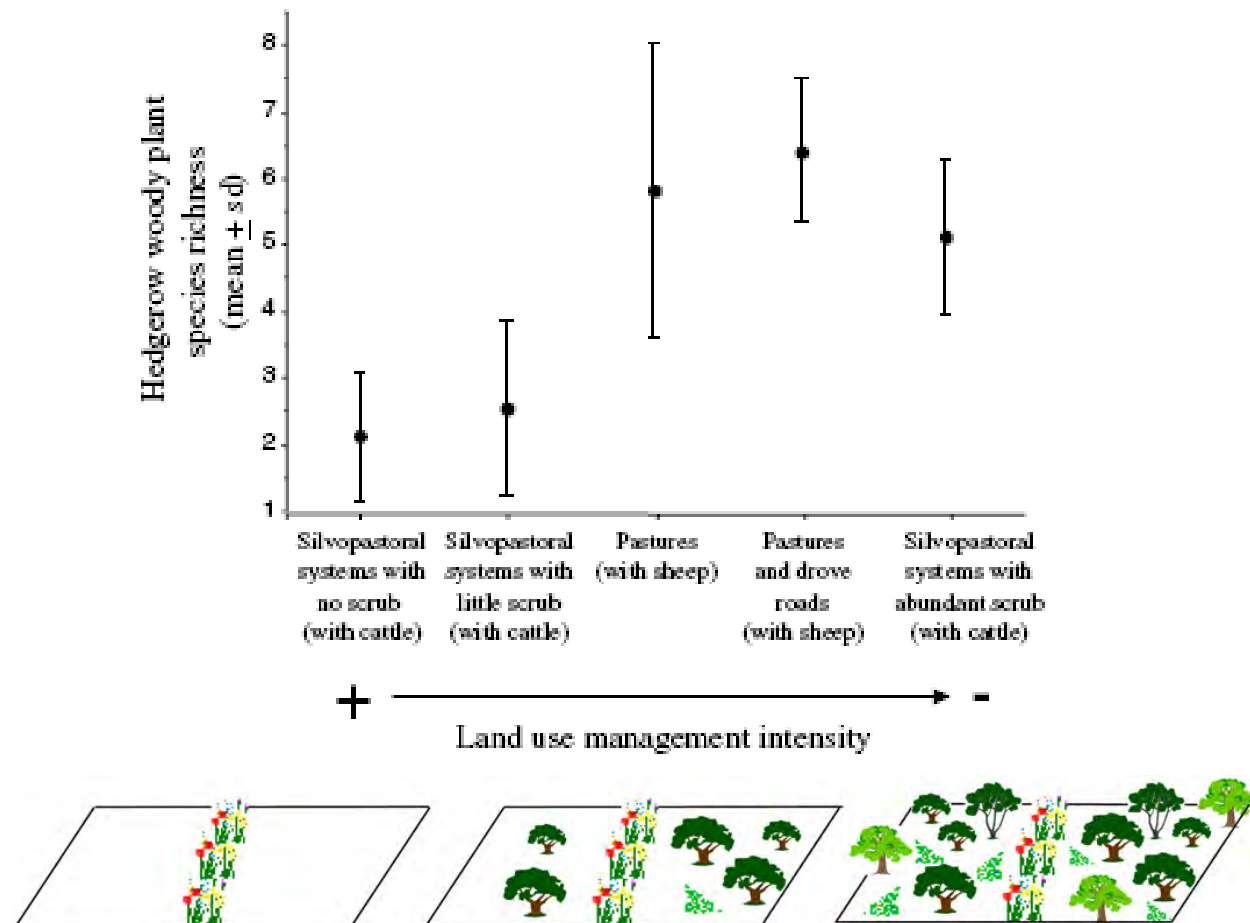


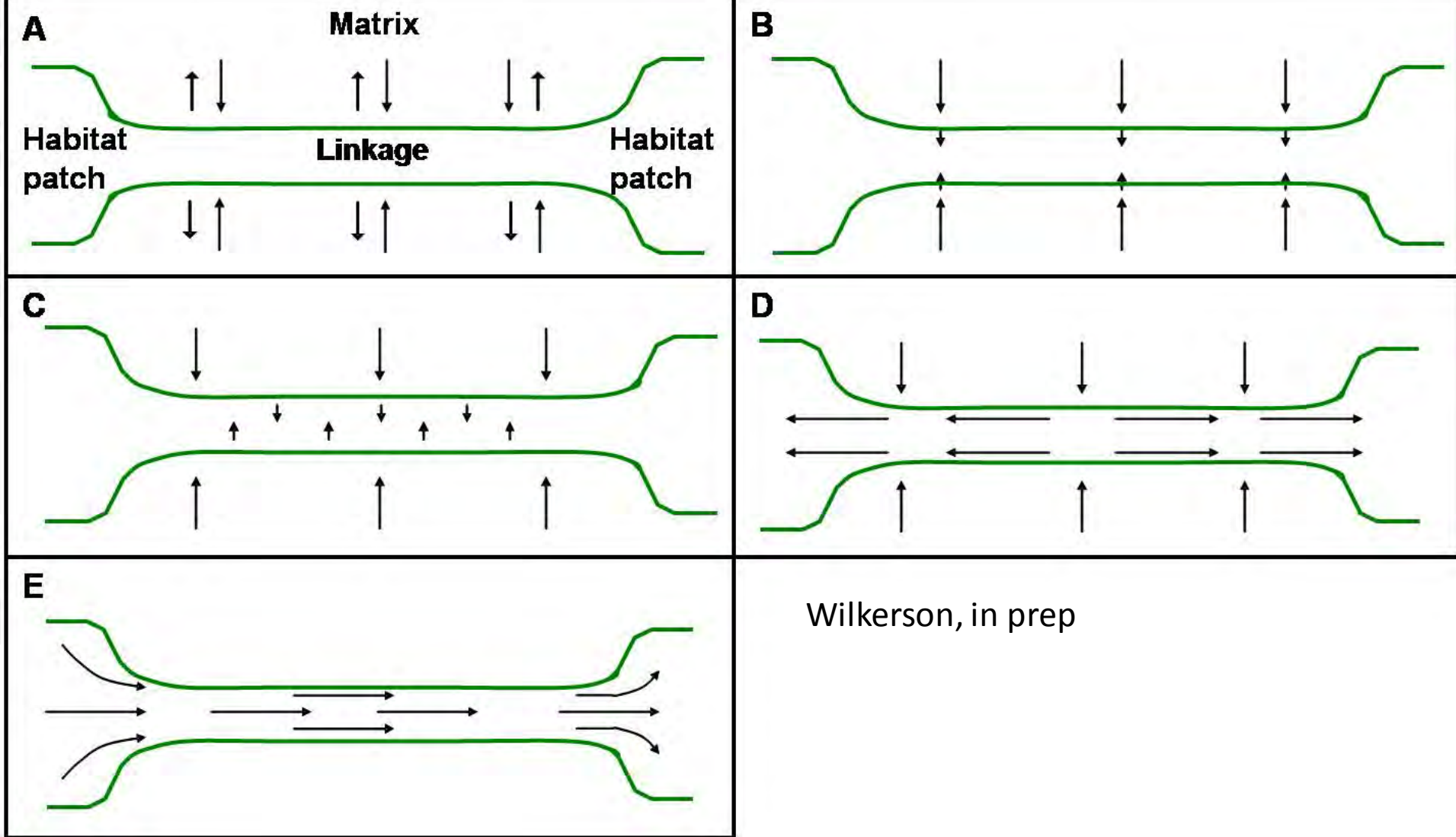
Beier et al. 2008



What's so special about invasive plants and linkages?

- Strong influence of the matrix



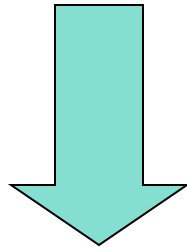


Methods of linkage invasion

Arrows denote direction of invasion.

(A) Barrier (B/C) Habitat (D/E) Conduit

1. **Which** invasive plants occur in conservation linkages and at what abundance?
2. **Where** do they occur within and across these landscape features?
3. Are the **patterns** of invasion correlated with matrix characteristics, linkage characteristics, and/or species' ecology?

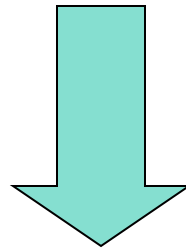


How can linkages be designed and managed to minimize invasion?



Research focus

- Edge vs. interior
- Matrix effects
- Dispersal ecology



Do invasive plant patterns change with distance from the edge?
How do different types of matrices impact those patterns?
Are those patterns driven by the species' dispersal mode?

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Focal invasive species

- Reasons chosen
 - Occur in Riverside and/or San Diego County
 - Actively controlled or prioritized by local land managers

AND/OR

- Rated moderate to high priority by California-Invasive Plant Council (Cal-IPC)
- 45 species total
 - 15 grasses
 - 17 forbs
 - 12 shrubs/trees/vines



Erodium spp. (filaree)



Pennisetum setaceum (fountain grass) and *Washingtonia robusta* (fan palm)



Avena spp. (wild oats)

Choosing sites

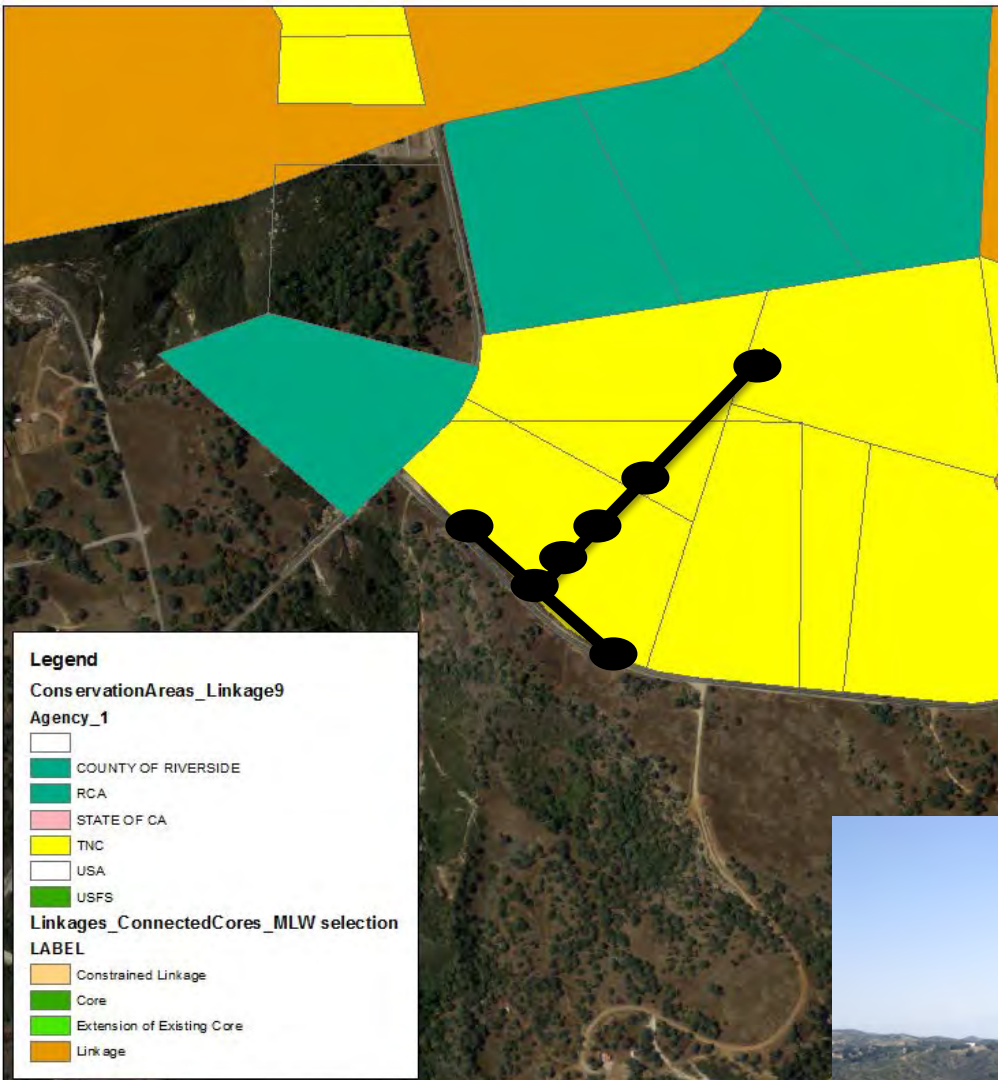
Differentiating between matrices based on predicted ease of plant dispersers (wind, animal, bird)



Minimal open/green space for animals to move between matrix and linkage
e.g., densely, packed suburban housing matrix

Abundant open/green space for animals to move between matrix and linkage
e.g., wildlands matrix





At each site

- 2 line transects (focal species presence/absence)
 - Edge
 - Edge to interior
- 7 cover block (focal species percent aerial cover)
 - 3 edges
 - 1 at 25 m from edge
 - 1 at 50 m from edge
 - 1 at 100 m from edge
 - 1 at 200 m from edge

Transect (100 or 200 m)
 Cover block (6m x 6m)





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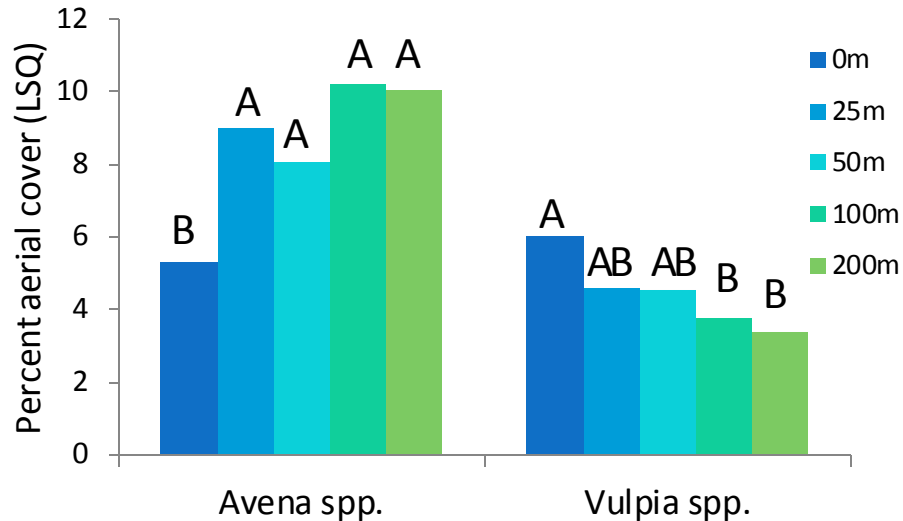


**Do invasive plant patterns change
with distance from the edge?**

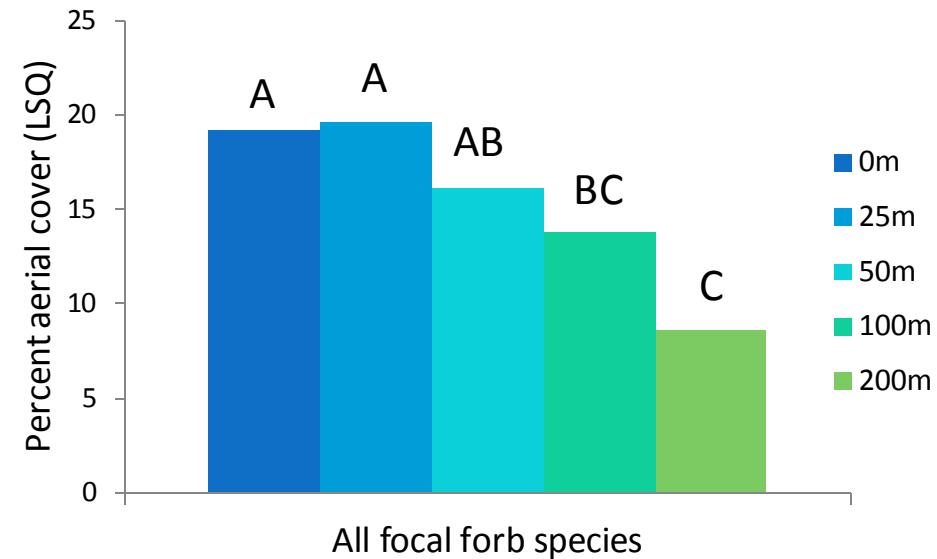


Effect of distance on cover from edge to interior

Mixed distance effects in grasses

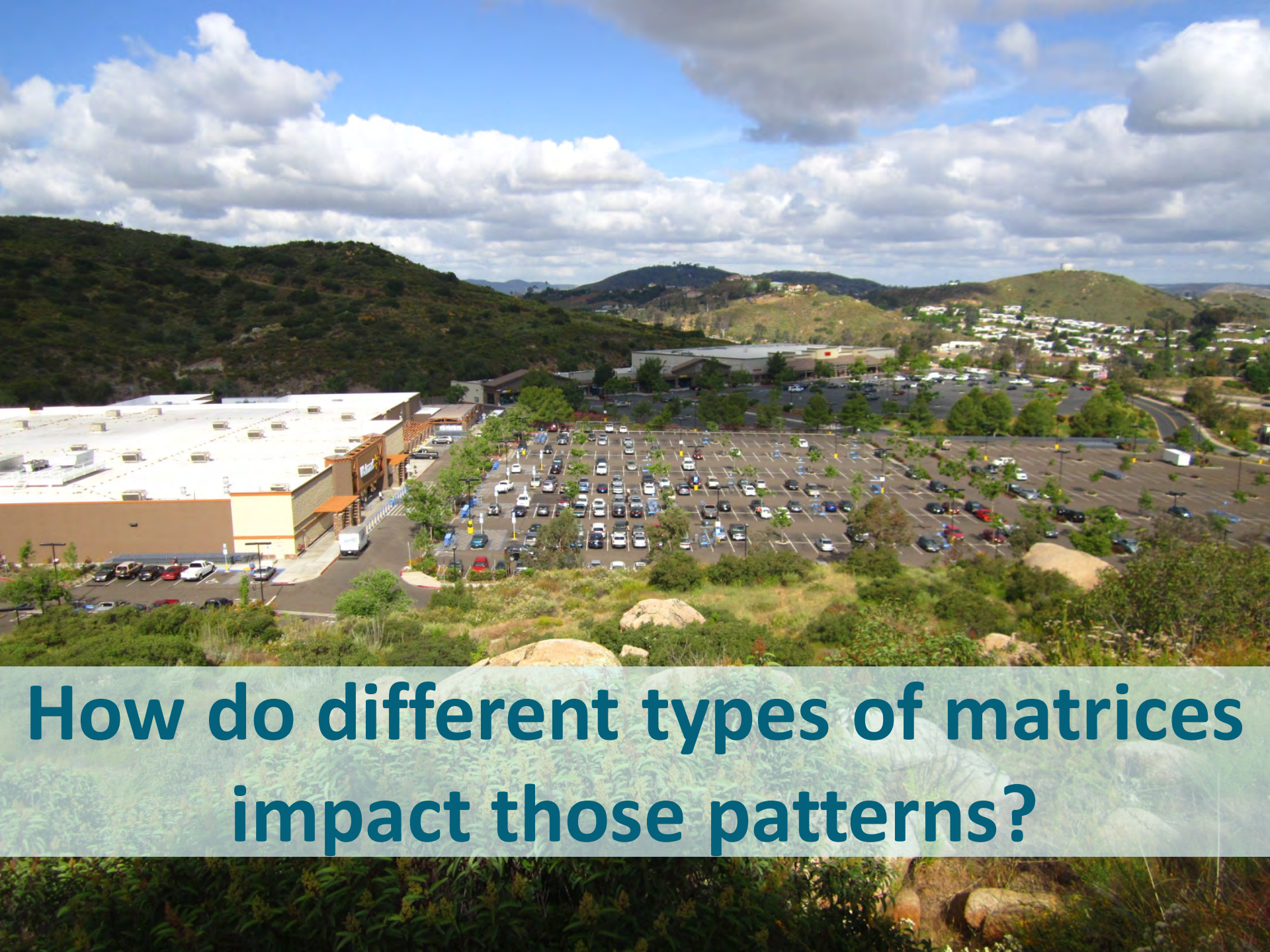


Most forbs decreased from edge to interior



Conclusion: Distance from edge is a significant factor in most focal invasive species cover patterns but direction of trend varies

Note: Letters above bars denote statistically significant Tukey groups



**How do different types of matrices
impact those patterns?**

Effect of land cover on species presence along edge transect

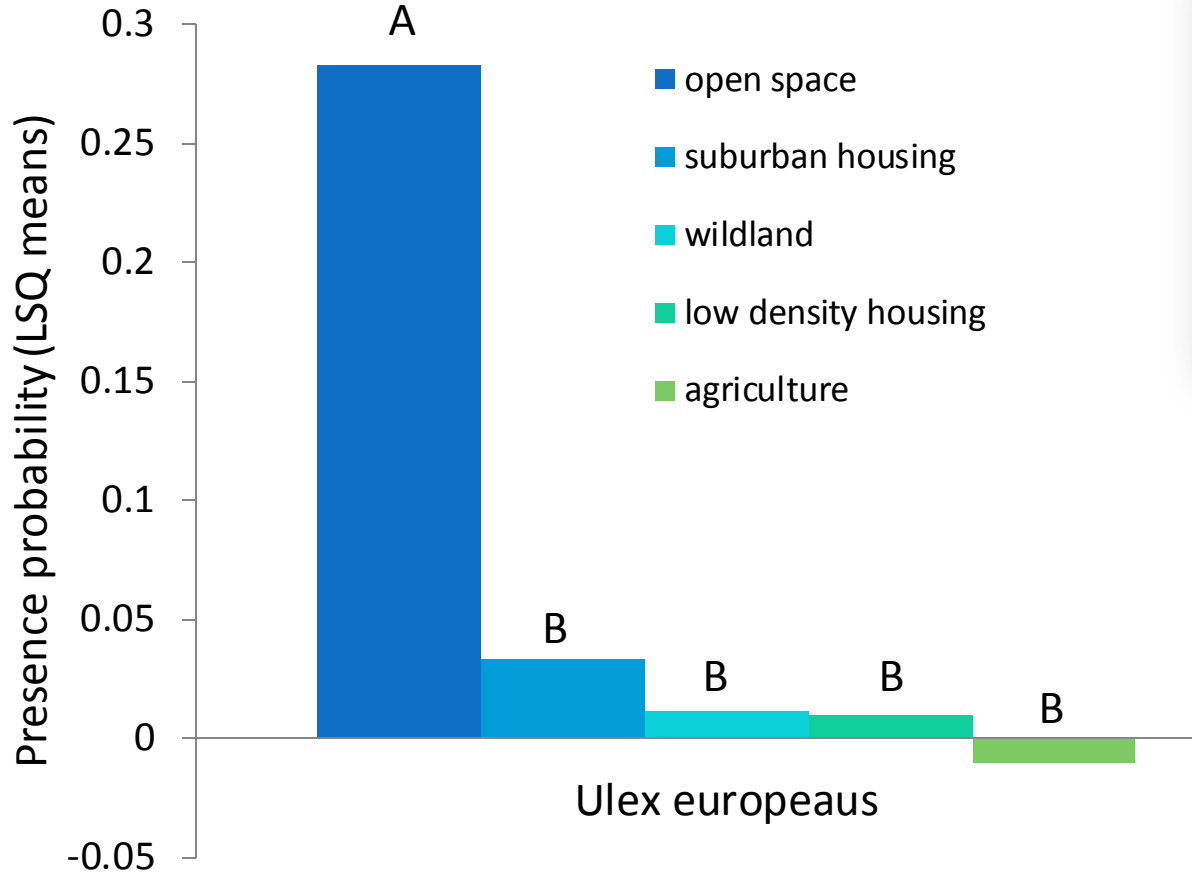
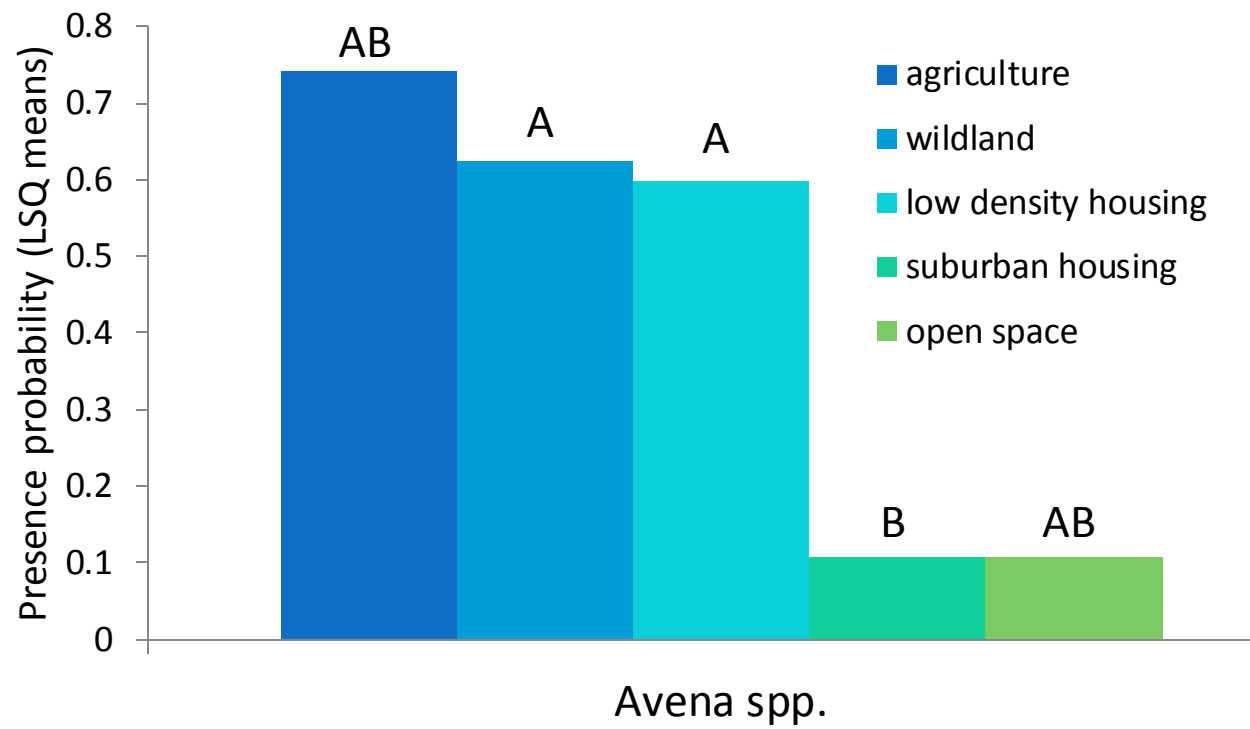


Photo by Hugh Bollinger

Conclusion: Land cover is a significant factor in the presence of certain species along linkage edges

Note: Letters above bars denote statistically significant Tukey groups

Effect of land cover on species presence along edge transect



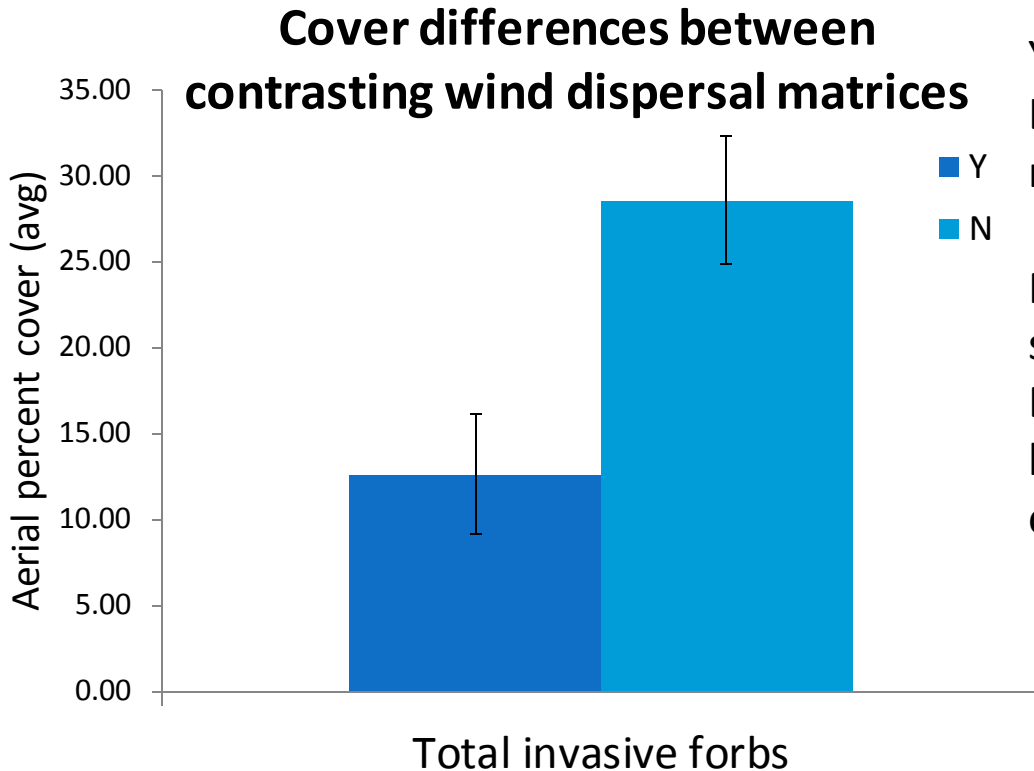
Conclusion: Land cover is a significant factor in the presence of certain species along linkage edges but direction of trend varies

Note: Letters above bars denote statistically significant Tukey groups



Are those patterns driven by the species' dispersal mode?

Effect of dispersal matrix type on species cover along edge



■ Y
■ N

Y – open, flat matrix

Little barrier to wind movement from matrix to linkage (e.g., wildlands)

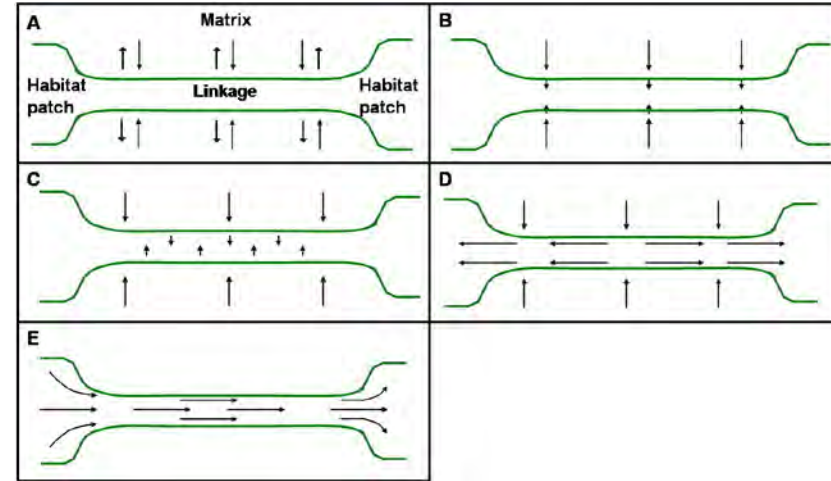
N – matrix that has dense, tall vertical structure

Barrier to wind movement from matrix to linkage (e.g., suburban housing or orchards)

Conclusion: Due to species' dispersal mode, the type of matrix can be a significant factor in species cover patterns along the edge of a linkage

Take-home messages

- There is a difference between edge and interior in large-scale conservation linkages
- The type of matrix may have an impact on what species are present in a linkage site and at what abundance → different landscapes for different species and/or groups

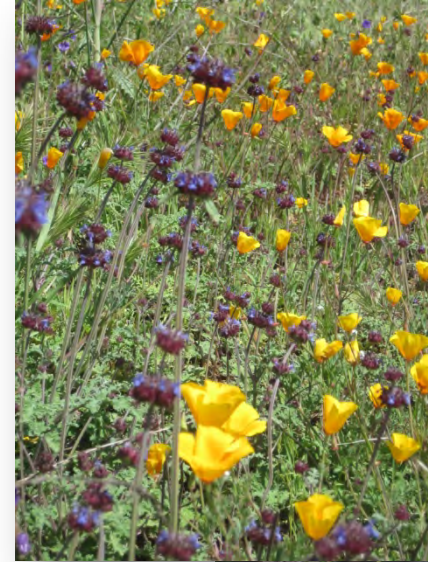


Next steps

- More analysis!
 - Incorporate historical weed management practices
 - Incorporate land history
 - Modeling and ordination techniques
- End goal: management recommendations
 - Where to prioritize invasive plant prevention/control within a linkage based on matrix type
 - Which species to prioritize based on dispersal mode and matrix type
 - Incorporate findings into broader SoCal (and beyond!) linkage work

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And thank y'all!

