

Considerations when applying thresholds to management



Outline

- Relationships between thresholds and ecosystem health
- Using S&T models to help make policy and management decisions [ranking the likelihood of autogenic (and non-autogenic) recovery]

Thresholds and Ecosystem Health

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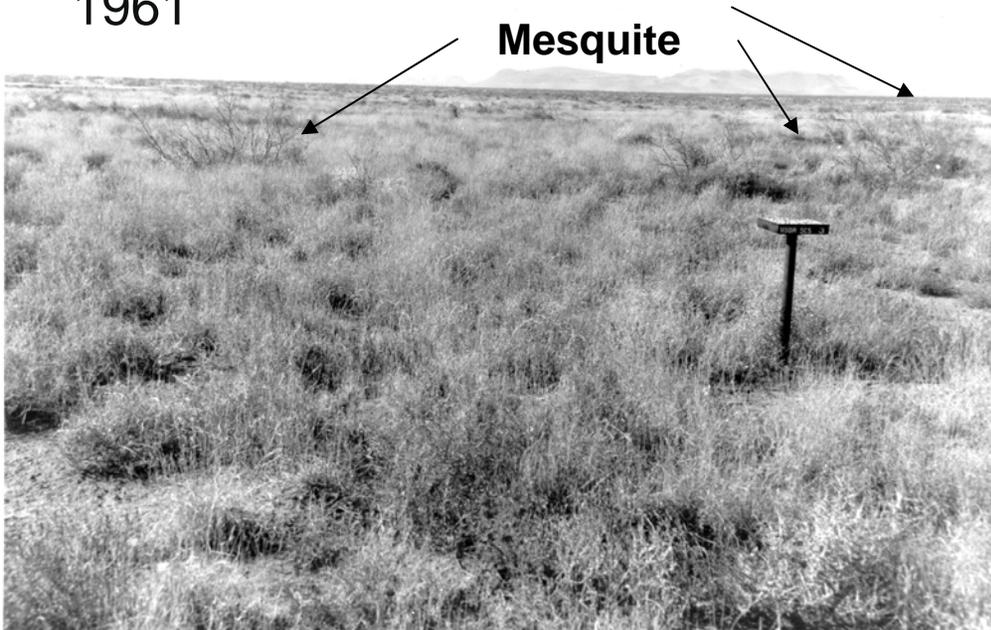
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- IIRH helps understand processes associated with threshold and non-threshold transitions
- IIRH can be used to identify processes that have been modified
 - To decide if management action is required
 - To select appropriate management actions AND the appropriate scale and location in the landscape (rills and water flow patterns)

Ecological threshold crossed?

1961

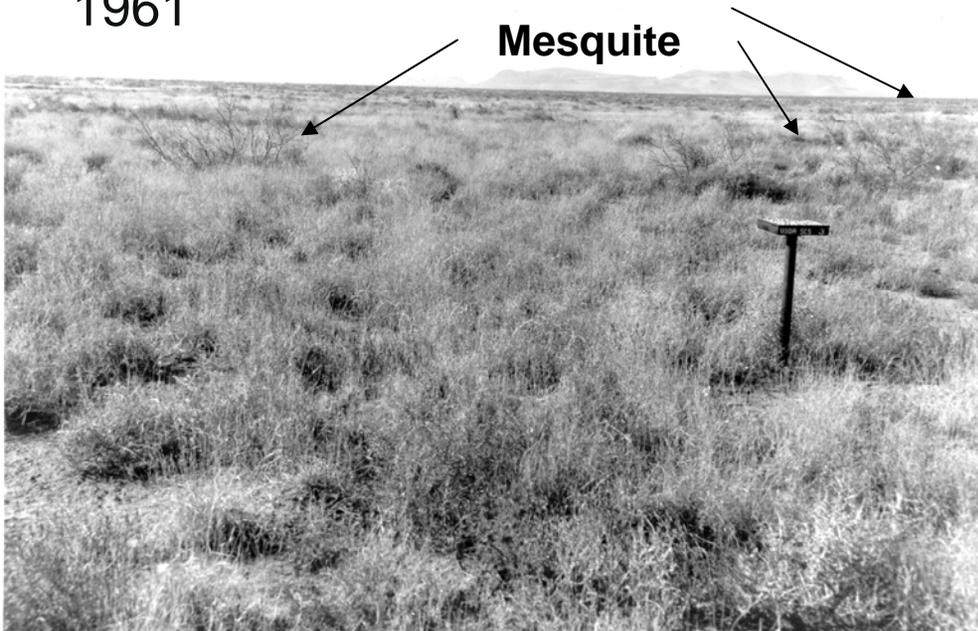
Mesquite



*Ecological threshold
crossed?
Yes, probably*

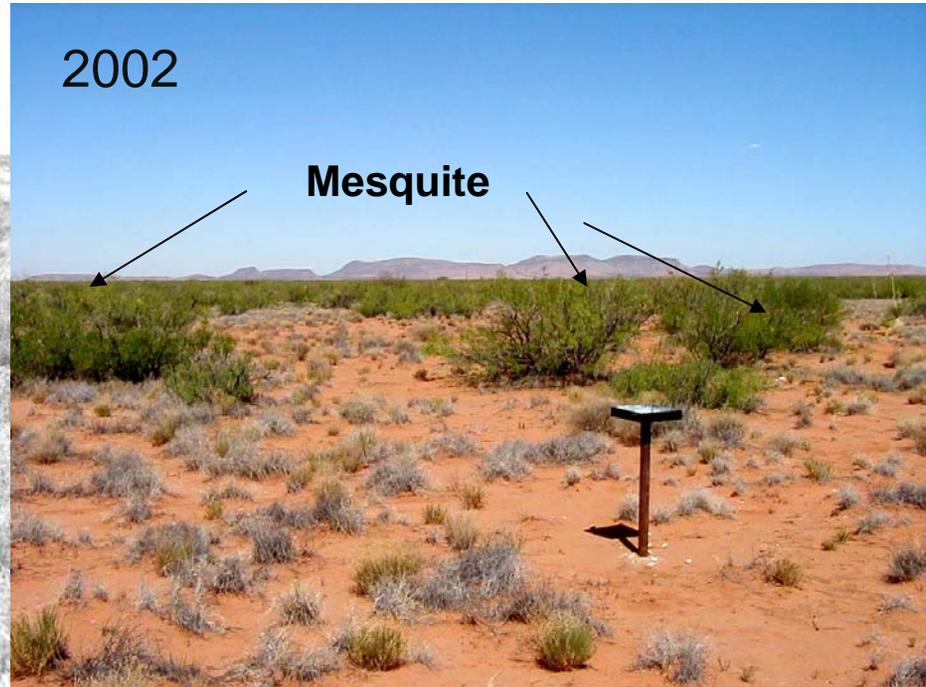
1961

Mesquite



2002

Mesquite



Fenced and ungrazed since ca. 1960

Ecological threshold crossed?



Nov. 1971

BLM photo point

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No, probably not*

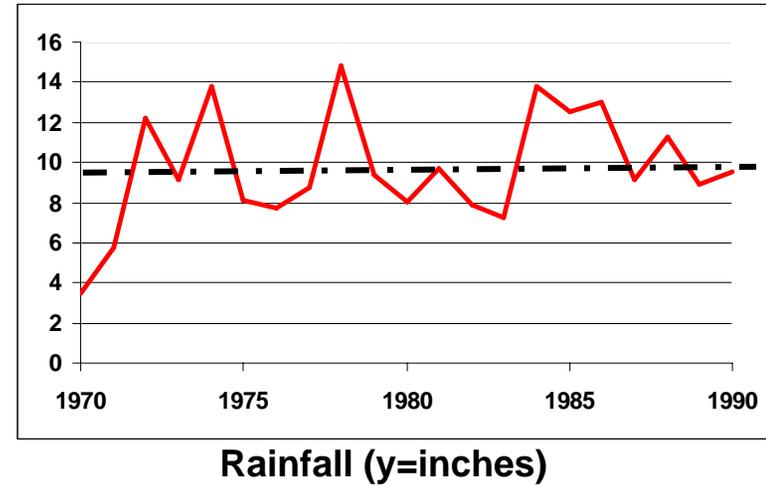


Nov. 1971
BLM photo point



Nov. 1990

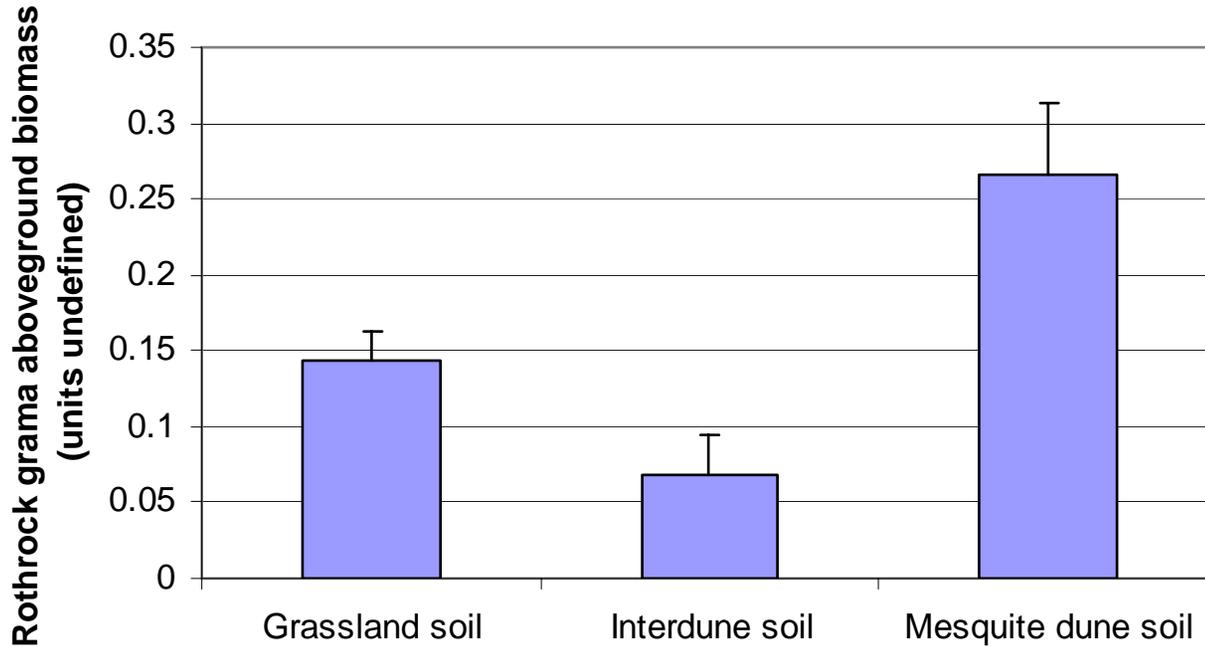
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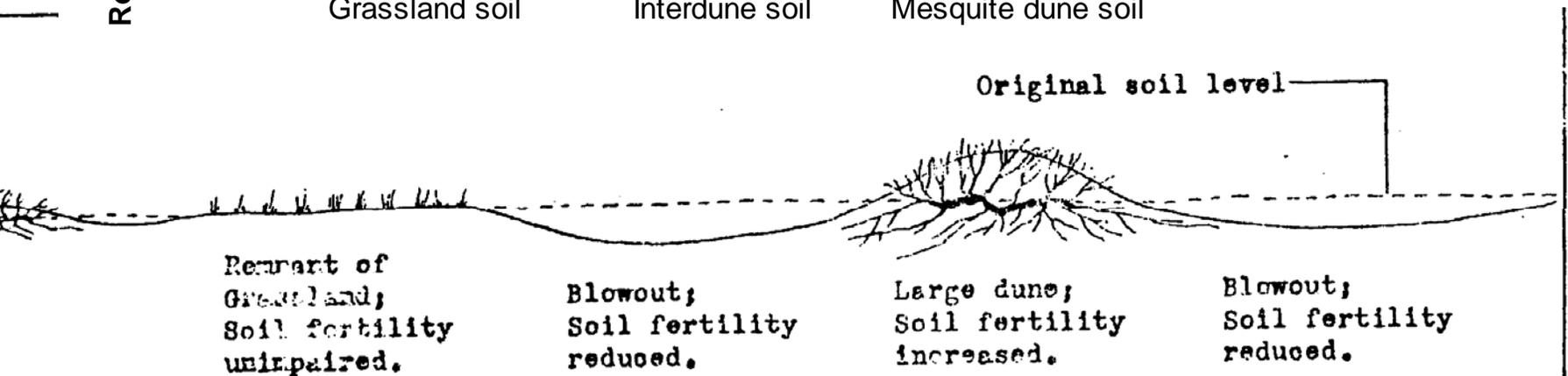
State transition: Non-eroding
grassland → eroding shrubland



Pattern (of plants, soil carbon & nutrients)

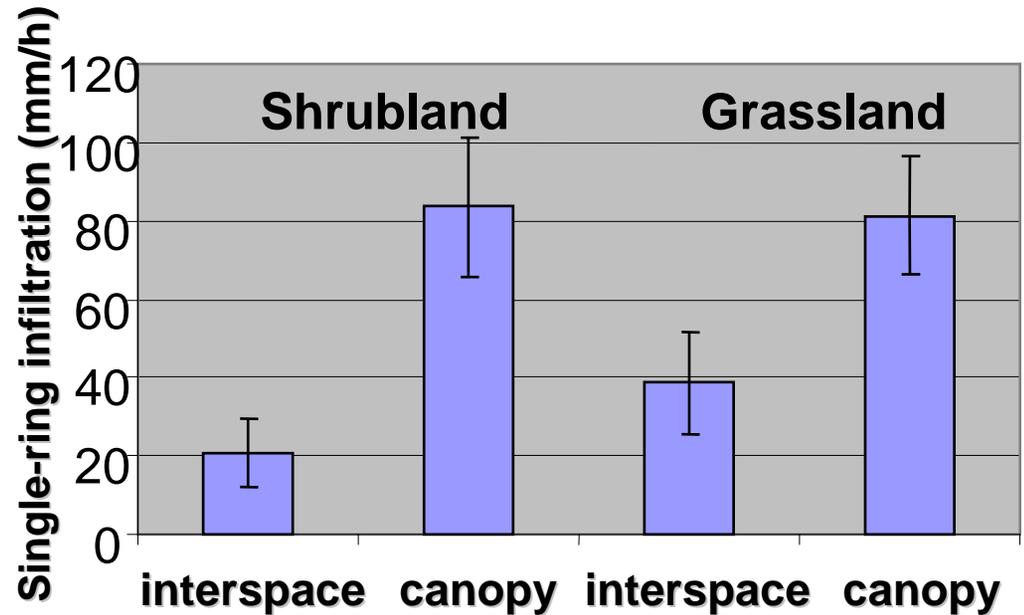


Soil nutrients become increasingly concentrated under shrubs (Valentine, 1941)



Pattern/Process

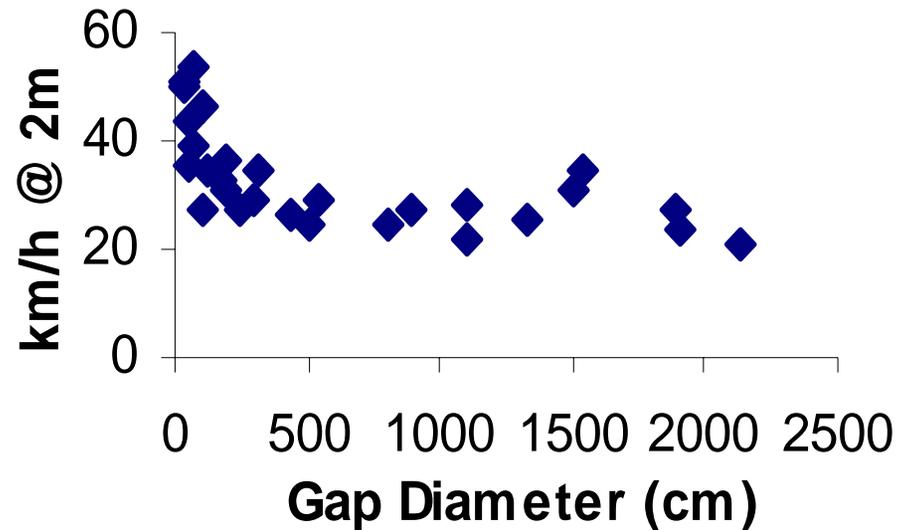
Soil & water runoff and erosion increase during shrub invasion as interspace infiltration



Pattern/Process threshold

Wind erosion thresholds are crossed as gap sizes increase due to grass mortality (often, but not always, associated with shrub invasion)

Threshold Velocity for Saltation (50-200cm)



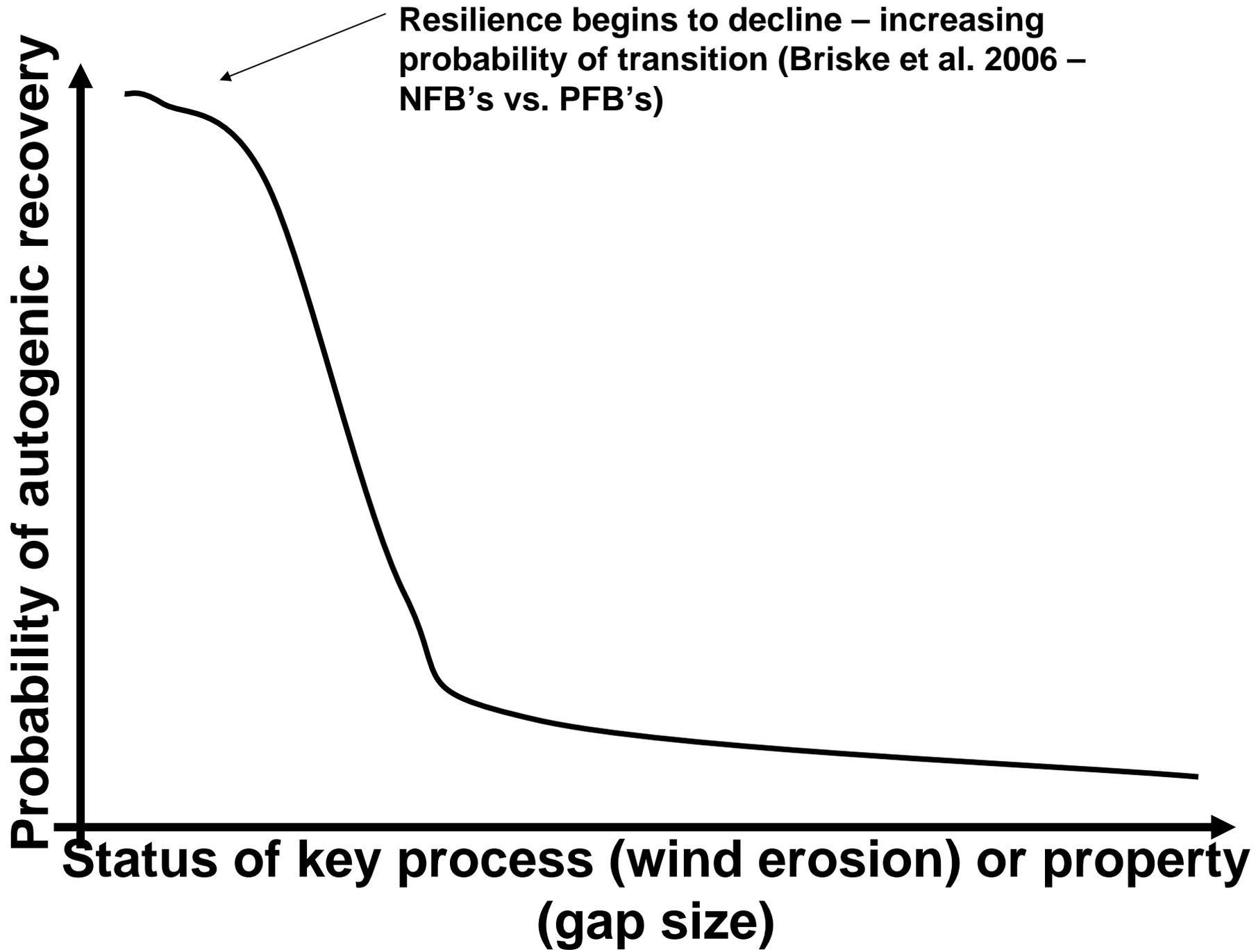
Applying S&T Models to Policy and Management



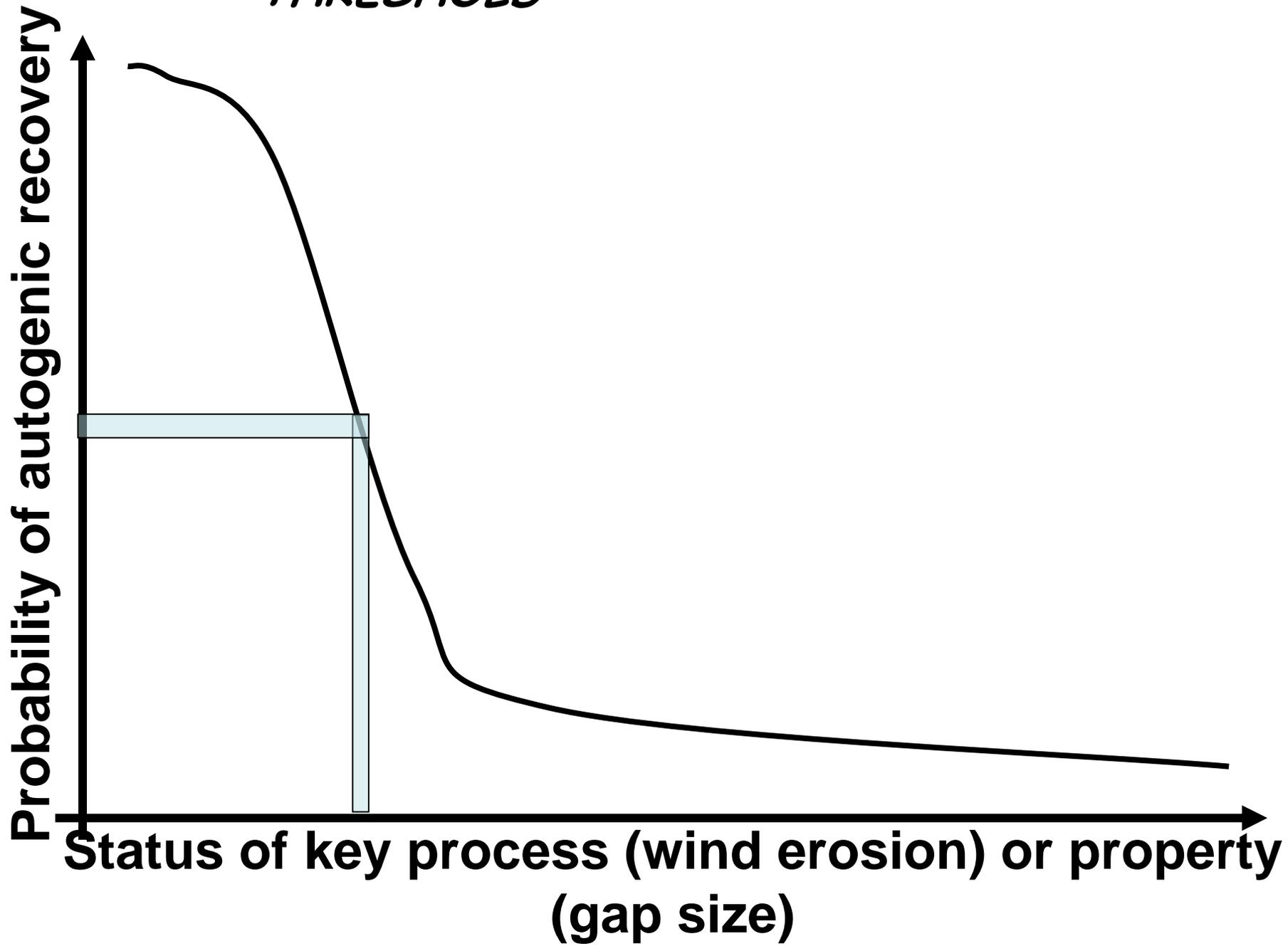
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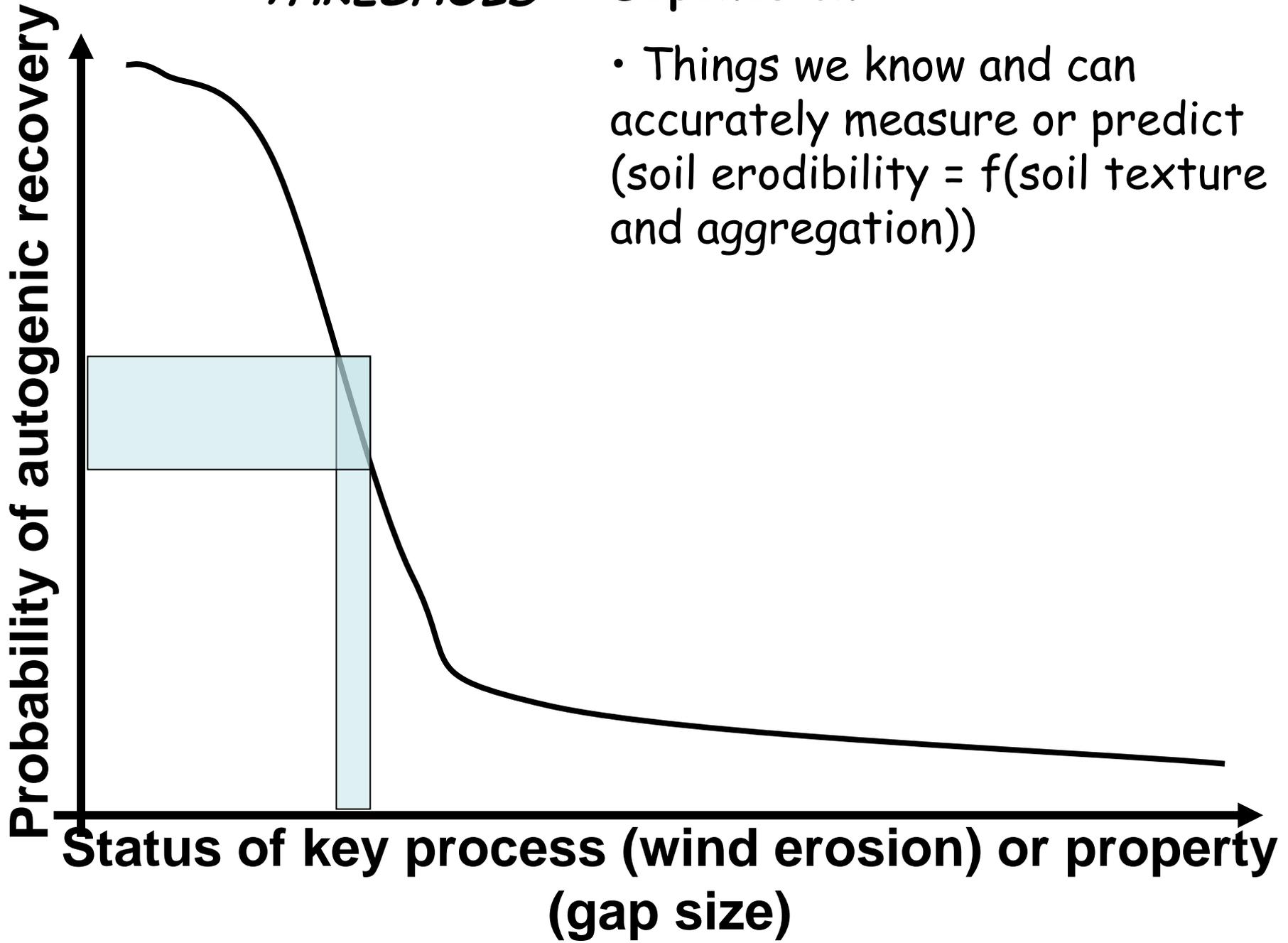


"THRESHOLD"

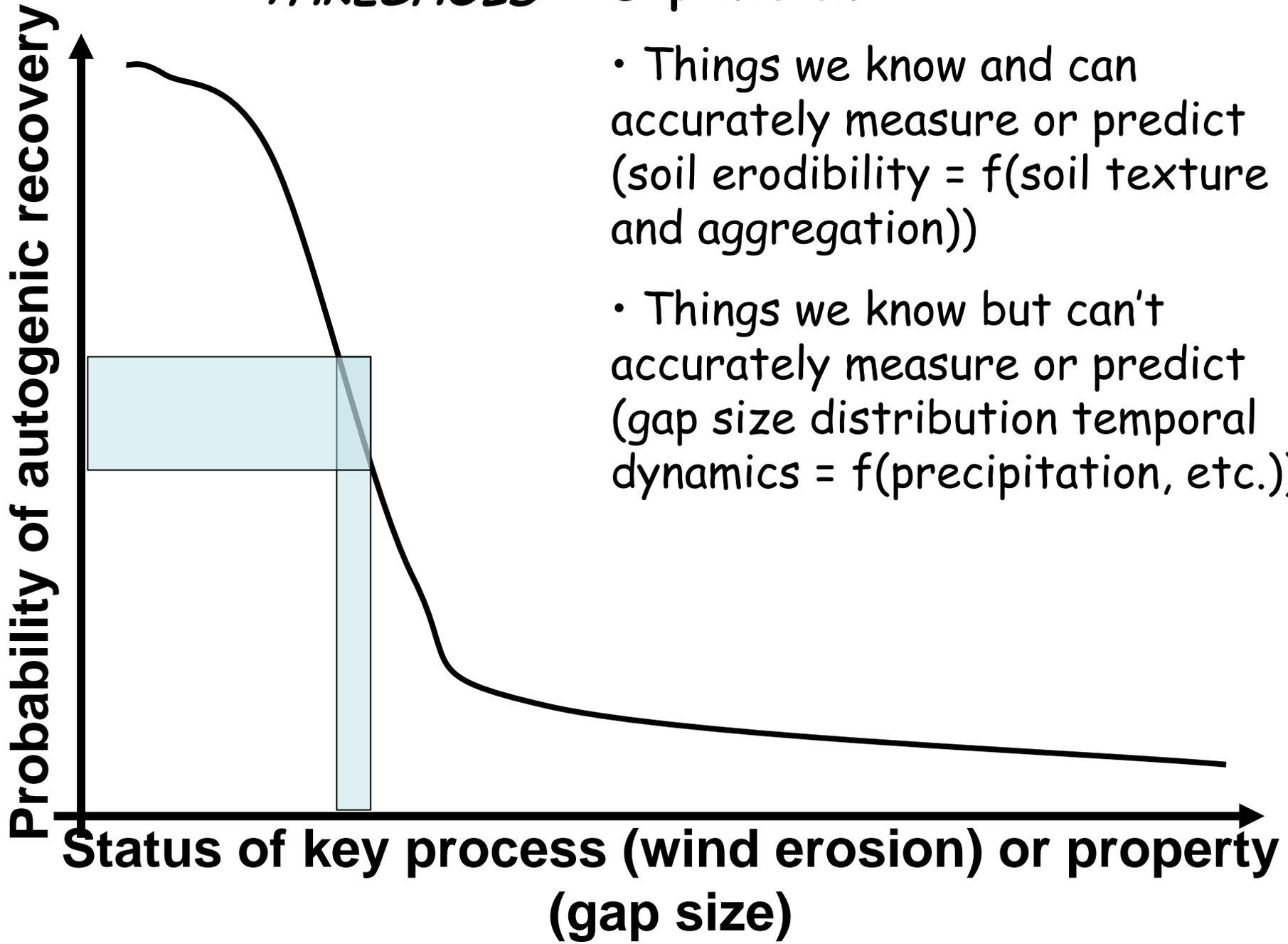


"THRESHOLD" Depends on:

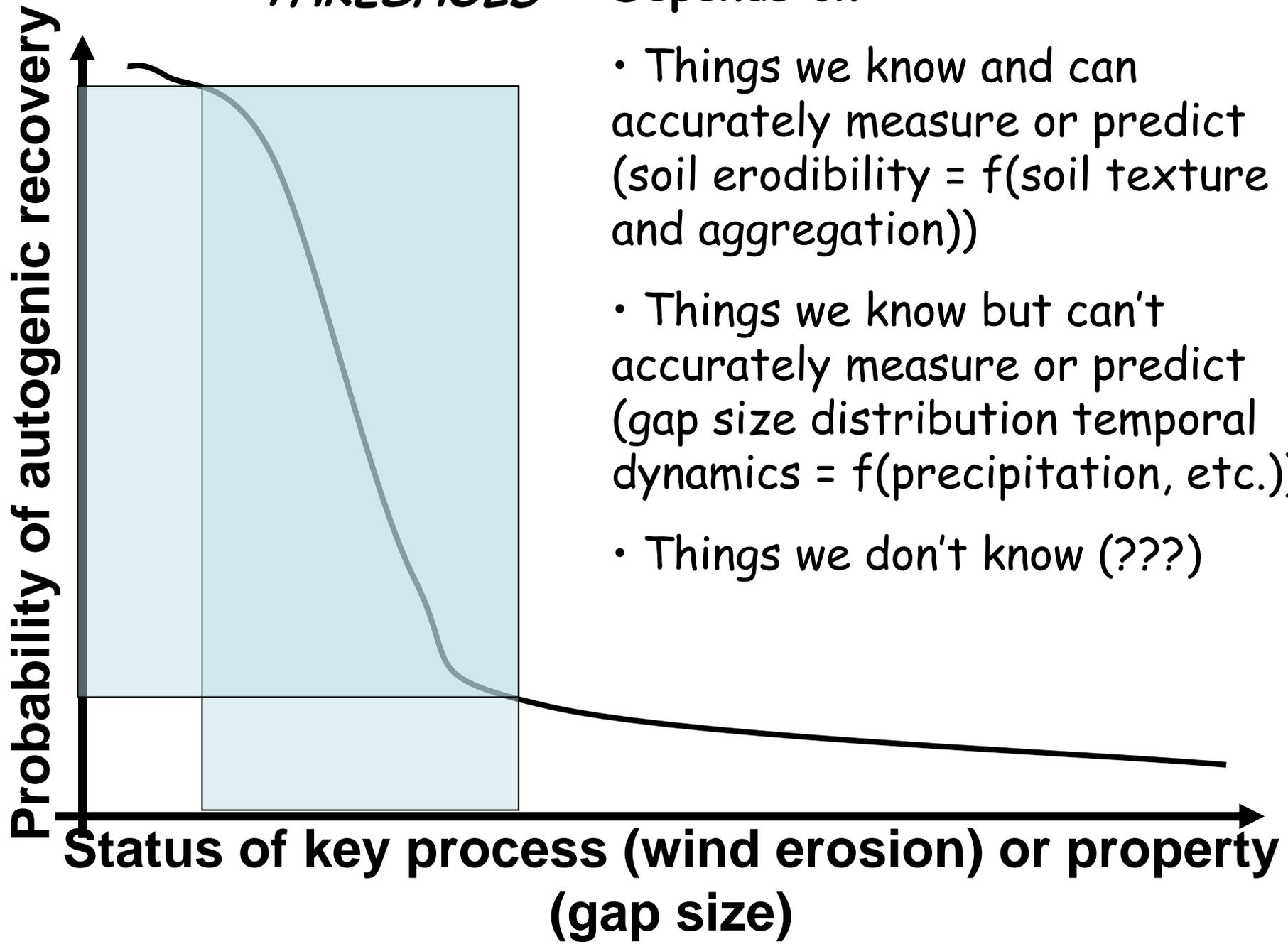
- Things we know and can accurately measure or predict (soil erodibility = $f(\text{soil texture and aggregation})$)



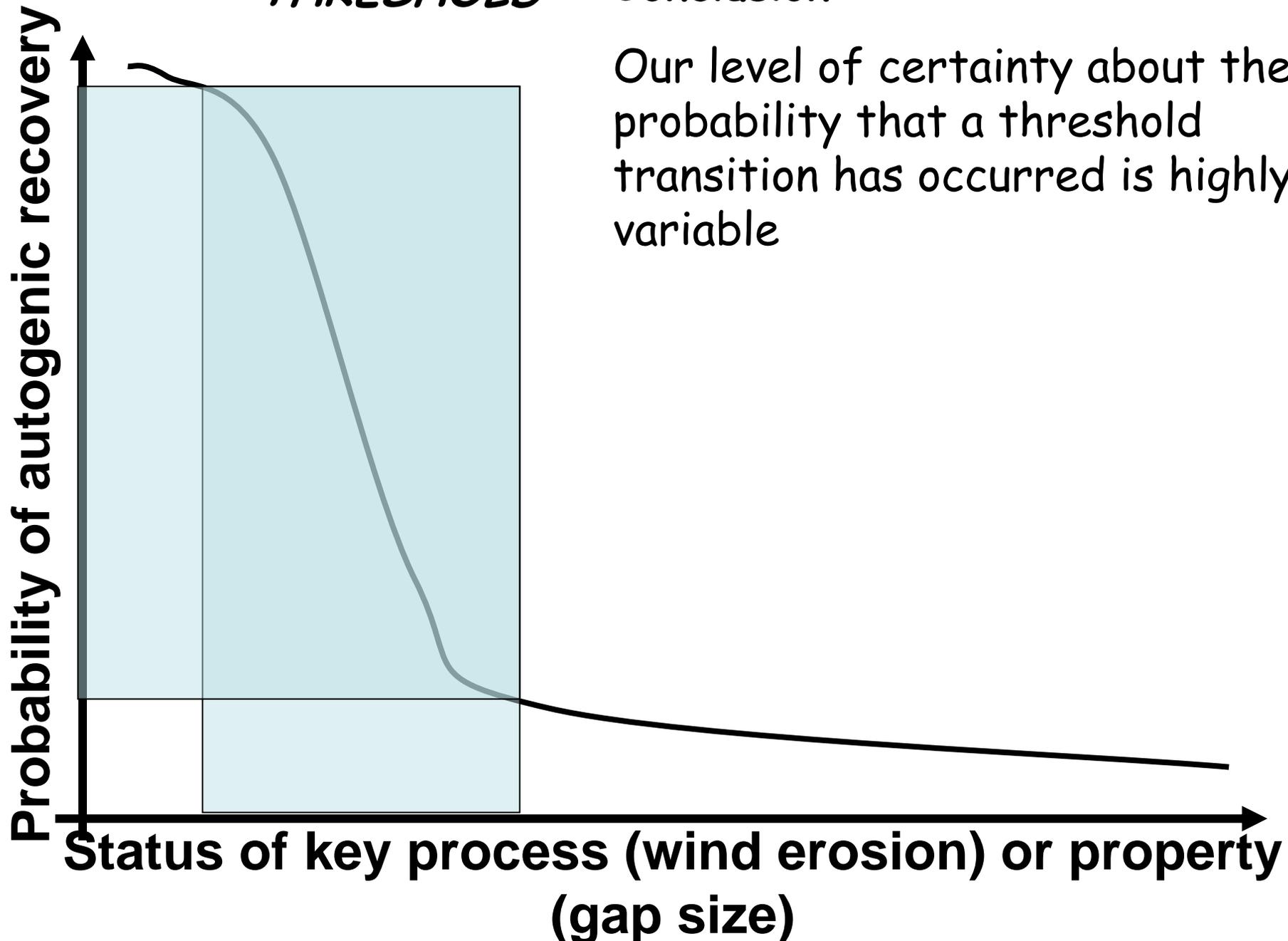
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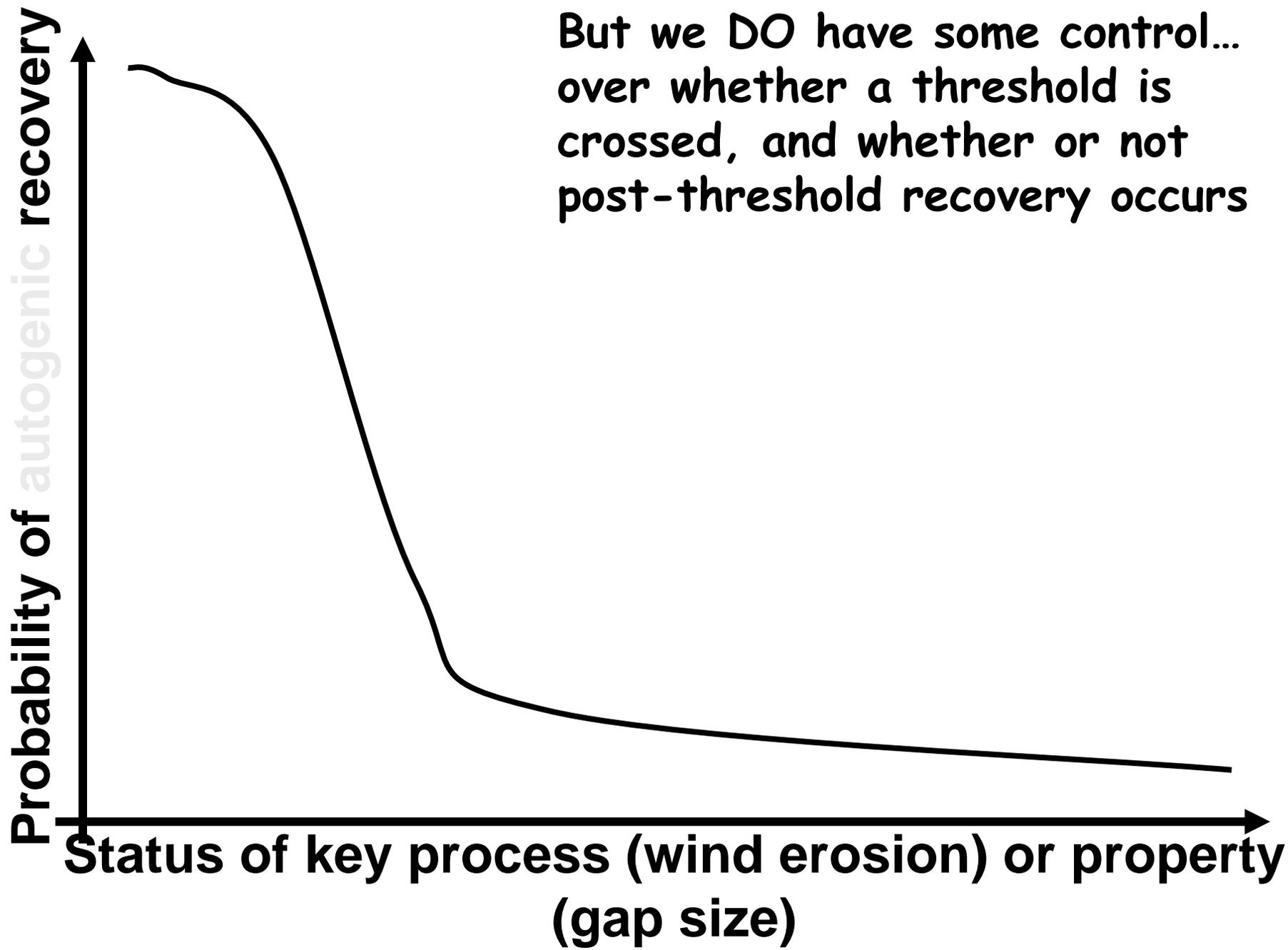


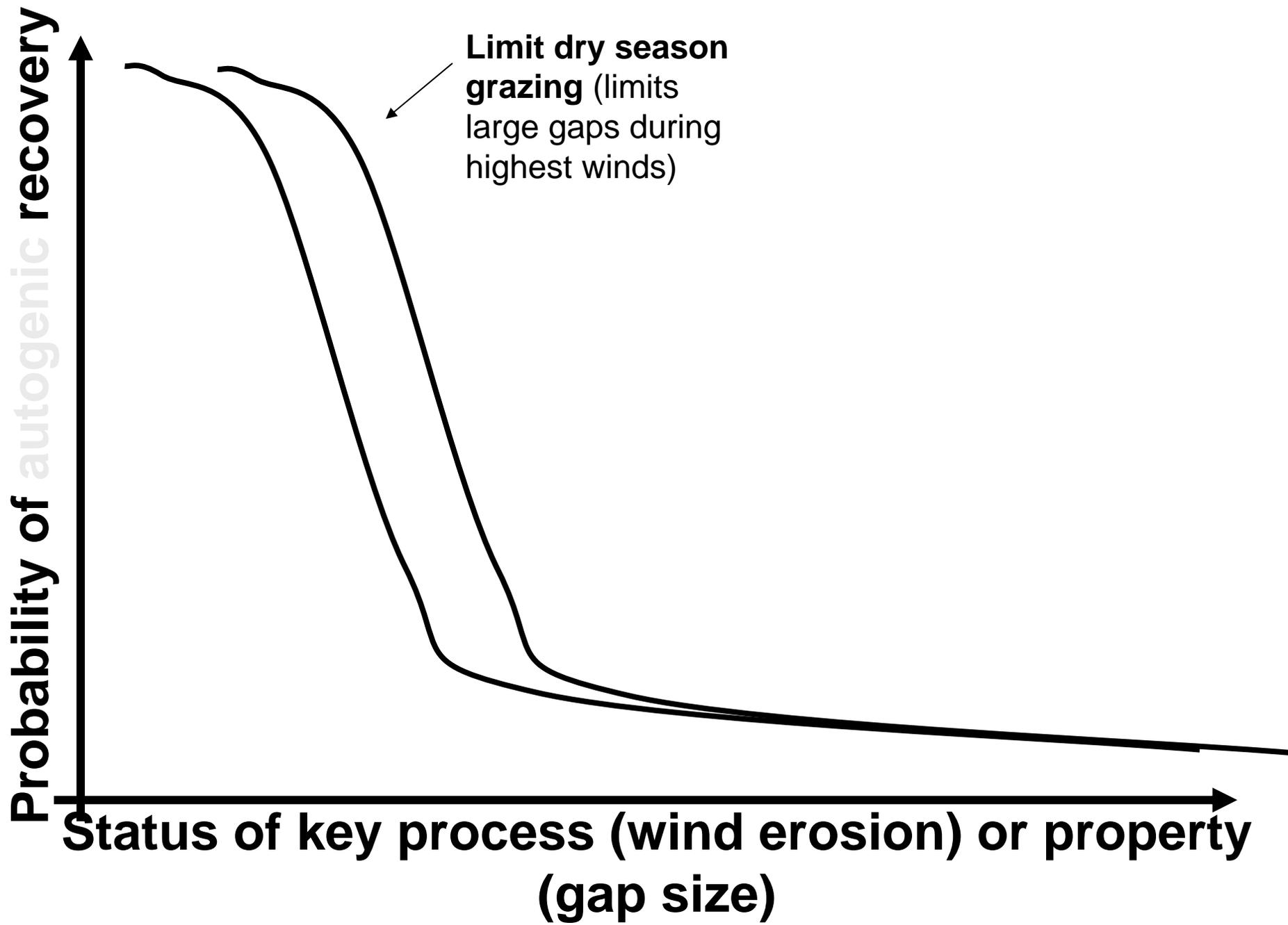
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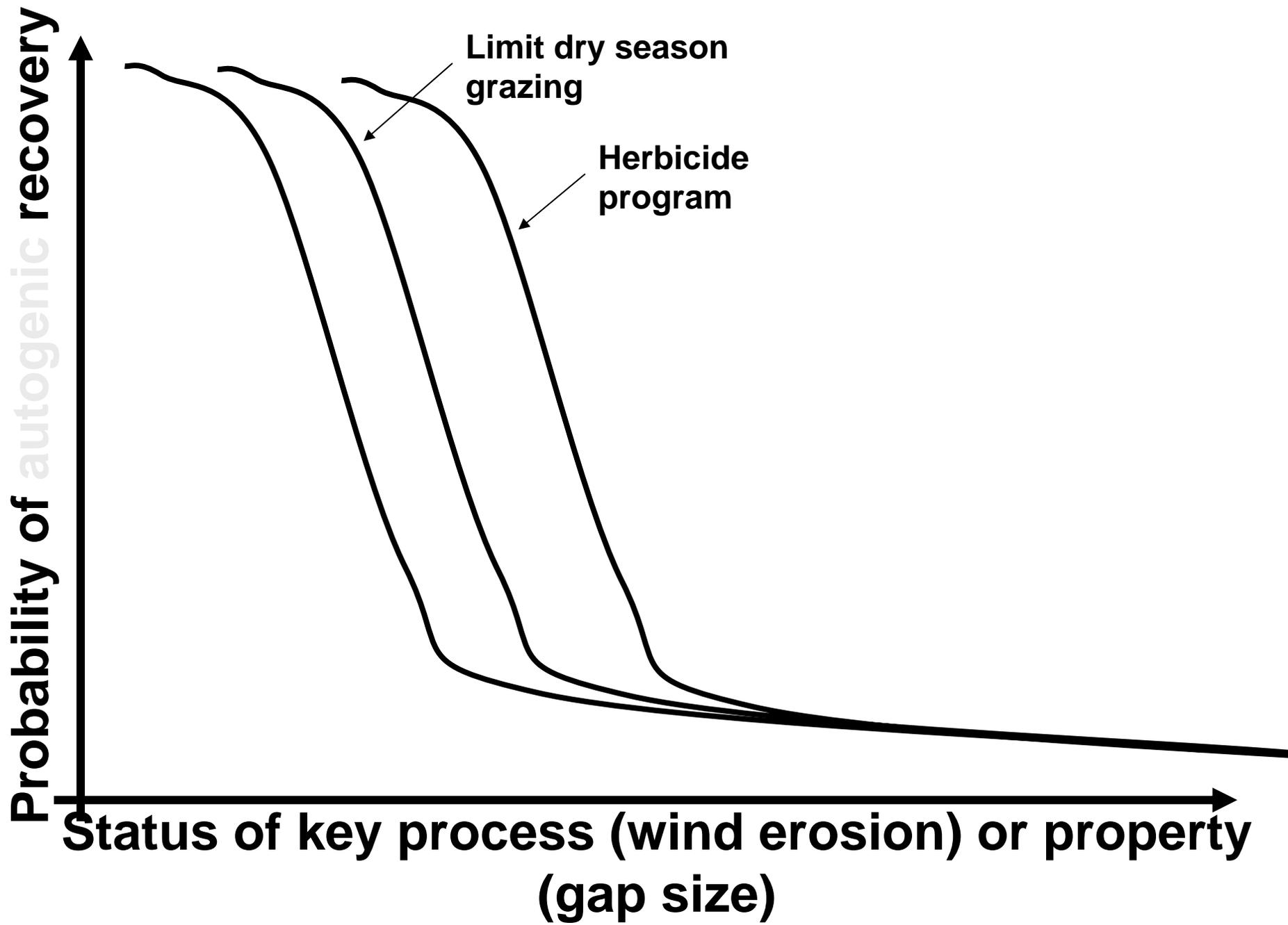


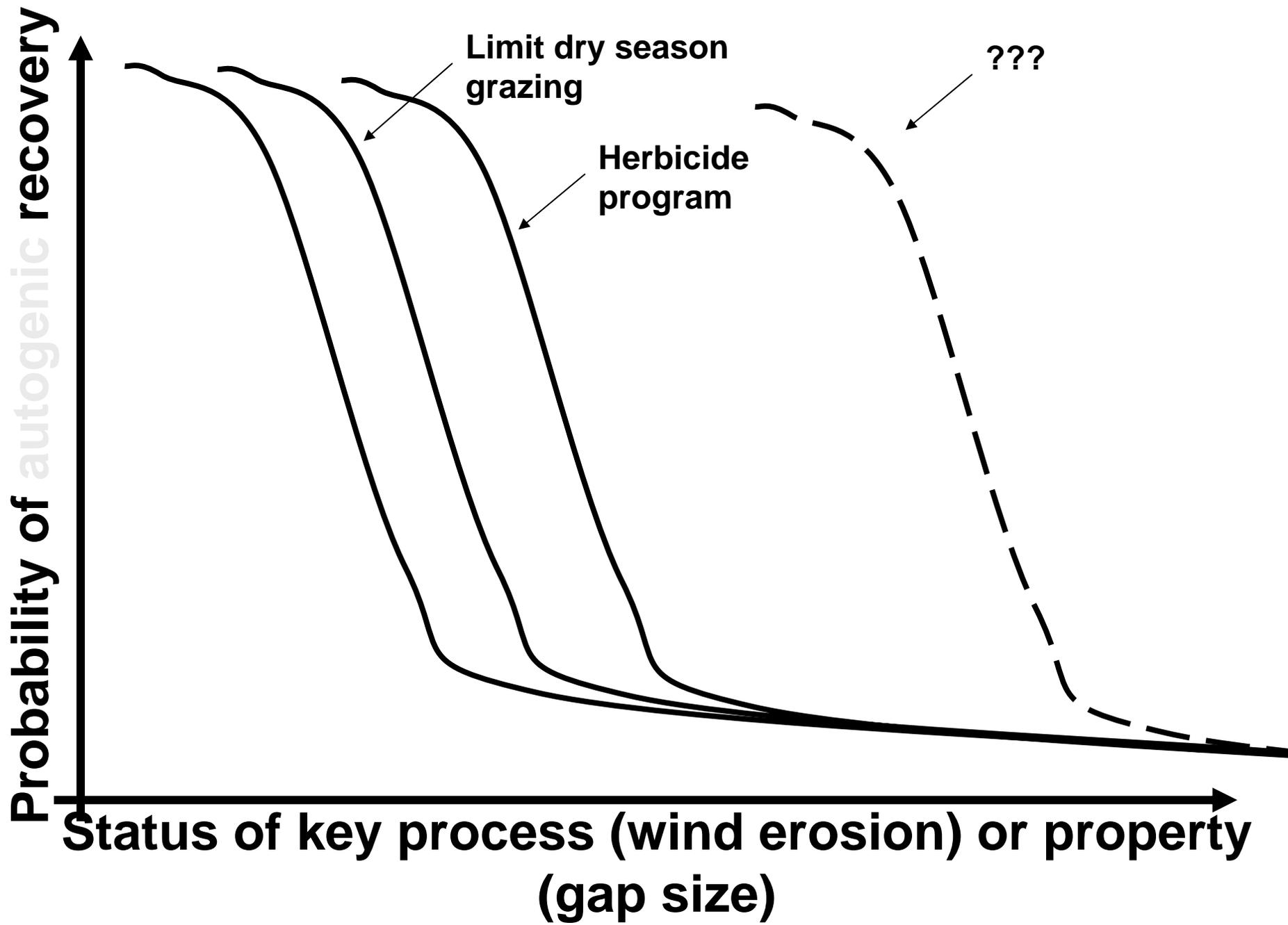
"THRESHOLD" Conclusion











Decision Constraints

- Regulatory and political (incl. public perception – e.g. fire)
- Technical
- Financial
 - Resources available
 - Opportunity cost
 - Cost of *not* taking action
 - Benefit:cost relative to other projects to which resources could be allocated

Conclusions

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- Recovery potential is stochastic - be ready to act



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- Jornada team
- IIRH team

