Investigating the dynamic patterns of management costs in protected areas

Informing more effective investments in land conservation

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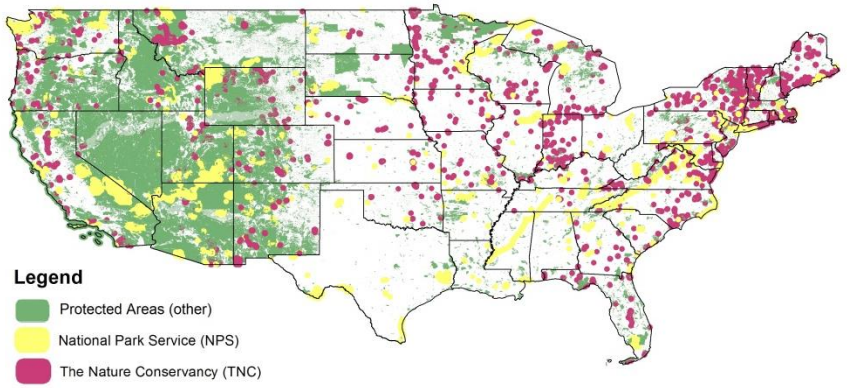
Intro

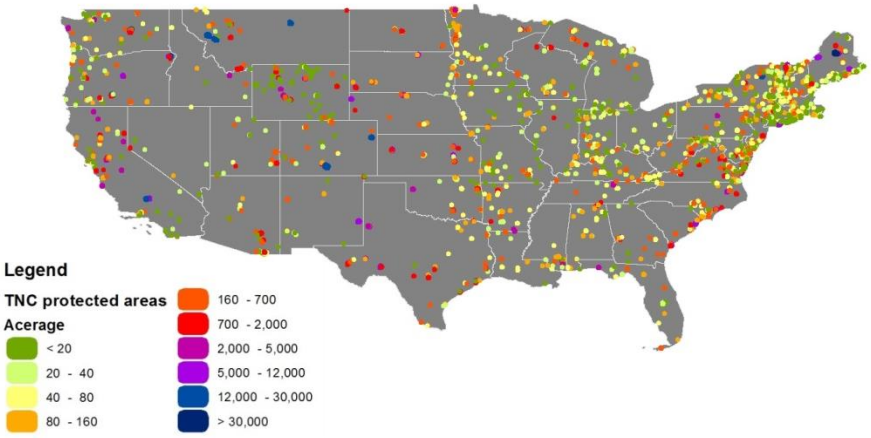
- Protected areas

- and The Nature Conservancy

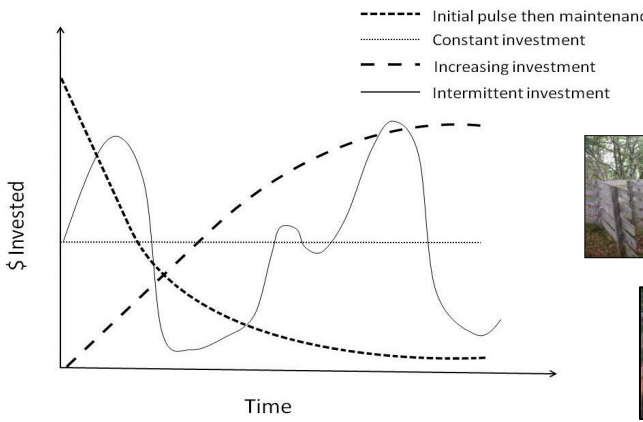


- Conservation costs

- Acquisition costs



- Management costs

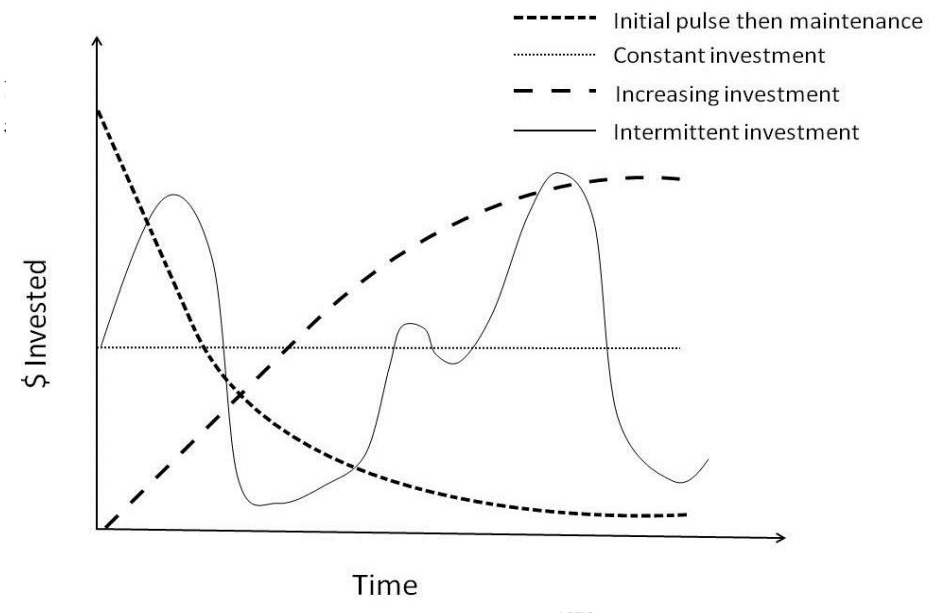


Management costs

- Often left out of spatial optimization…

SPATIAL VARIATION
conservation goals and needs

TEMPORAL VARIATION
… and why it matters



Questions

- How do investments in site management change through time and in association with site characteristics?
- How wrong are we when we disregard this temporal variability?
- How do costs and their patterns compare to resulting ecological benefits?

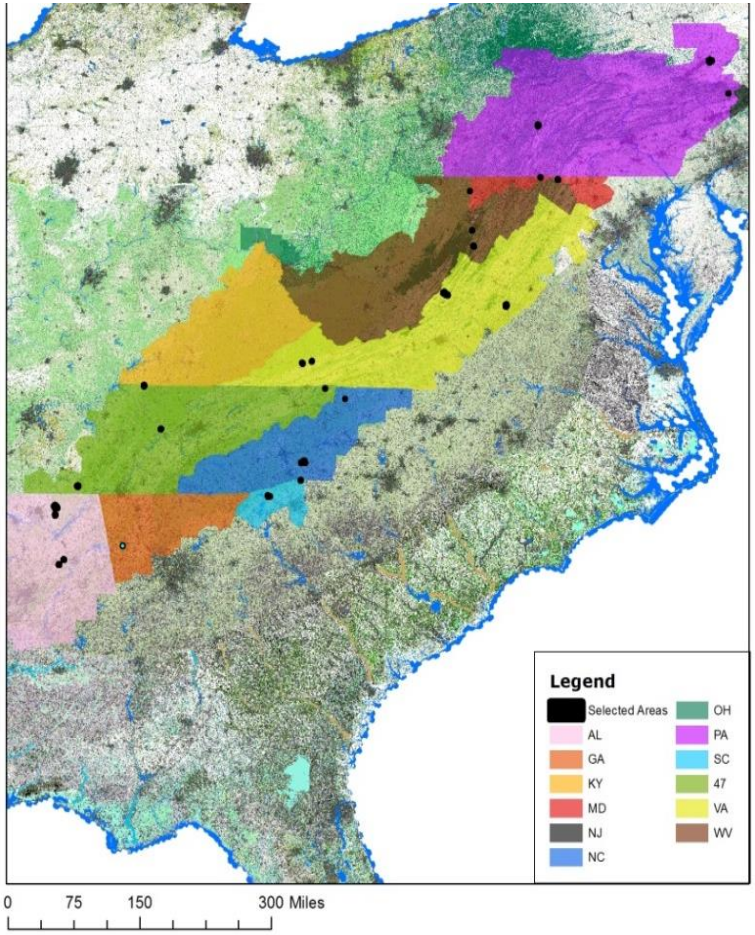
Methods

- 42 protected areas
- South. and Central Apps
- Acquired and maintained by TNC since 2000

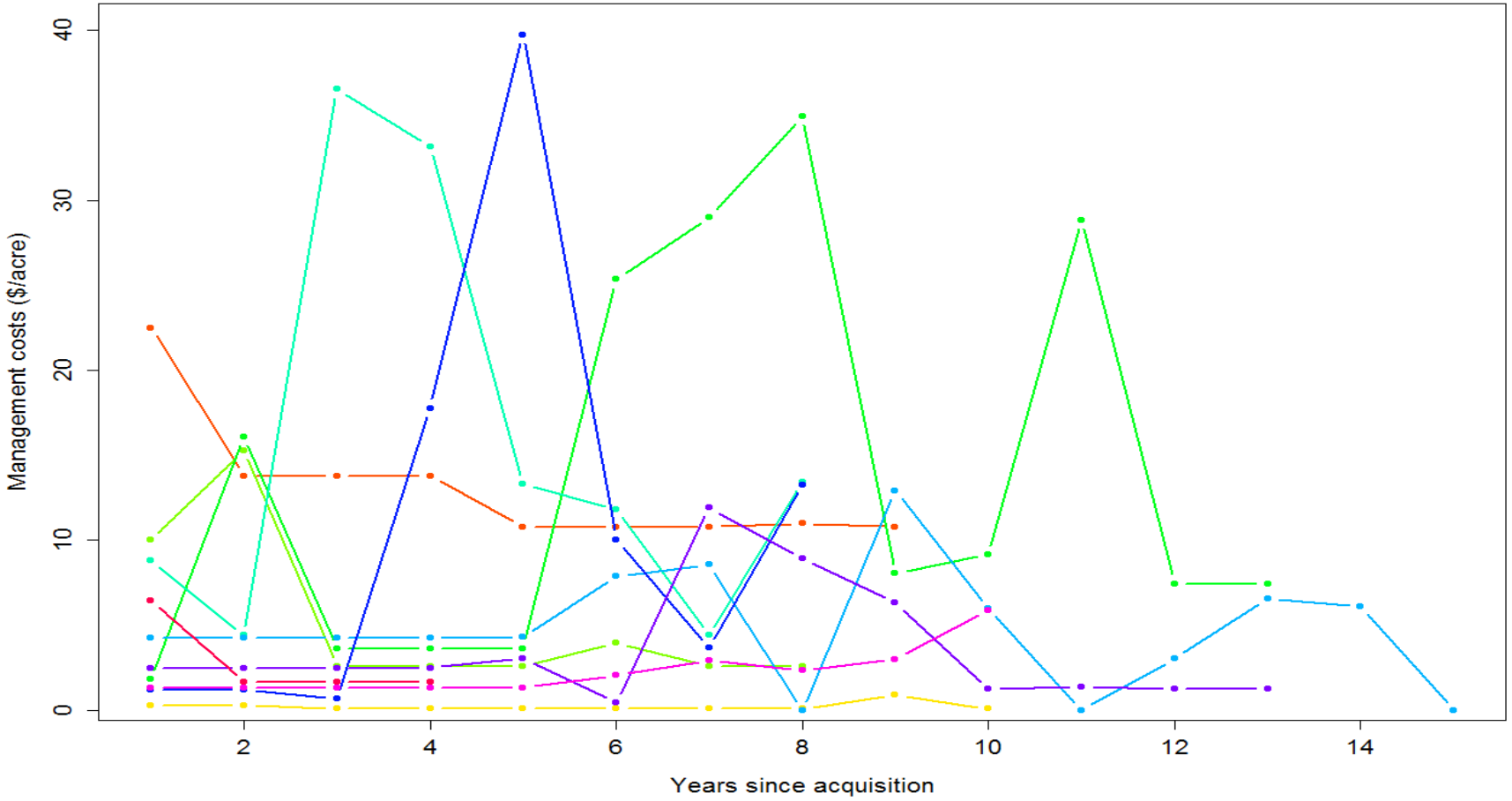
- Survey -> TNC land managers

- *Independent variables:*
  - *Time since protection*

  - *Area size*
  - *Protected area density*
  - *Urban Areas density*
  - *Road density*
  - *Agricultural land density*
  - *Easement density*
  - *Fire management*



Investment Pattern



Explaining the variation

- Building a regression model in time

- *No time :*

$$Costs = \alpha + \beta_1 * Size + \beta_2 * Fire + \beta_3 * Agri + \beta_4 * Easements + \beta_5 * PAs + \beta_6 * Roads + \beta_5 * UrbanAreas + \varepsilon$$

Variable	Estimate	P-value
Size (ha)	0.004256	**
Fire Management (yes or no)	1.30697	*
Agricultural lands (prop)	-2.3839	
Easements (prop)	1.61833	
Protected Areas (prop)	0.011065	
Road Density (density)	0.552102	***
Urban Area (prop)	-0.4201	*

So does time matter?

- Same time effect across sites

management costs =
$\alpha + \beta_1 * \text{predictor}_1 + \ldots + \beta_n * \text{predictor}_n + [\, a + b*(\text{time since protection})] + \varepsilon$

- Time x characteristics

management costs =
$\alpha + \beta_1 * \text{predictor}_1 + \ldots + \beta_n * \text{predictor}_n + [\, a_1 + a_2(\text{predictor}_i)](\text{time since protection}) + \varepsilon$

Thanks!

To the Armsworth lab:

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