# Seed dispersal by wind in fragmented landscapes with corridors

Images: E. Damschen

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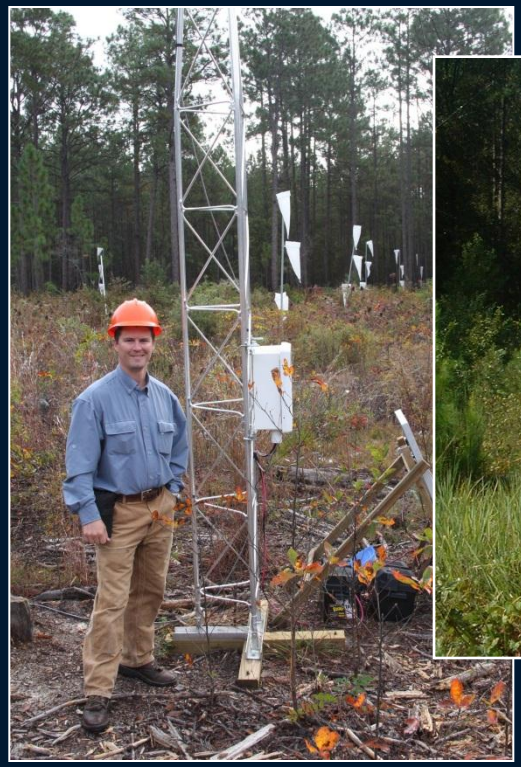
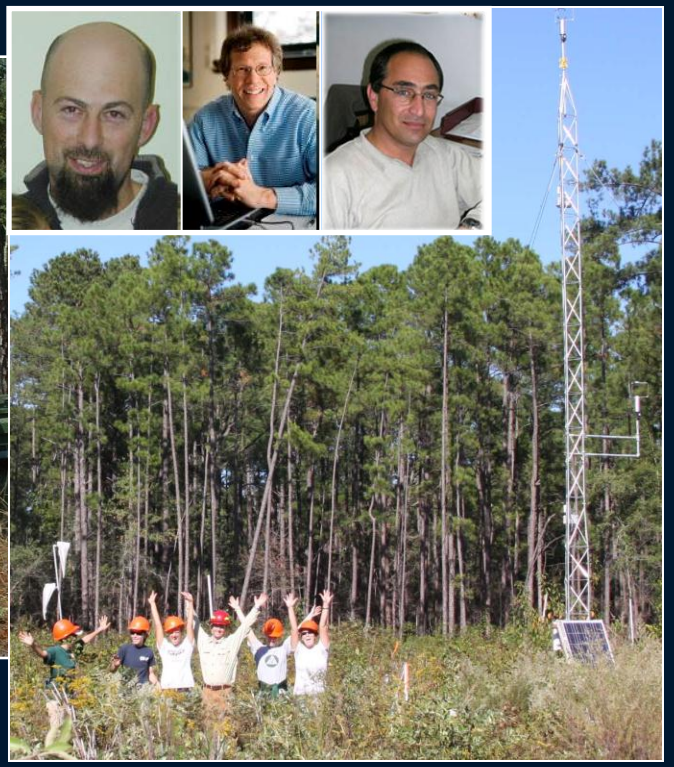
US Forest Service-Savannah River

National Science Foundation

10 Field Technicians





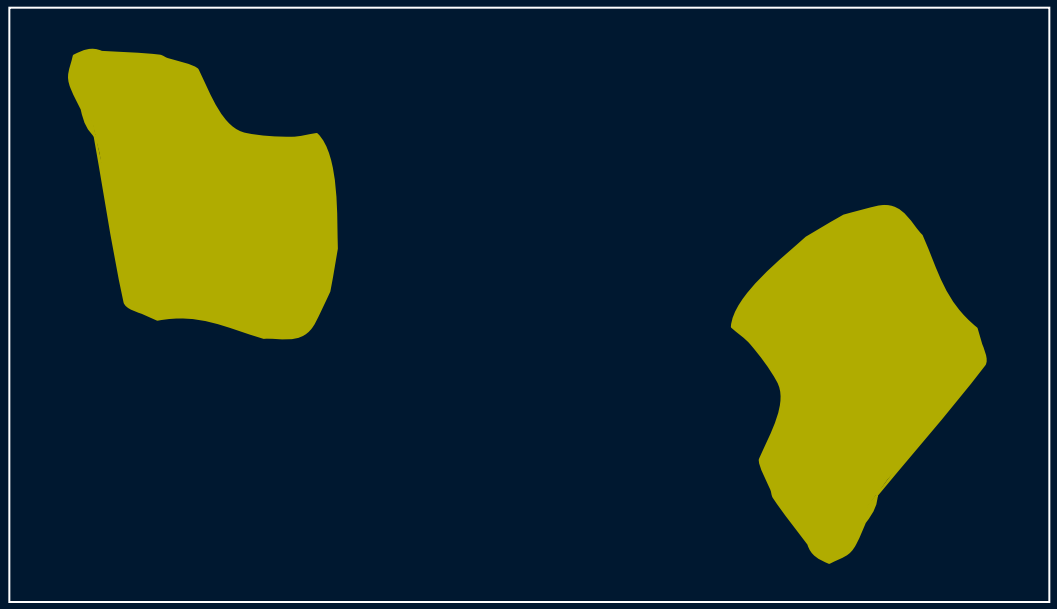
Images: E. Damschen, D. Baker

# Dispersal under global change



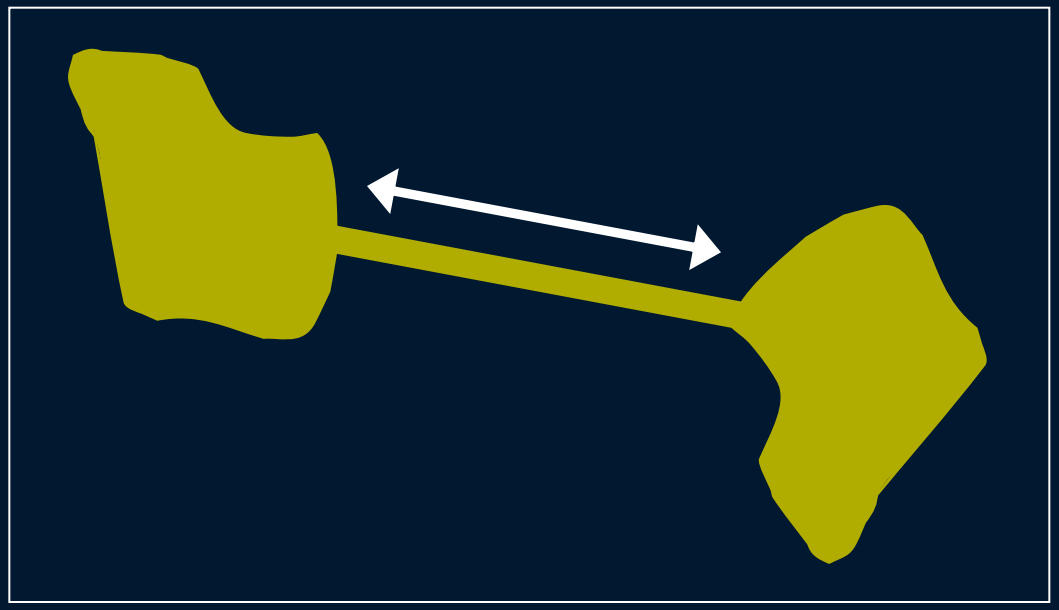



Images: : pss.okstate.edu/personnel/ faculty/englepi, E .Damschen, T. Grey

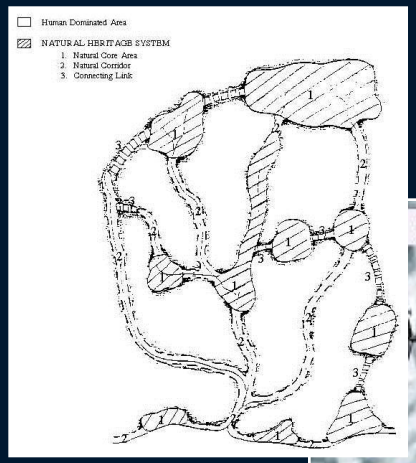


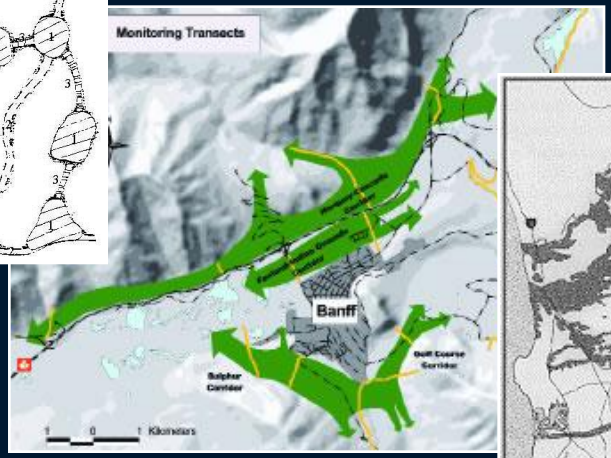
# Landscape corridors

## - Reduce between-patch isolation -



# Landscape conservation





Images: ceres.ca.gov, www.carolinian.org, www.pc.gc.ca, www.y2y.net

# Wind dispersal

Images: E. Damschen, USC Herbarium

# Questions

How do heterogeneous landscapes affect seed dispersal by wind?

How do habitat corridors affect wind-driven dispersal?

Do changes in wind dispersal lead to community-level impacts?

# Approach

- Experimental landscapes
- Mechanistic simulation model
- Empirical data
    - Seed releases
    - Wind dynamics
- Community impacts

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# Experimental landscape

Image: NOAA

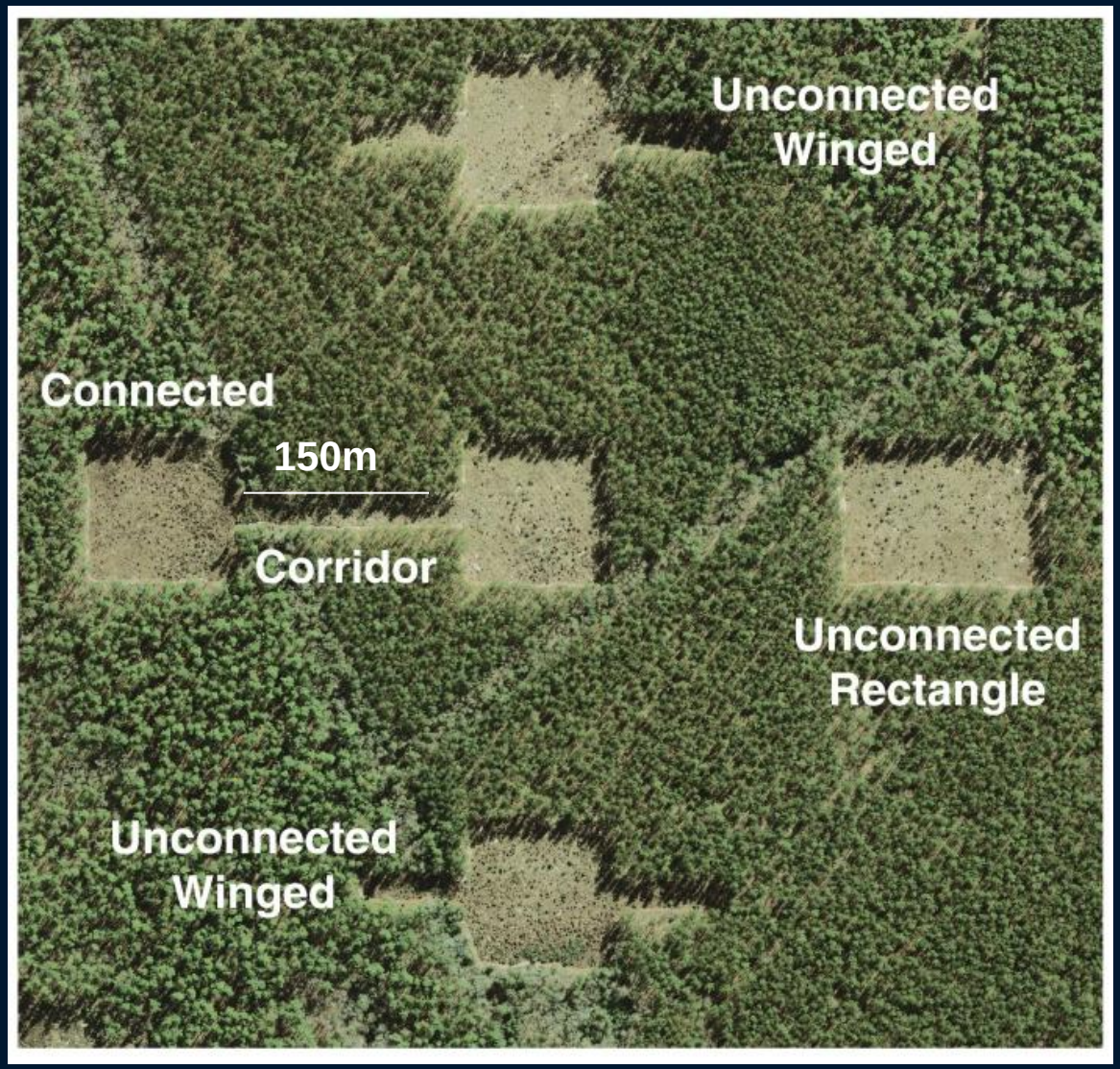
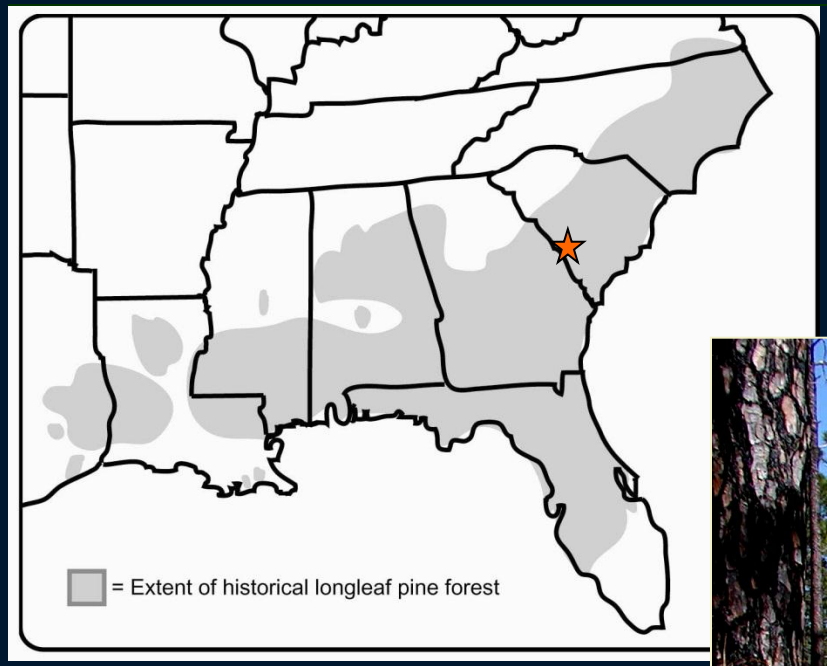



Image: SRS USDA Forest Service




# Longleaf pine forests

Images: E. Damschen

# Approach

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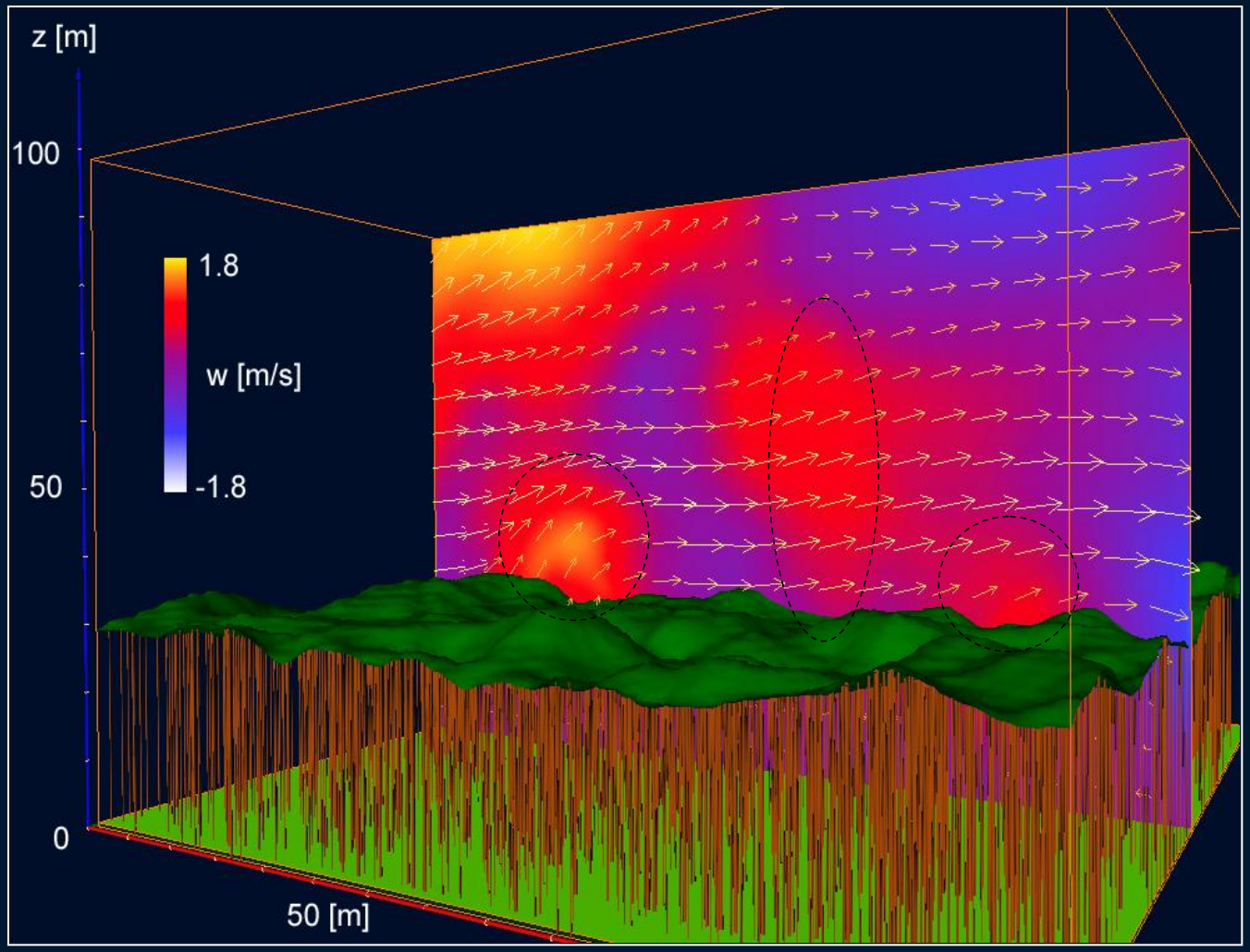
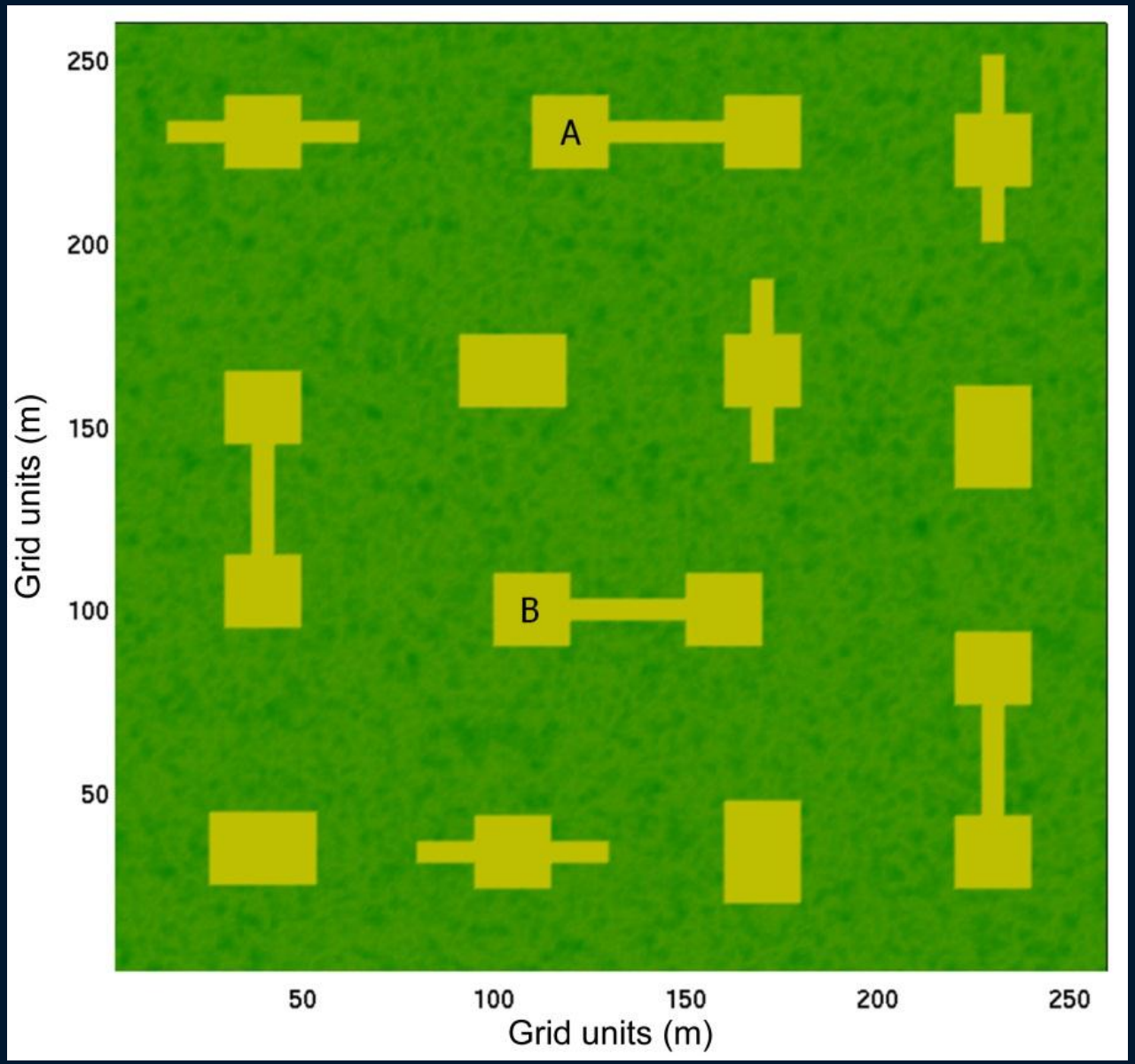
# Mechanistic simulation model
## (RAFLES: RAMS-based Forest Large Eddy Simulation)

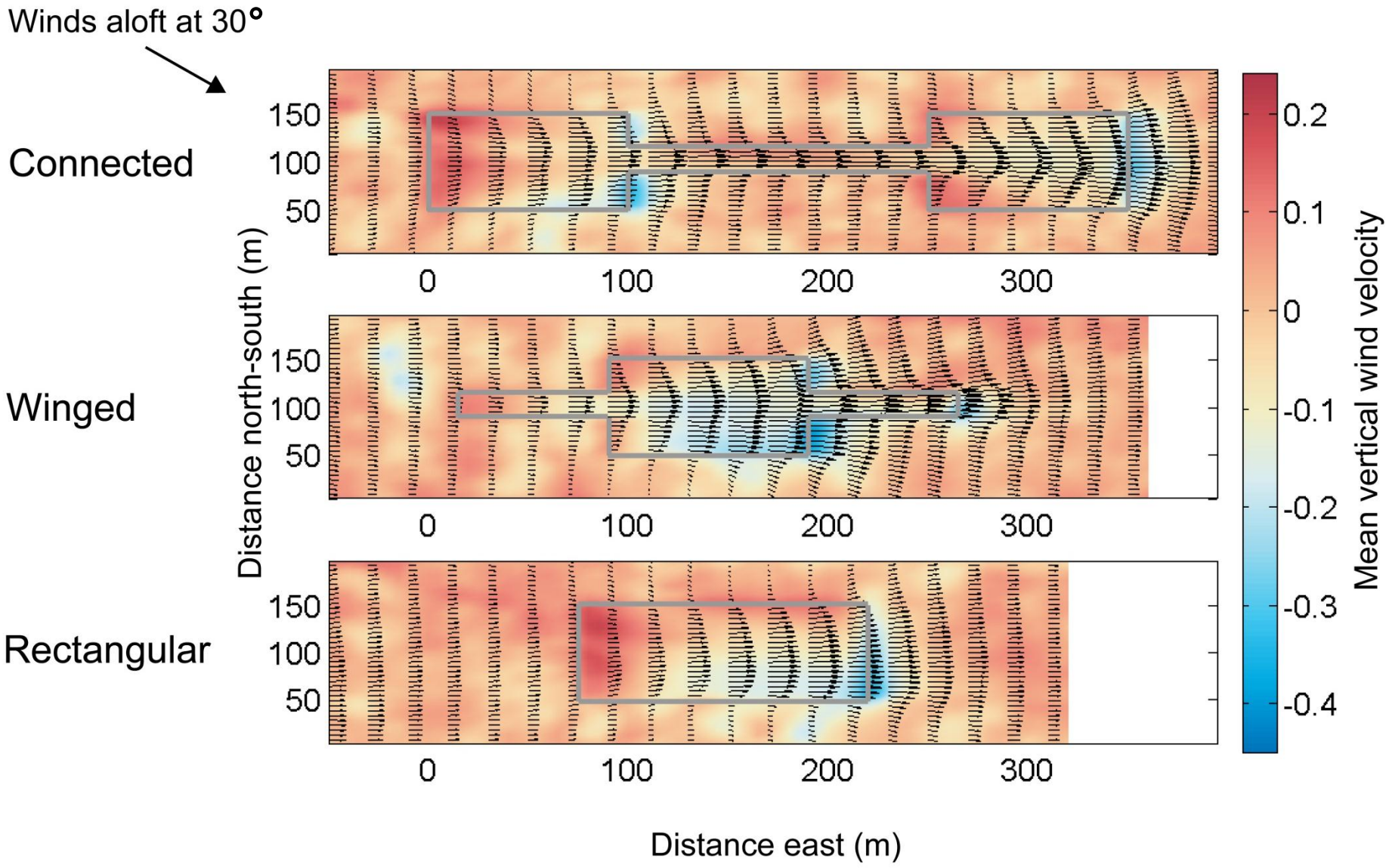



Bohrer et al., *Journal of Ecology*, 2008

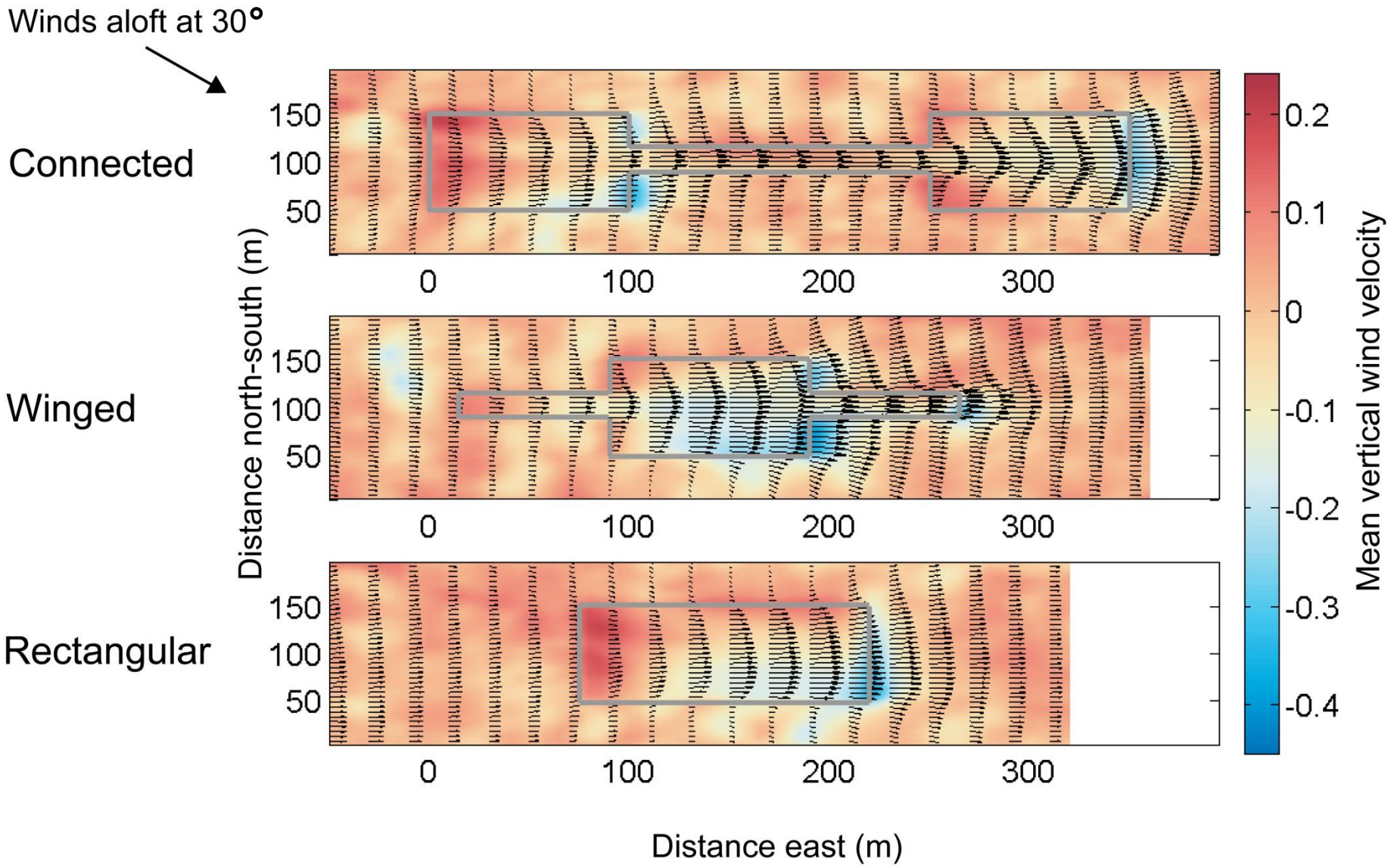
# Simulation landscape



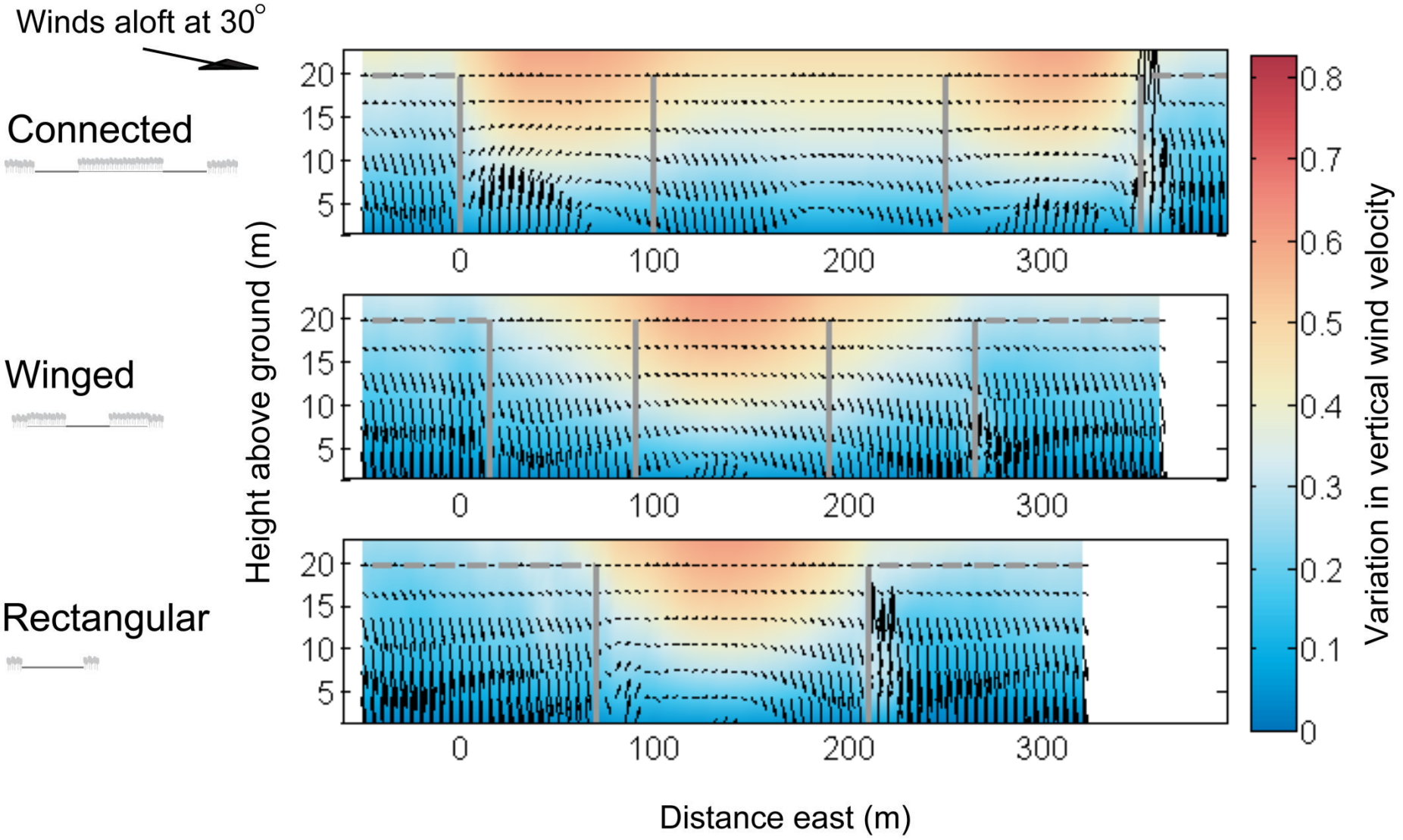
# Redirecting



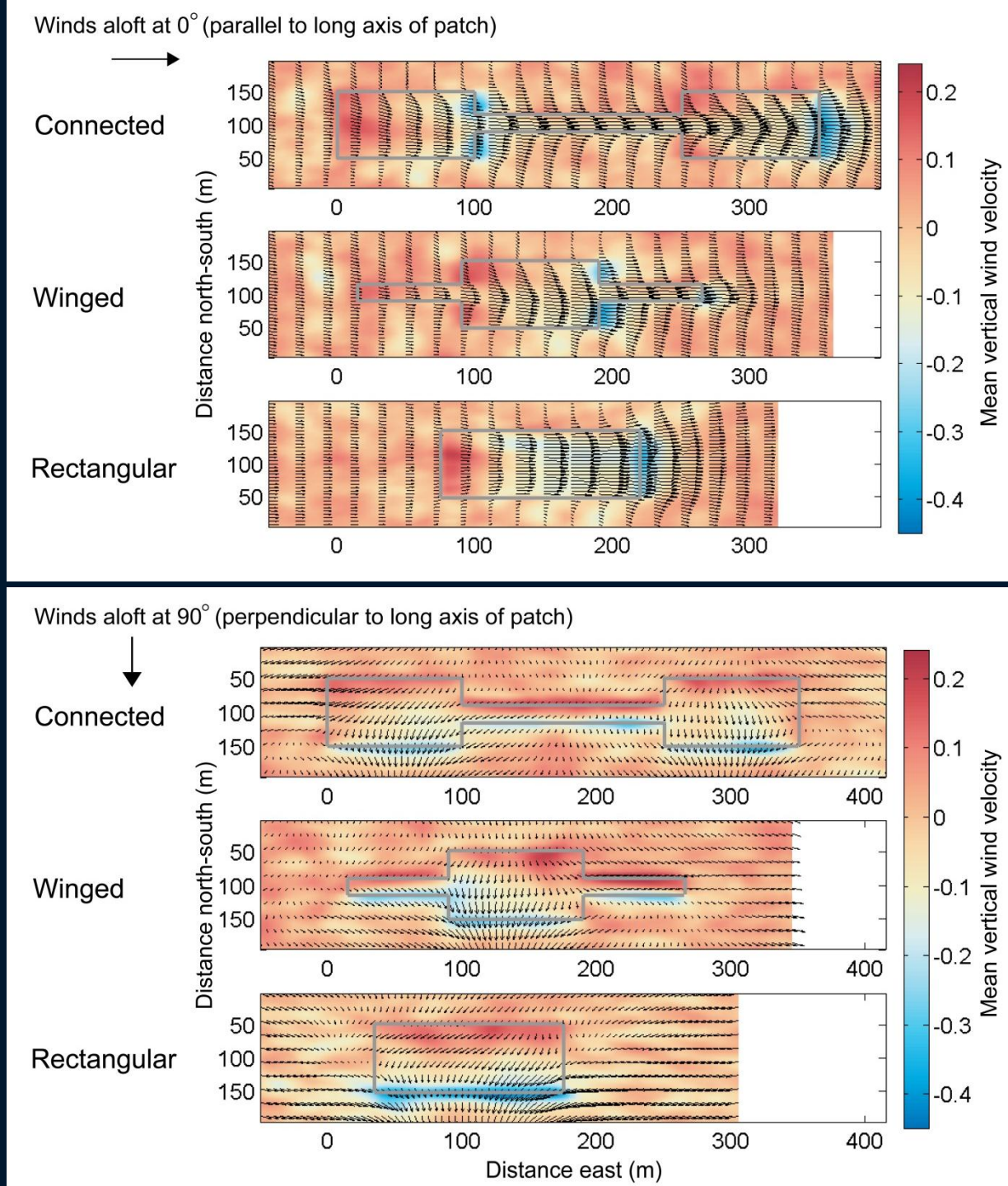
# Bellowing


Winds aloft at 30°
Connected
Winged
Rectangular
Distance north-south (m)
150
100
50
0
100
200
300
Distance east (m)
Mean vertical wind velocity
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4

# Ejection and sweep hotspots



# Orientation important



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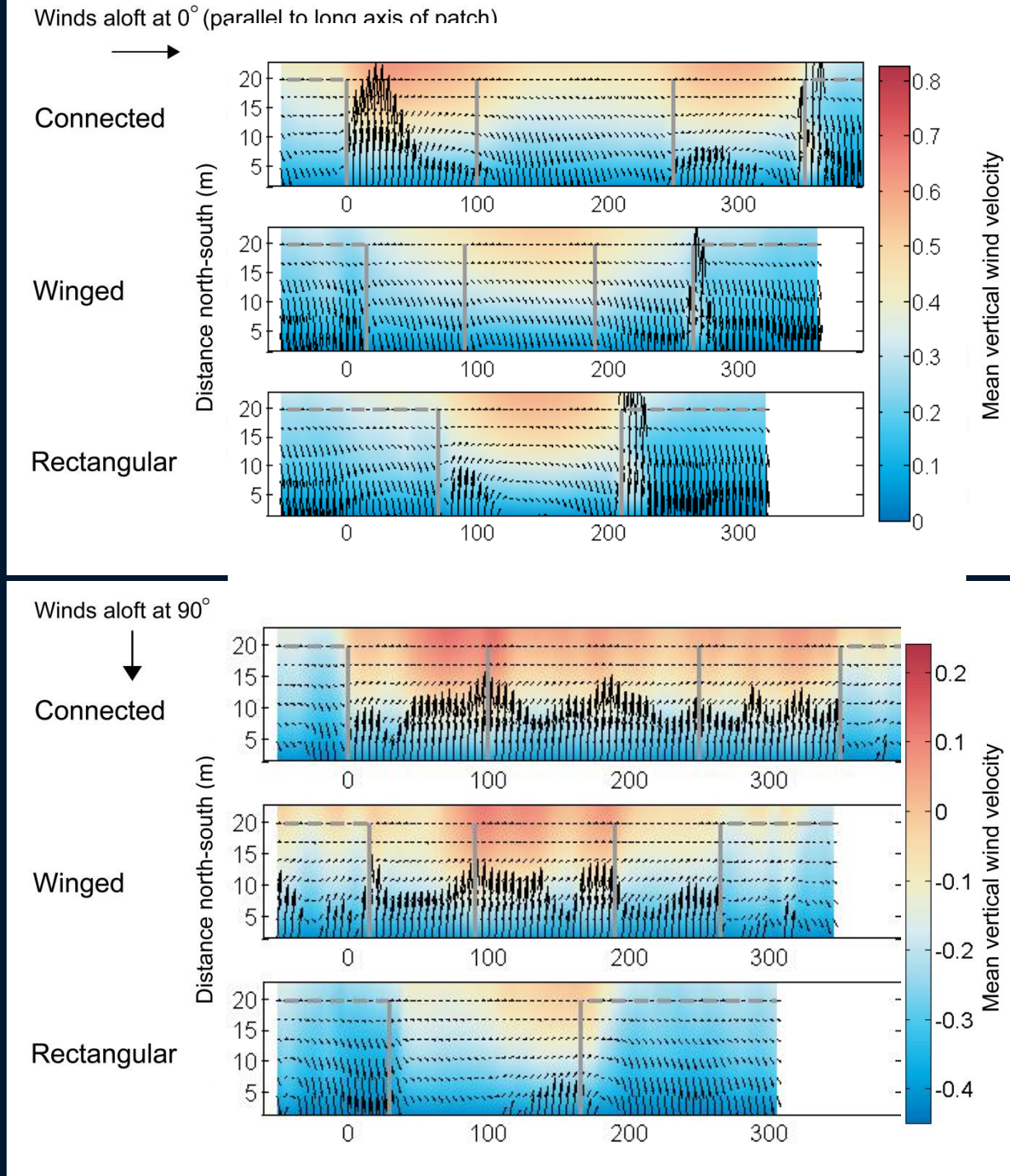

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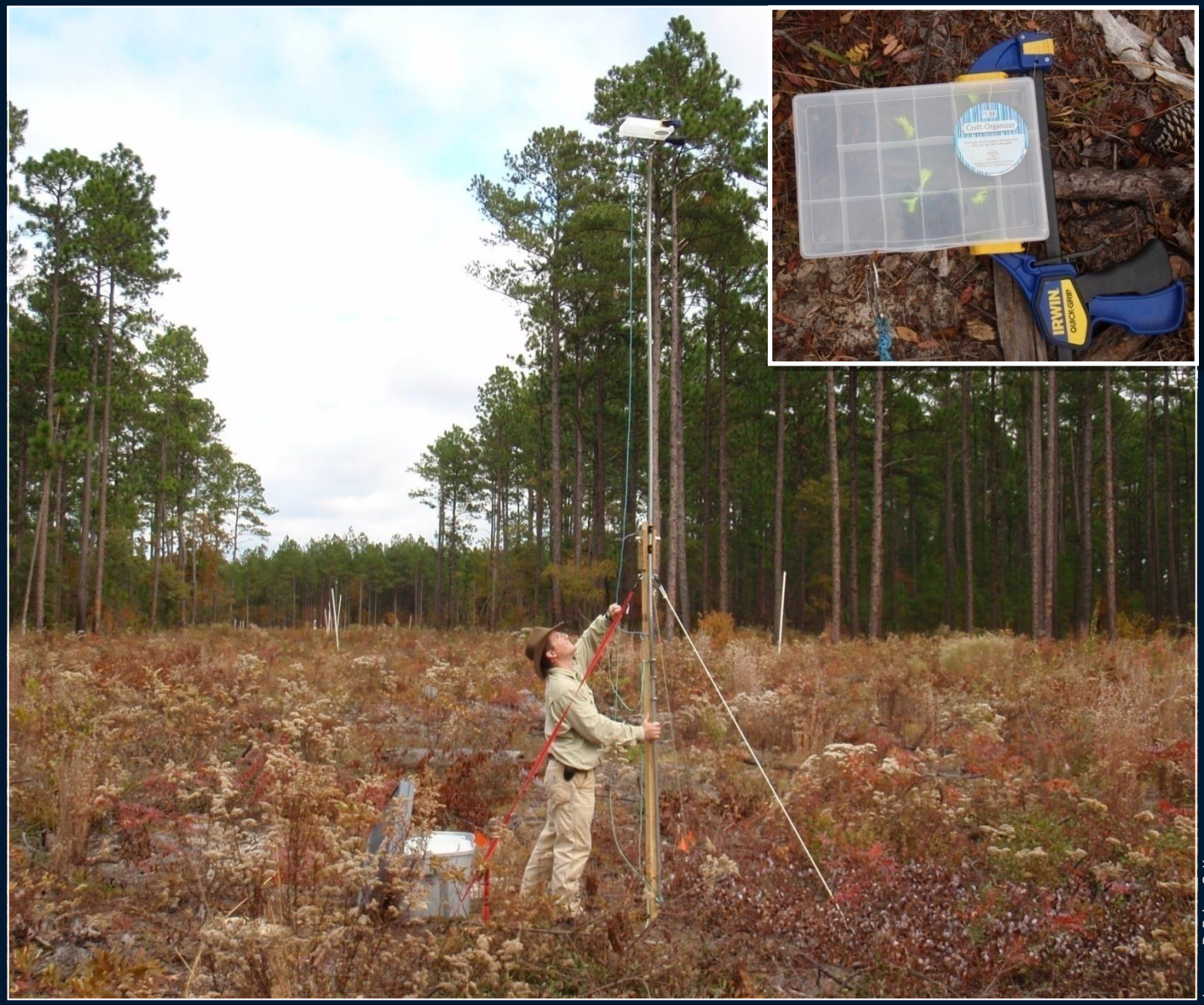
# Seed dispersal experiments

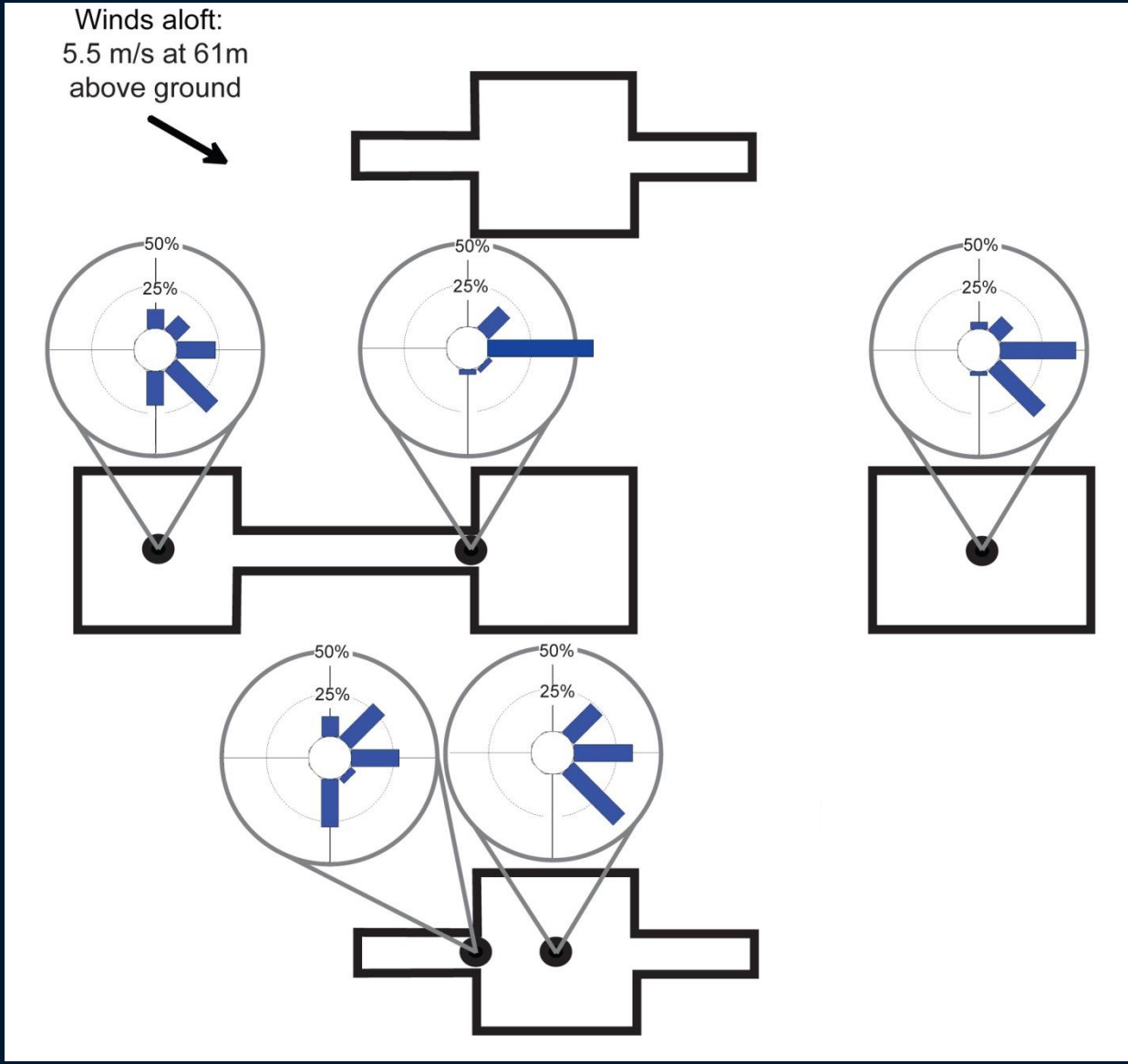



Images: D. Baker, C. Kremer

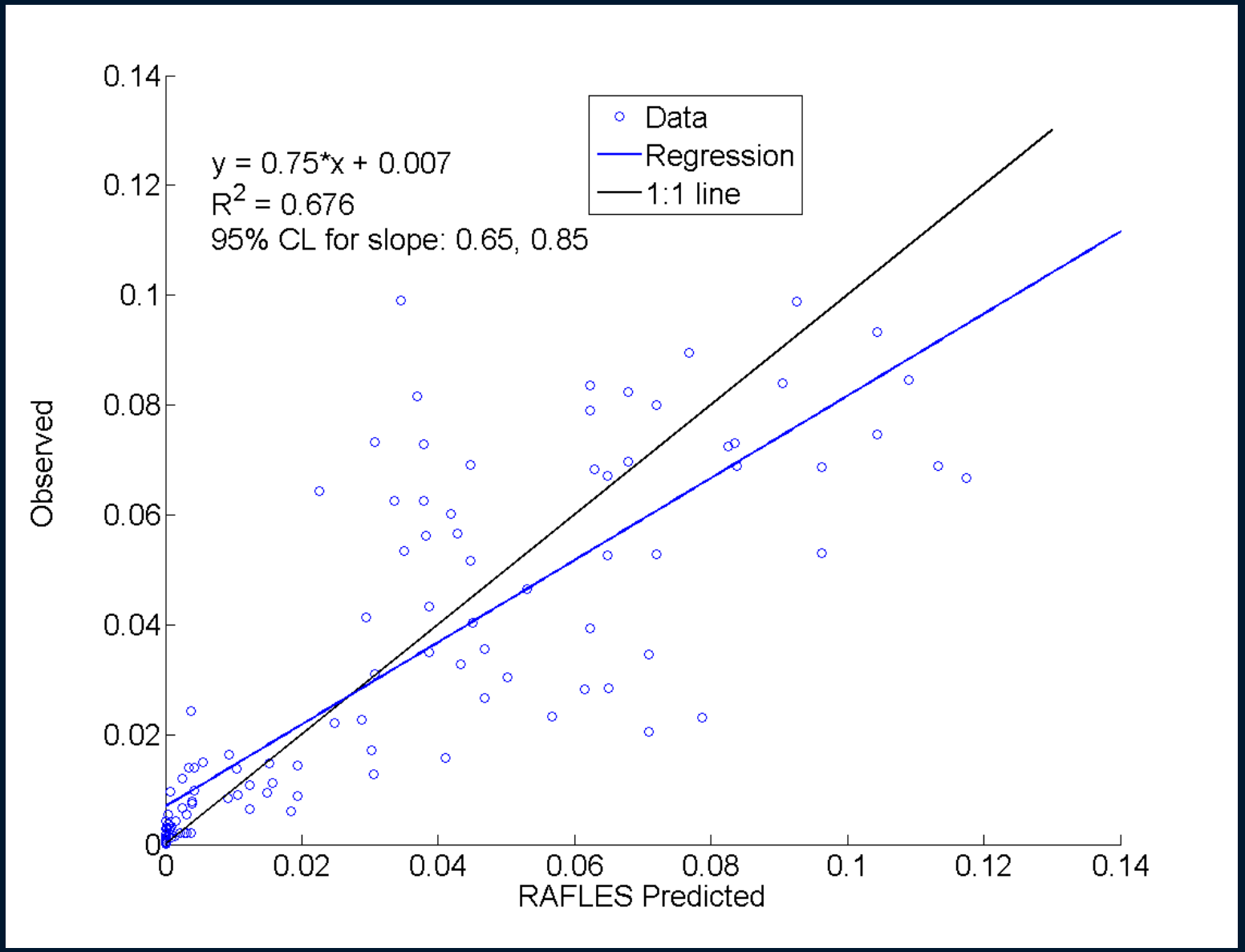

Image: D. Baker
Image: D. Baker


Image: E. Damschen
Image: D. Baker

# Redirecting and bellowing



# Modeled vs. observed dispersal



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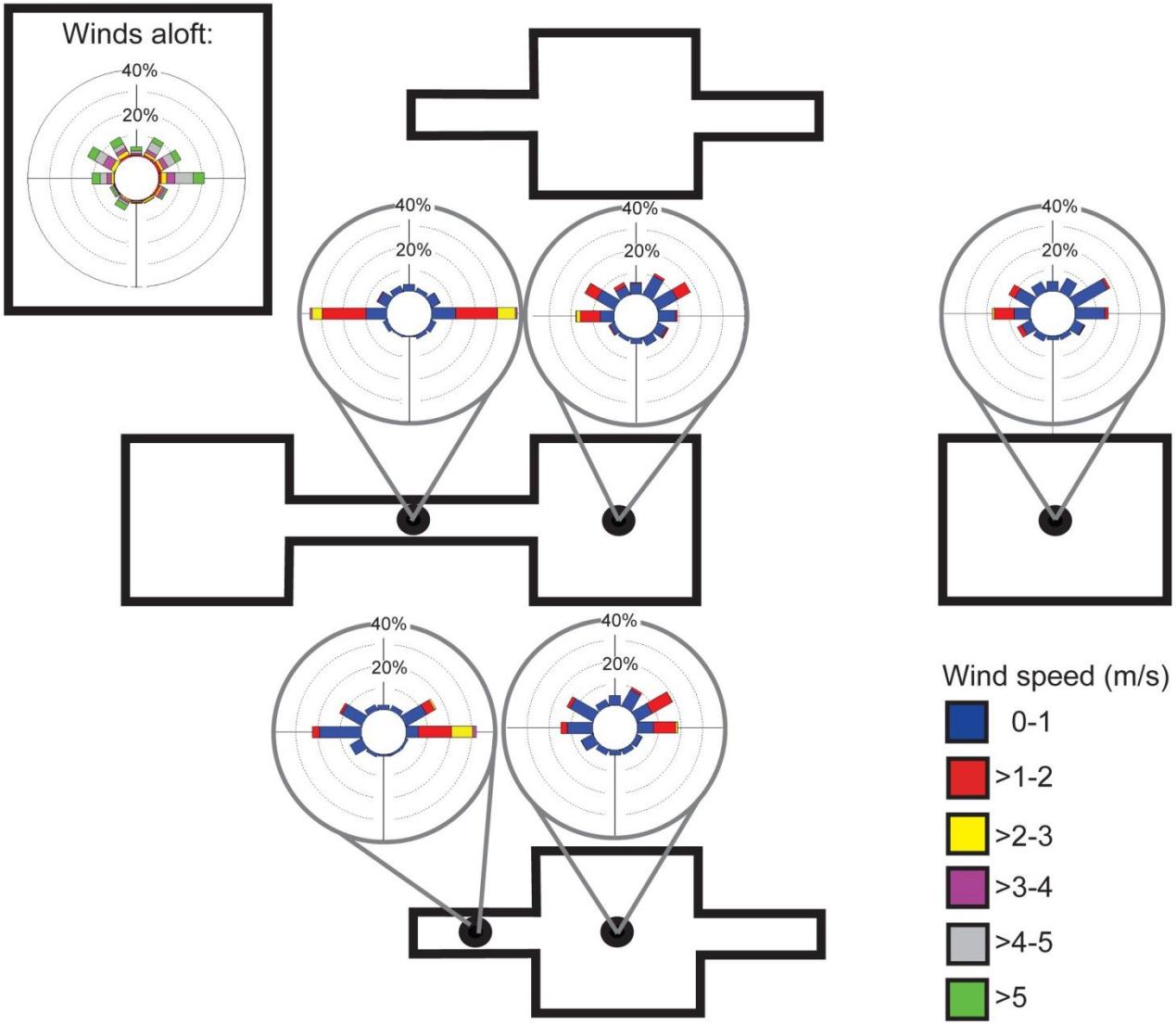
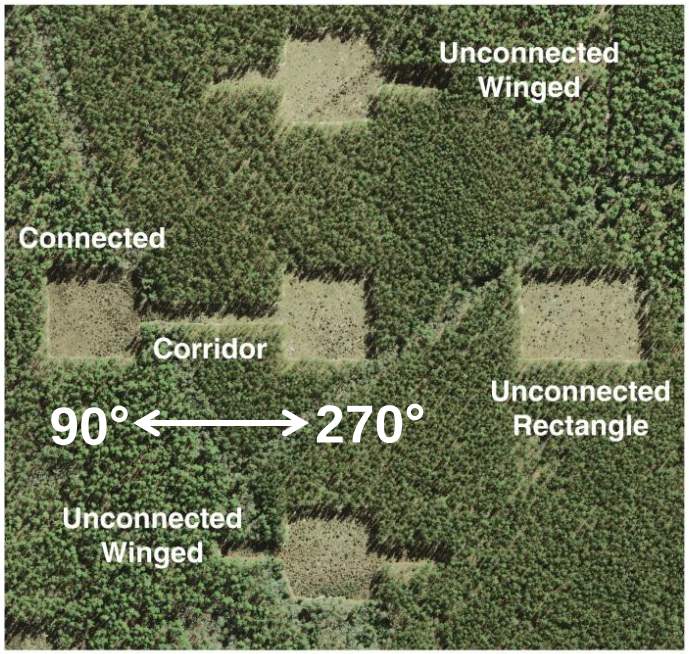
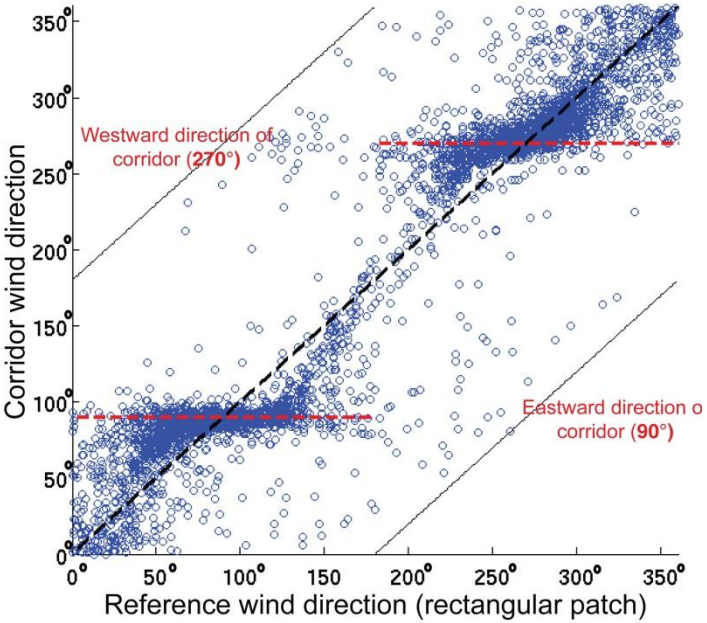



Image: E. Damschen

# Redirecting



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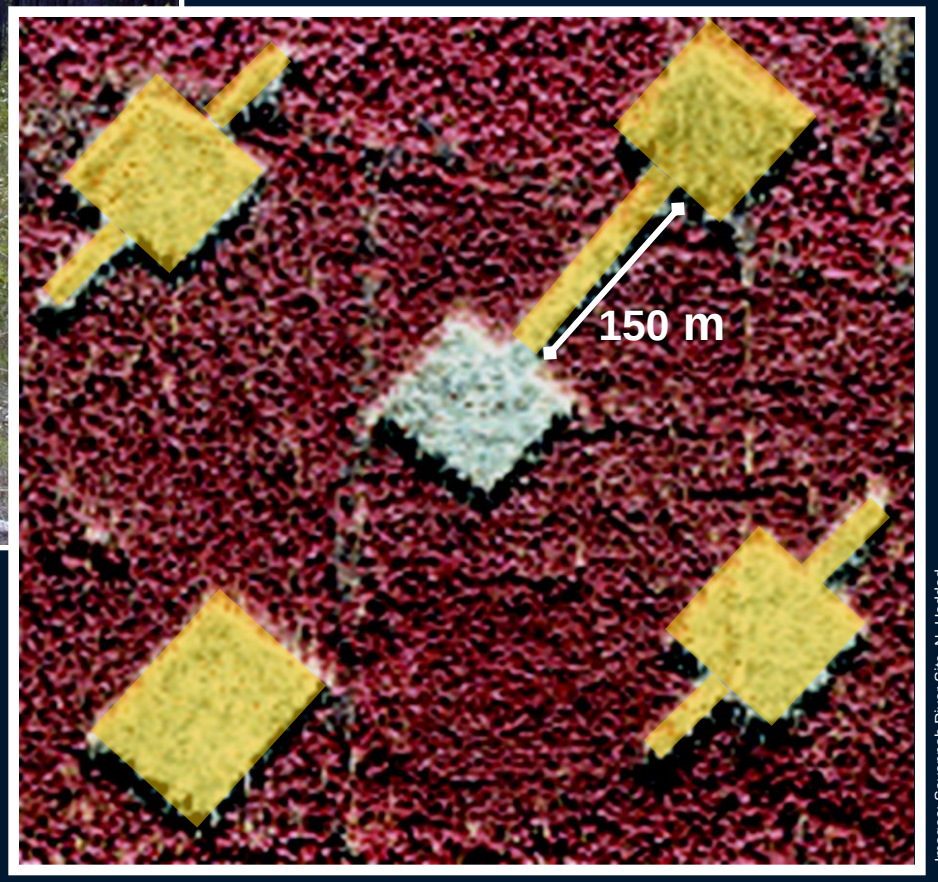
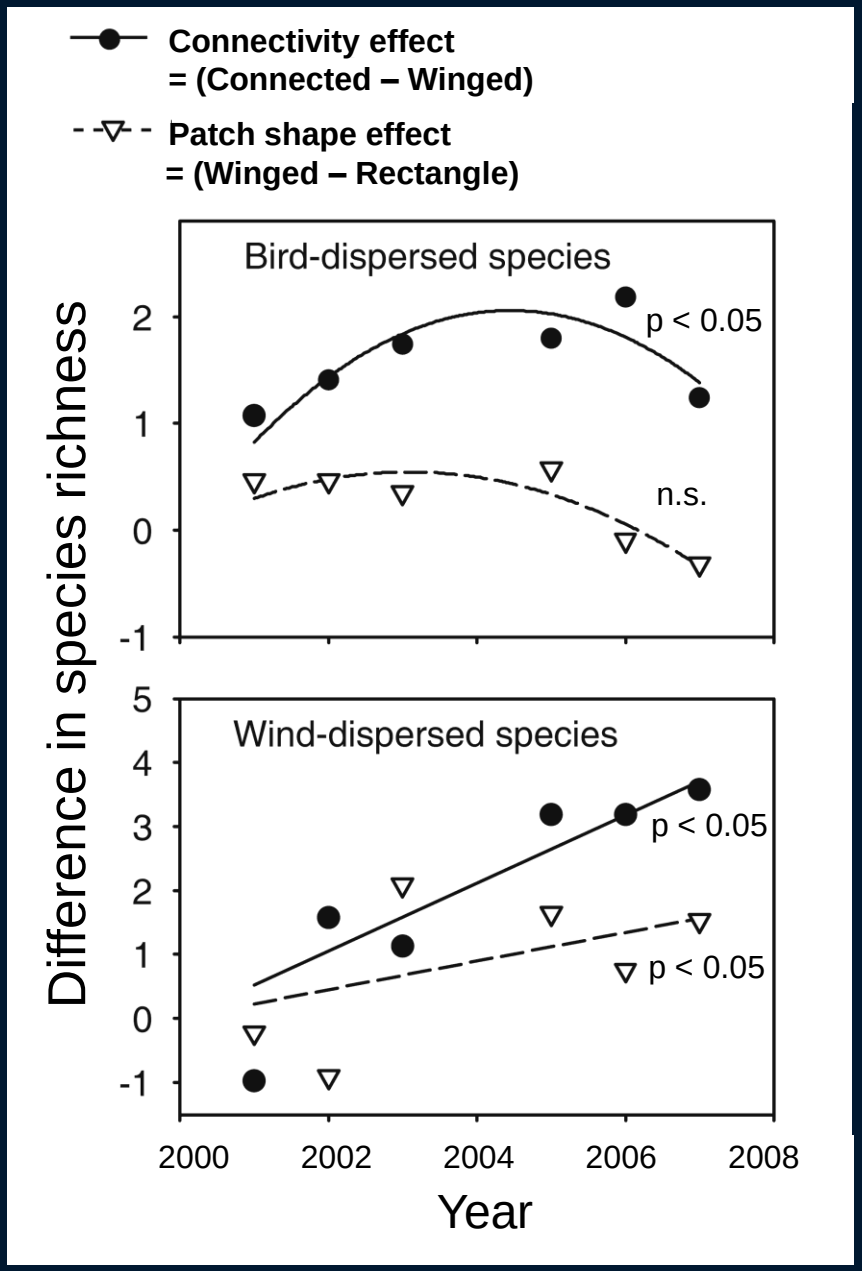
# Plant species richness




Images: Savannah River Site, N. Haddad

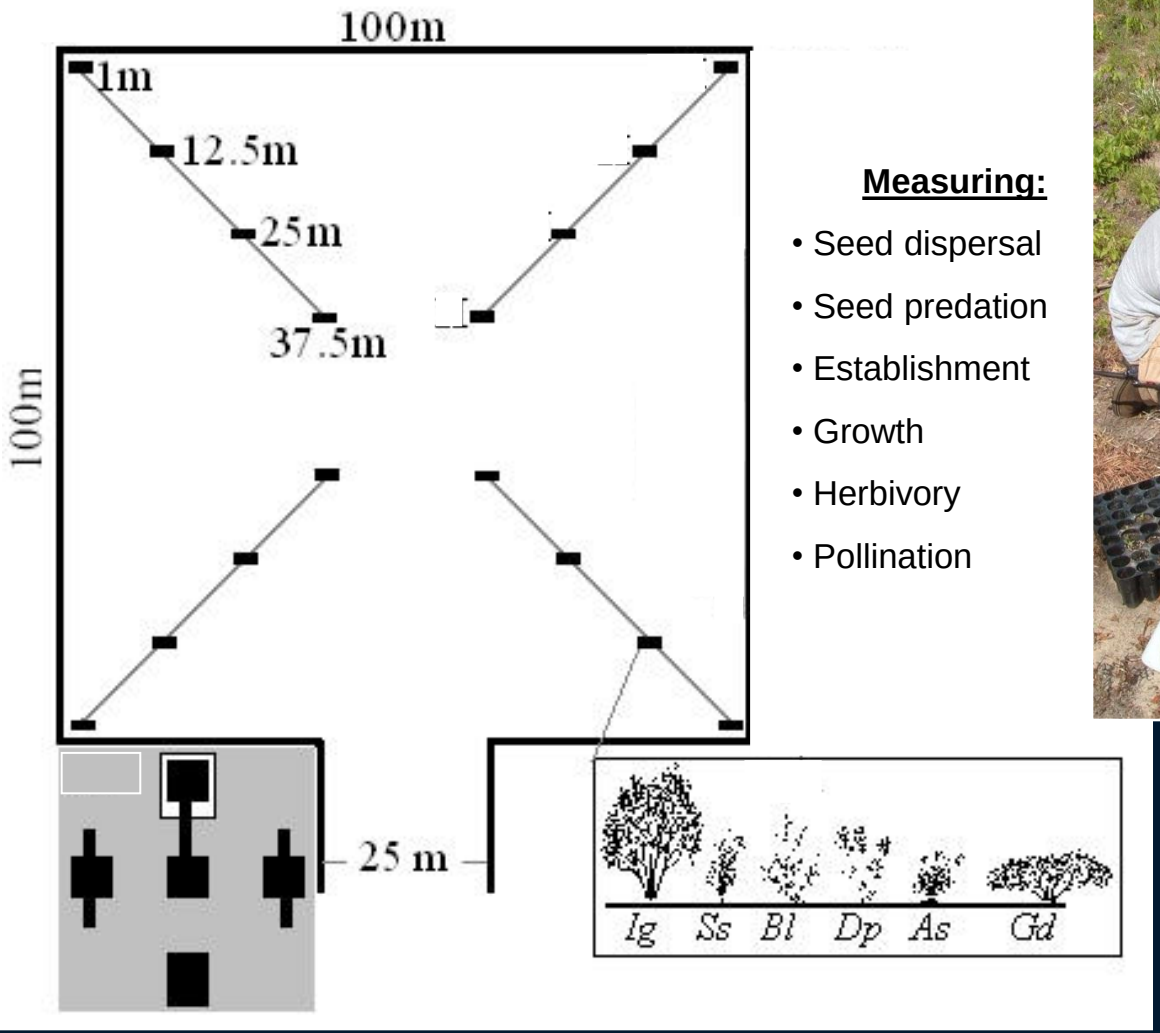
# Plant community impacts




Images: E. Damschen

Damschen et al., *PNAS*, 2008

# Summer 2007




**Measuring:**

- Seed dispersal
- Seed predation
- Establishment
- Growth
- Herbivory
- Pollination

Images: Nick Haddad and Josh Tewksbury

# Conclusions


- Heterogeneous landscapes alter wind dispersal
- Connectivity alters dispersal through:
    - Redirecting
    - Bellowing
    - Ejection and sweep hotspots
- Plant communities may be affected by altered dispersal patterns

# Conservation implications


- Corridors promote wind-driven dispersal
- Corridors maximally effective when aligned with wind
- Results especially applicable to other open-habitat ecosystems

# Acknowledgments

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Ohio State Supercomputing Center

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