

Why do some restoration projects fail and others succeed?

- ▶ A Quantitative Look at 243 Sites for Environmental, Management, and Social Factors



Anna A. Sher, Lisa B. Clark, Annie L. Henry, Alex Goetz, Anit Tyagi, Isabelle Simpson, and Eduardo González



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DENVER



Photos by Robin Bay



Lisa Clark, MS

Clark et al. 2019

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RESEARCH ARTICLE

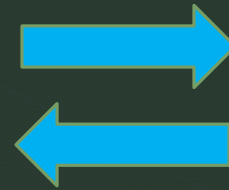
Successful information exchange between restoration science and practice

Lisa B. Clark¹, Annie L. Henry¹ , Rebecca Lave², Nathan F. Sayre³, Eduardo González^{1,4}, Anna A. Sher⁵

- There is good communication about
 - Collaborate widely
 - Monitor quantitatively
 - Use a variety of information sources
 - Have goals beyond invasive removal



Managers

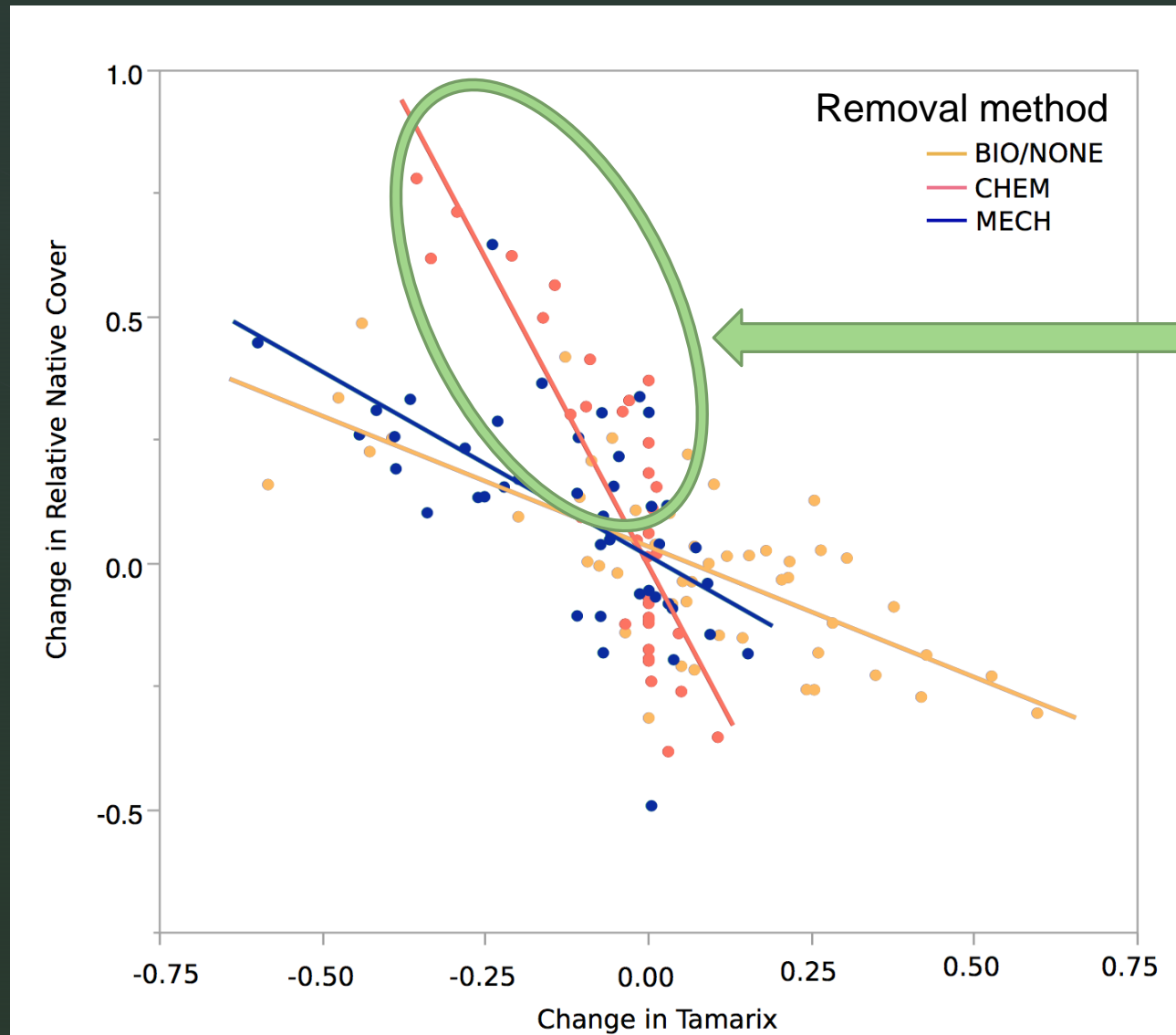


Scientists

Implications for restoration outcomes

But does this
human element
even matter?

Previous research: Reduction in *Tamarix* = increase in natives



Is there something special about this manager?

Sher, El Waer,
Gonzalez,
Anderson, Henry,
Beidron (2018)
Ecological
Engineering

The human element is intrinsic (but often ignored)



Elements include:

- Attitudes
- Training/Education
- Communication
- Goals

Attitudes \neq Decisions



Clark et al. 2019



Current research: What human characteristics and/or decisions are relevant for restoration success?

Manager Decisions

- Monitoring (types & frequency)
- Information Sources
- Types of goals
 - Plants
 - People
 - Water, Wildlife
- Organization
 - Number of collaborators
 - Employing agency



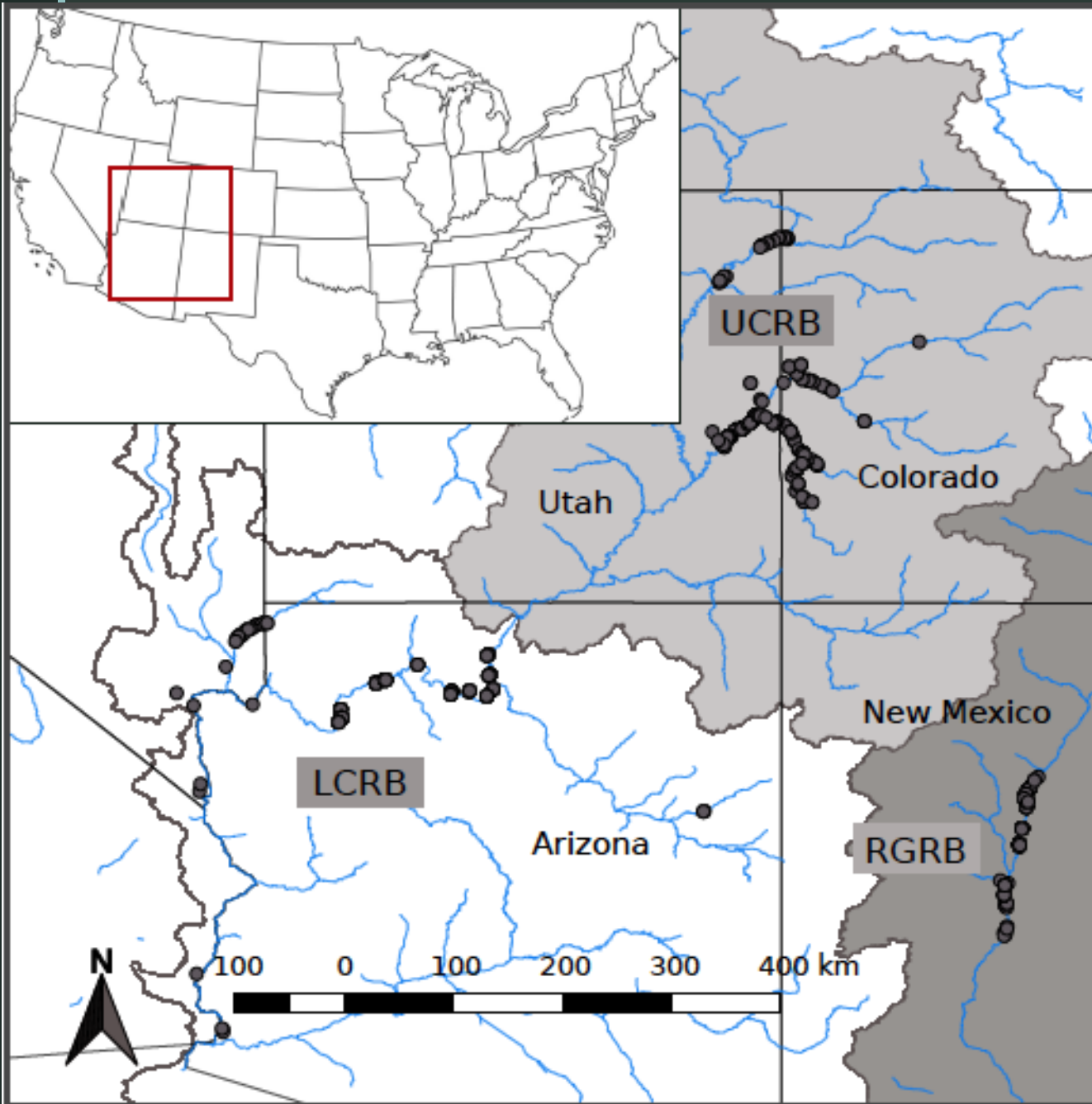
Variables Measured

Manager Characteristics

- Number of management roles
- Manager's highest level of formal education
- Overall experience
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Research Questions

- 1) Does the addition of human variables improve our prediction of restoration success?
- 2) Which human variables are associated with improvement of restoration success?

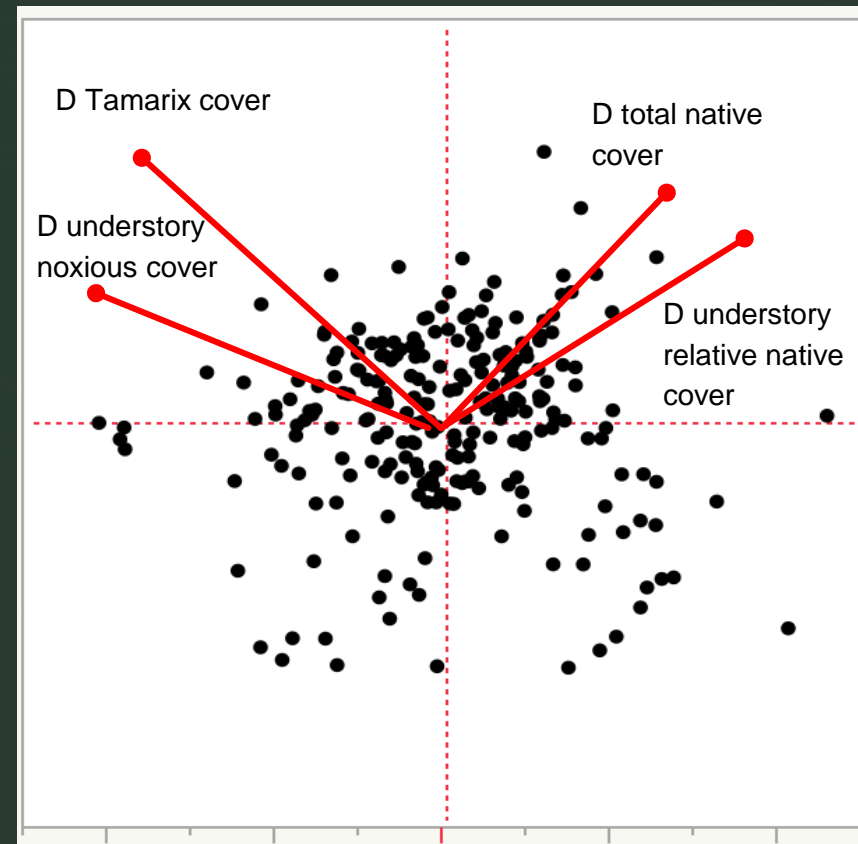


486 Paired Sites

- Vegetation papers:
 - González, Sher et al. (2017) Ecological Applications
 - González, Sher et al. (2017) Biological Conservation
 - Sher et al. (2018) Ecological Engineering
- Surveys and Interviews covering 80 projects (45 managers)
- Questions relating to recommendations and manager background

What is “restoration success”?

- PCA on difference in measures between:
 - “Desirable”
 - Total native cover
 - Understory relative native cover
 - “Undesirable”
 - *Tamarix* cover
 - Understory noxious cover



PCA1 explains 76%

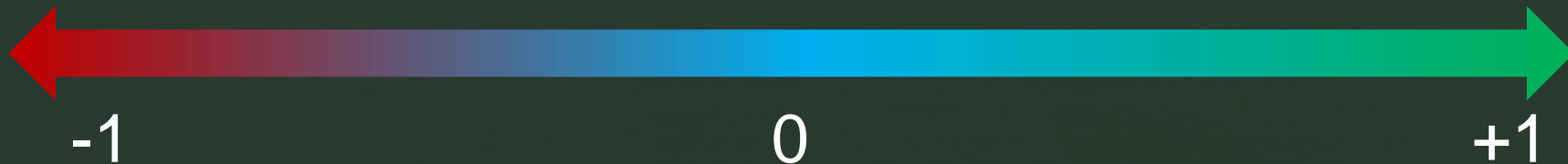
PCA1= “success metric”



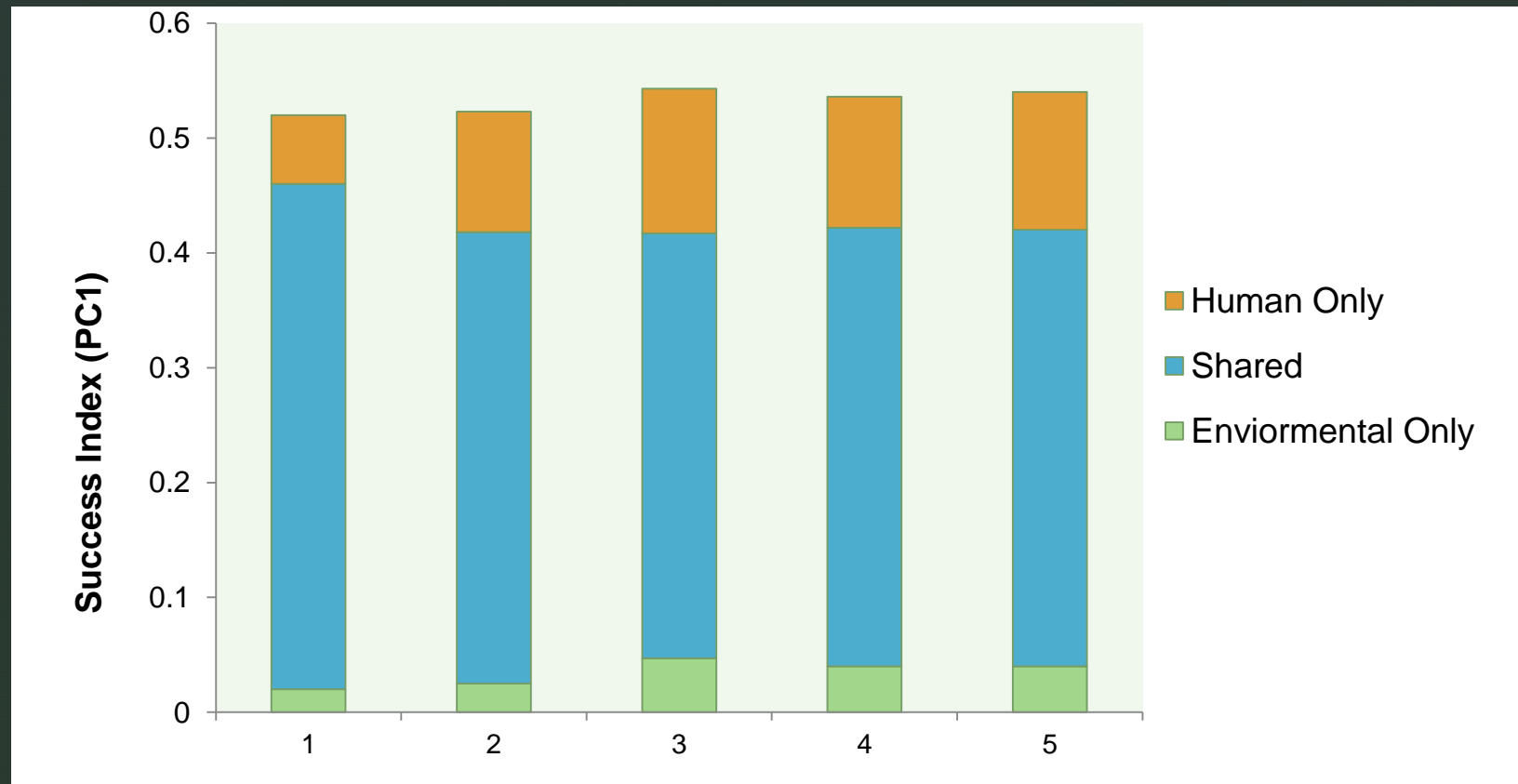
Increase in *Tamarix* and Noxious Understory



Increase in desirable species



1) YES: Adding human variables significantly improved our predictive ability



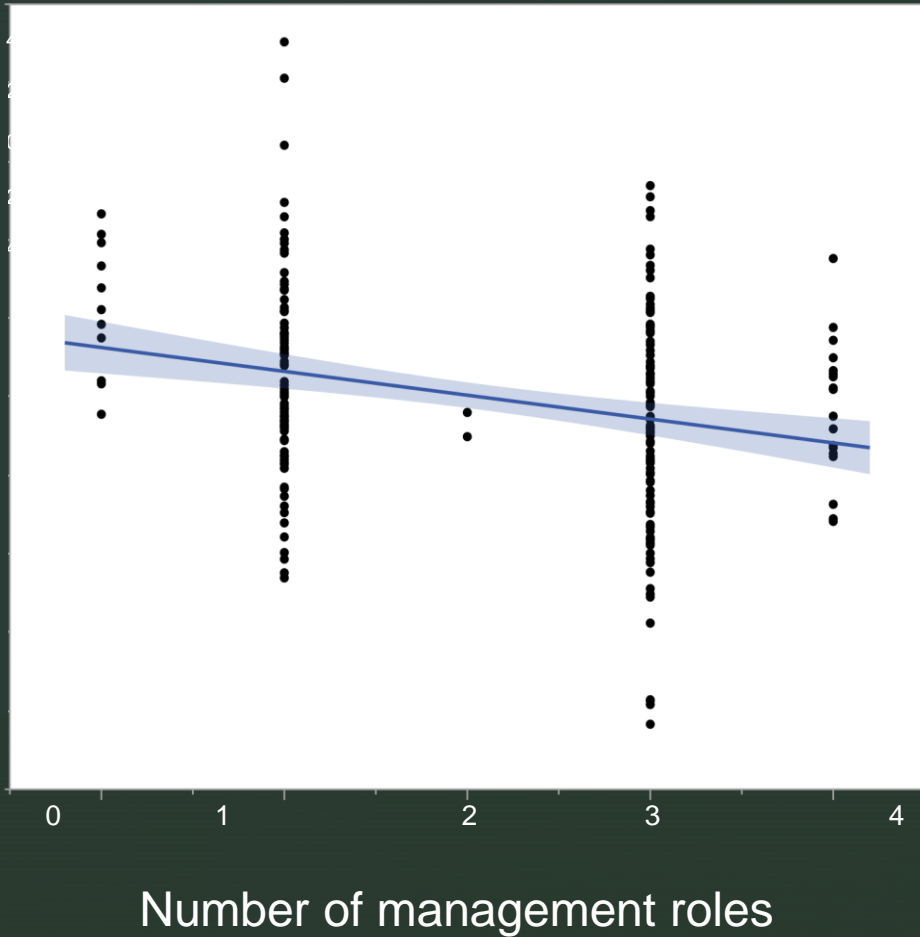
Different models to explain restoration success, with reach as random variable

Research Questions

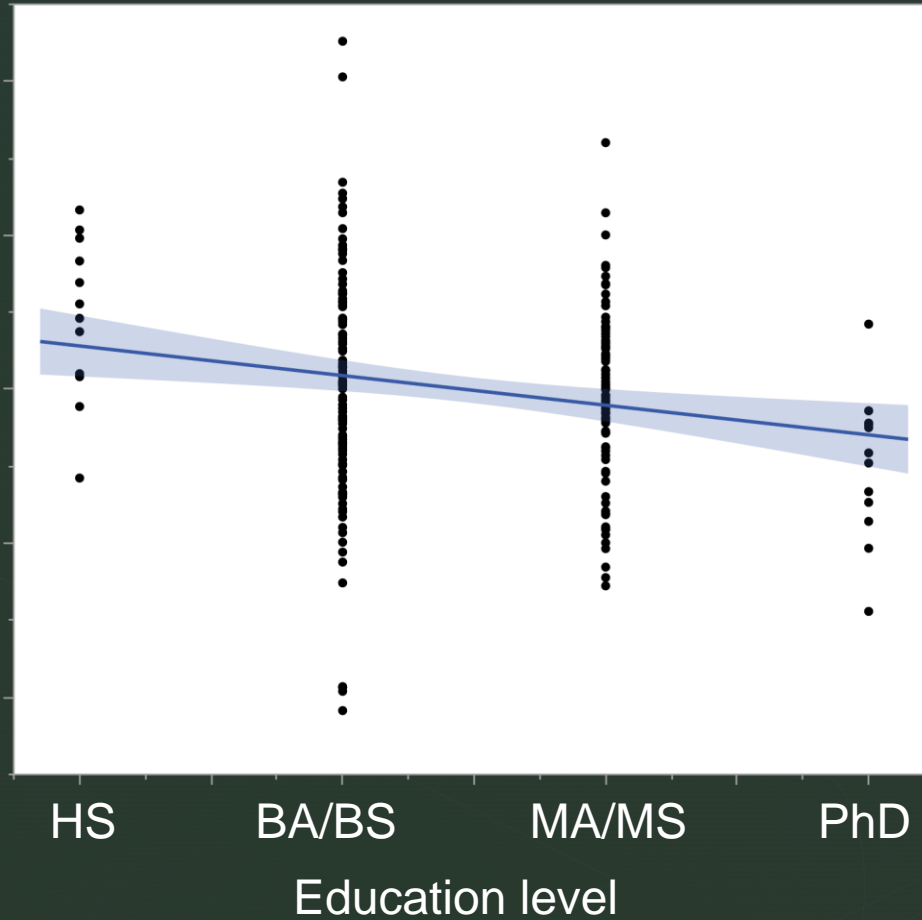
- 1) Does the addition of human variables improve our prediction of restoration success? **YES!**
- 2) Which human variables are associated with improvement of restoration success?

2a) Manager traits: too many responsibilities and fancy education bad

Success Index (PC1)



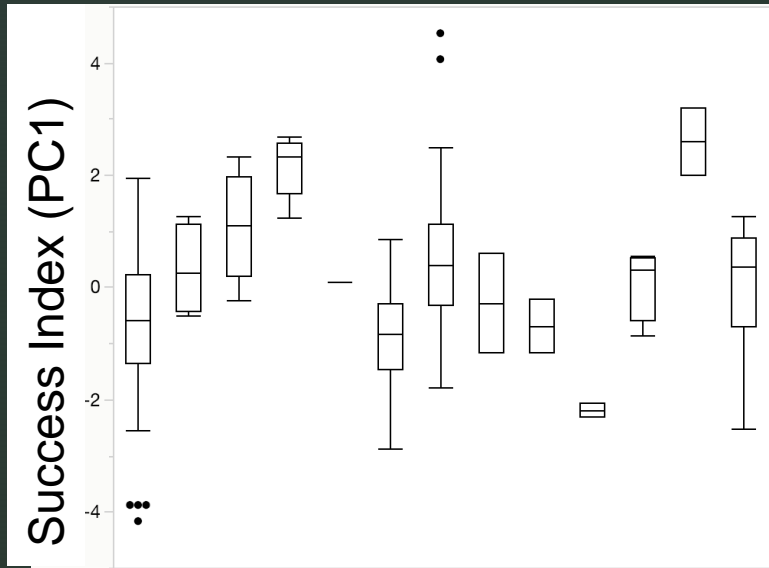
Success Index (PC1)



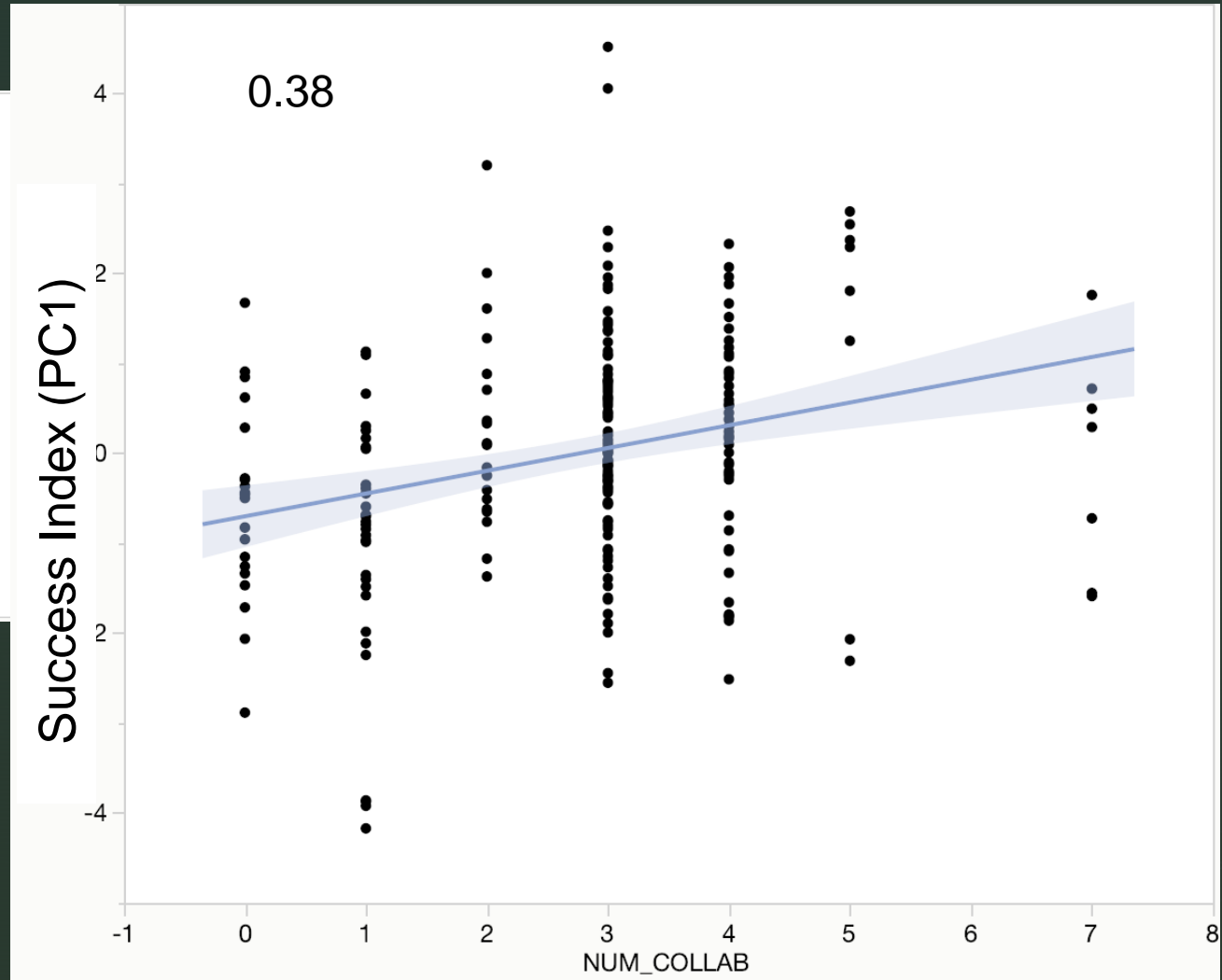
2b) Organization:

Lots more success with more collaborators

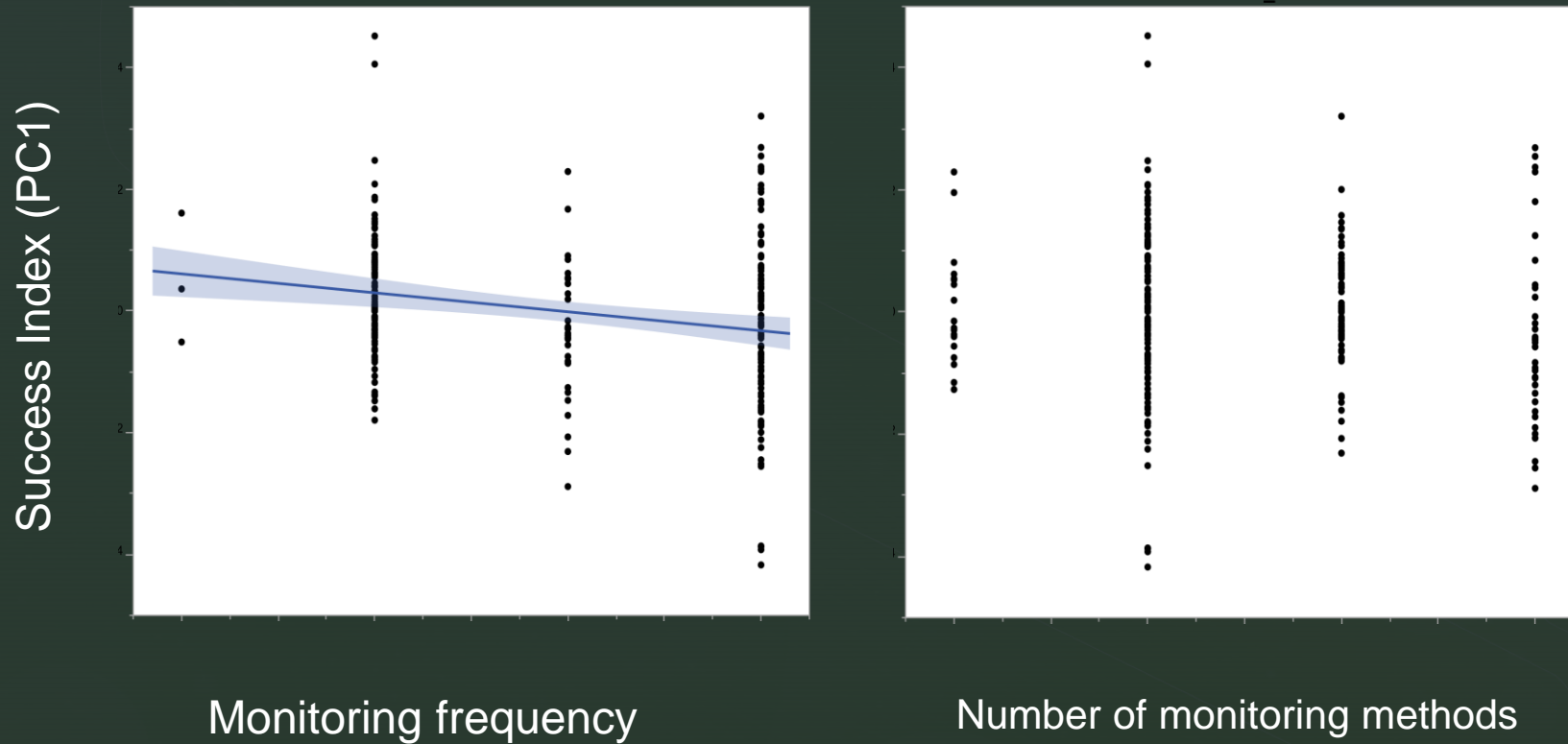
Agencies differed



Employing agency

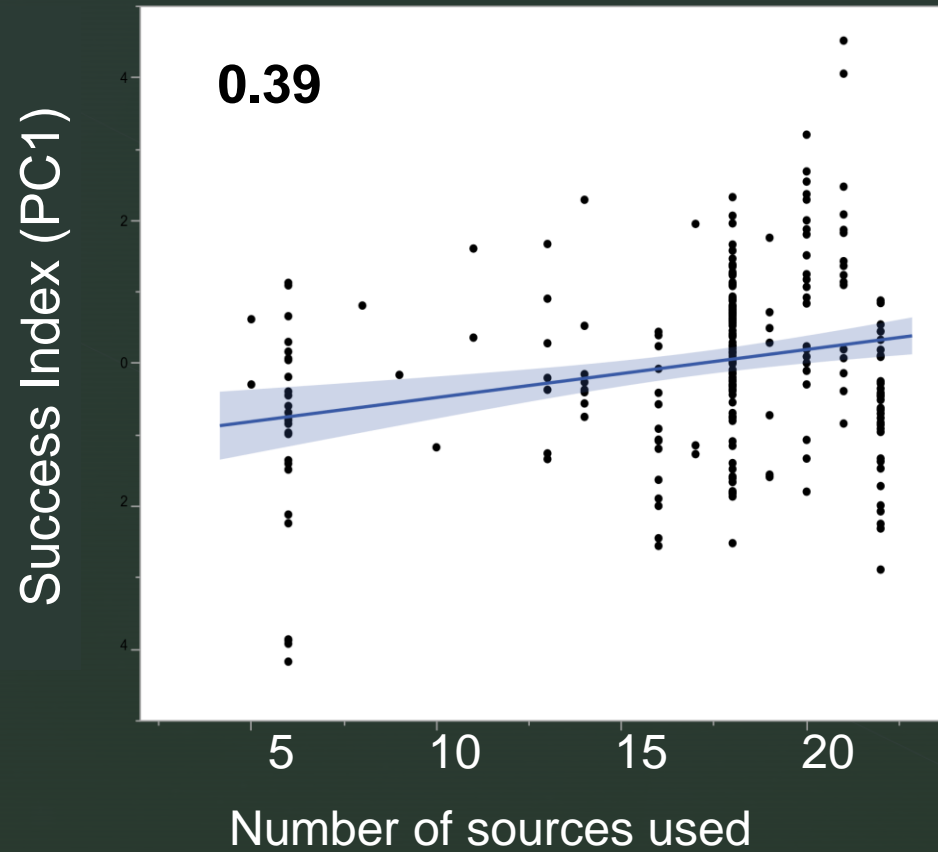


2c) Monitoring: Worse sites are monitored more?



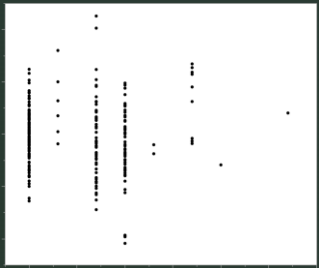
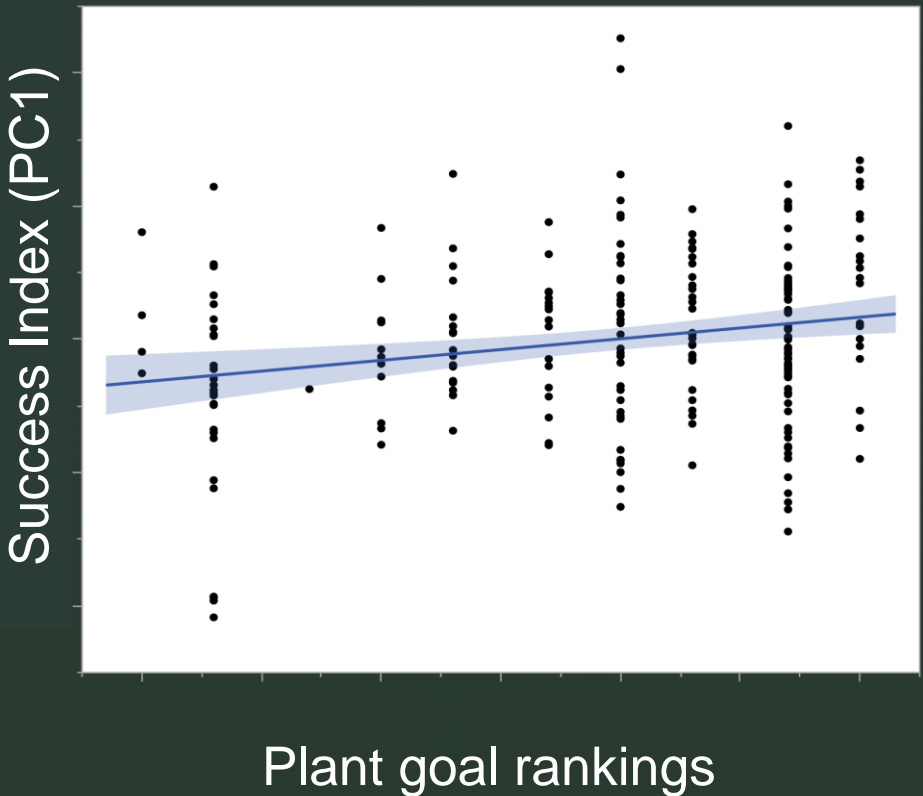
2d) Information Sources:

More success with more sources used

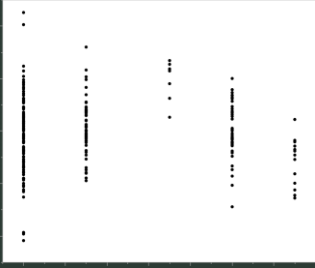


2e) Goal Setting:

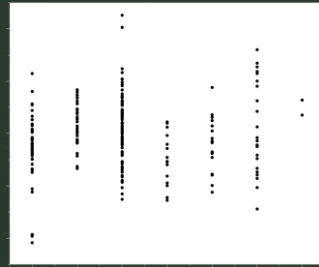
Making plant-related goals a high priority makes a positive difference



People goal rankings



Water goal rankings



Wildlife goal rankings

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 - Manager had fewer roles and less academic education
 - Manager collaborated with many different partners
 - Many information sources were used
 - Plant-related goals were prioritized

- Take home message: If we work together, we can overcome environmental constraints

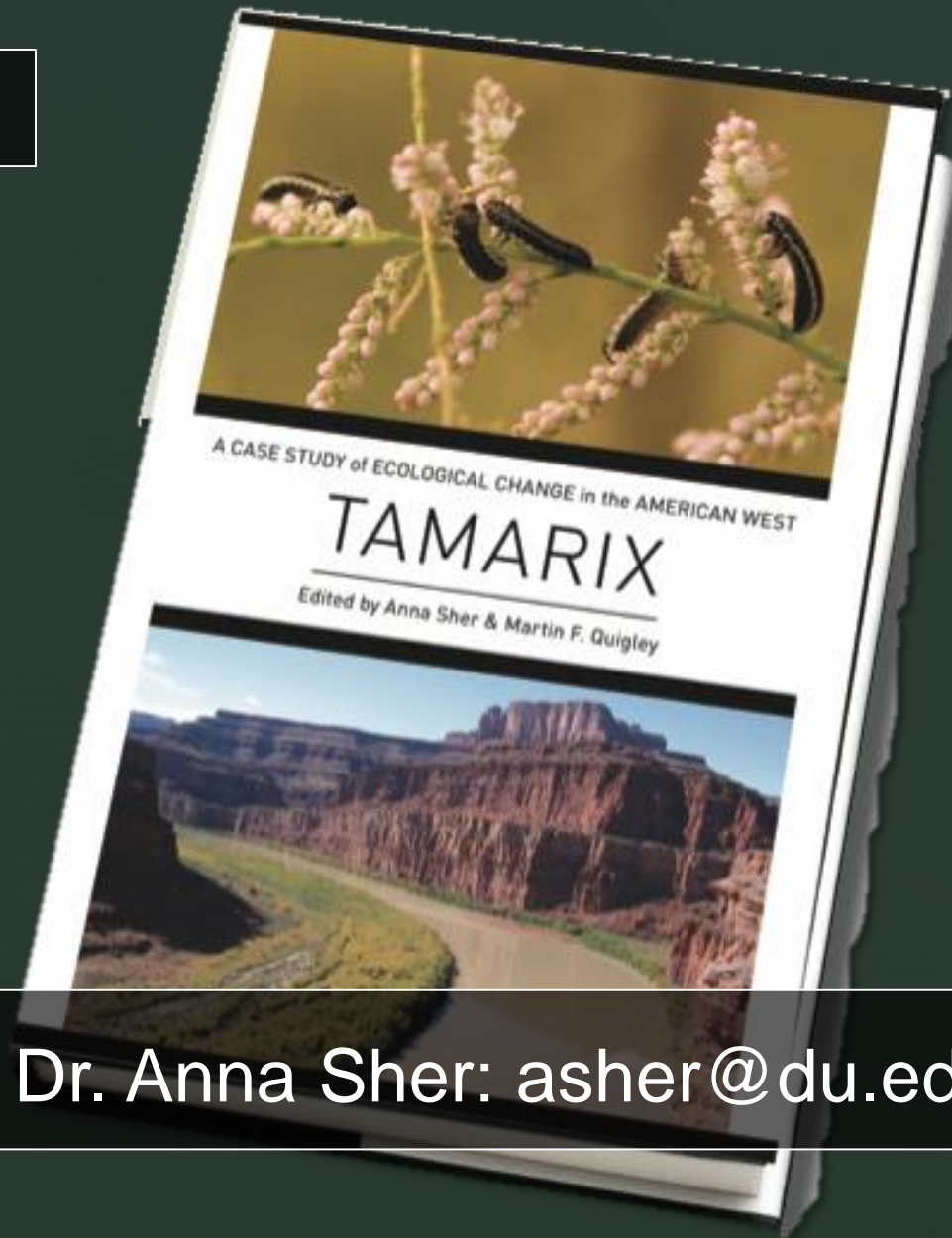


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Questions?



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▸ Environmental variables that were significant

- Reach was random variable (accounting for location and climate)
- Distance to nearest road
- Precipitation that year
- Use of herbicide