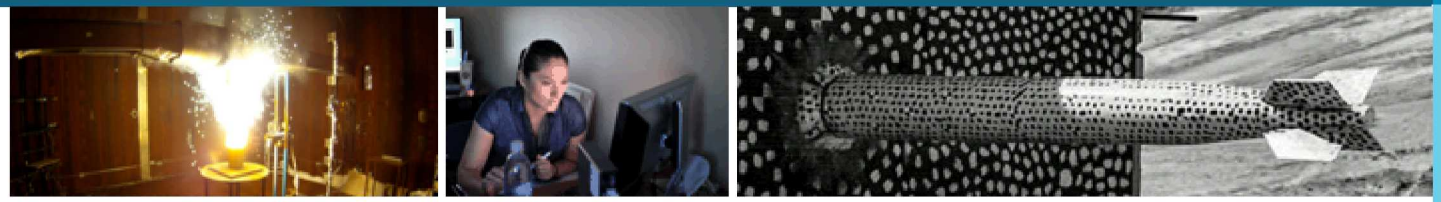
SAND2019-0348PE

# Sociocultural Feedbacks Influence Community Resilience During Water-Scarce Periods



*PRESENTED BY*

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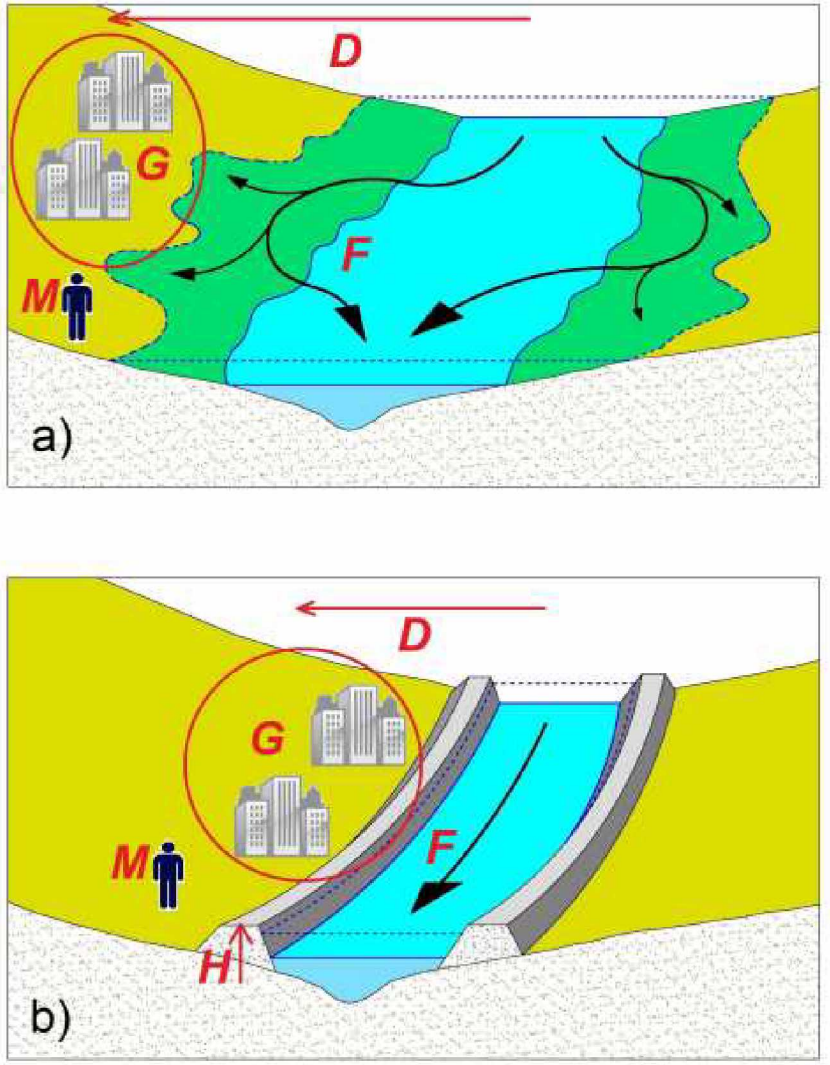
# Outline

1. Background & Motivation
   1. SocioHydrology
   2. Acequia Communities
2. Study Approach
3. Results
4. Implications for Community Water Resilience

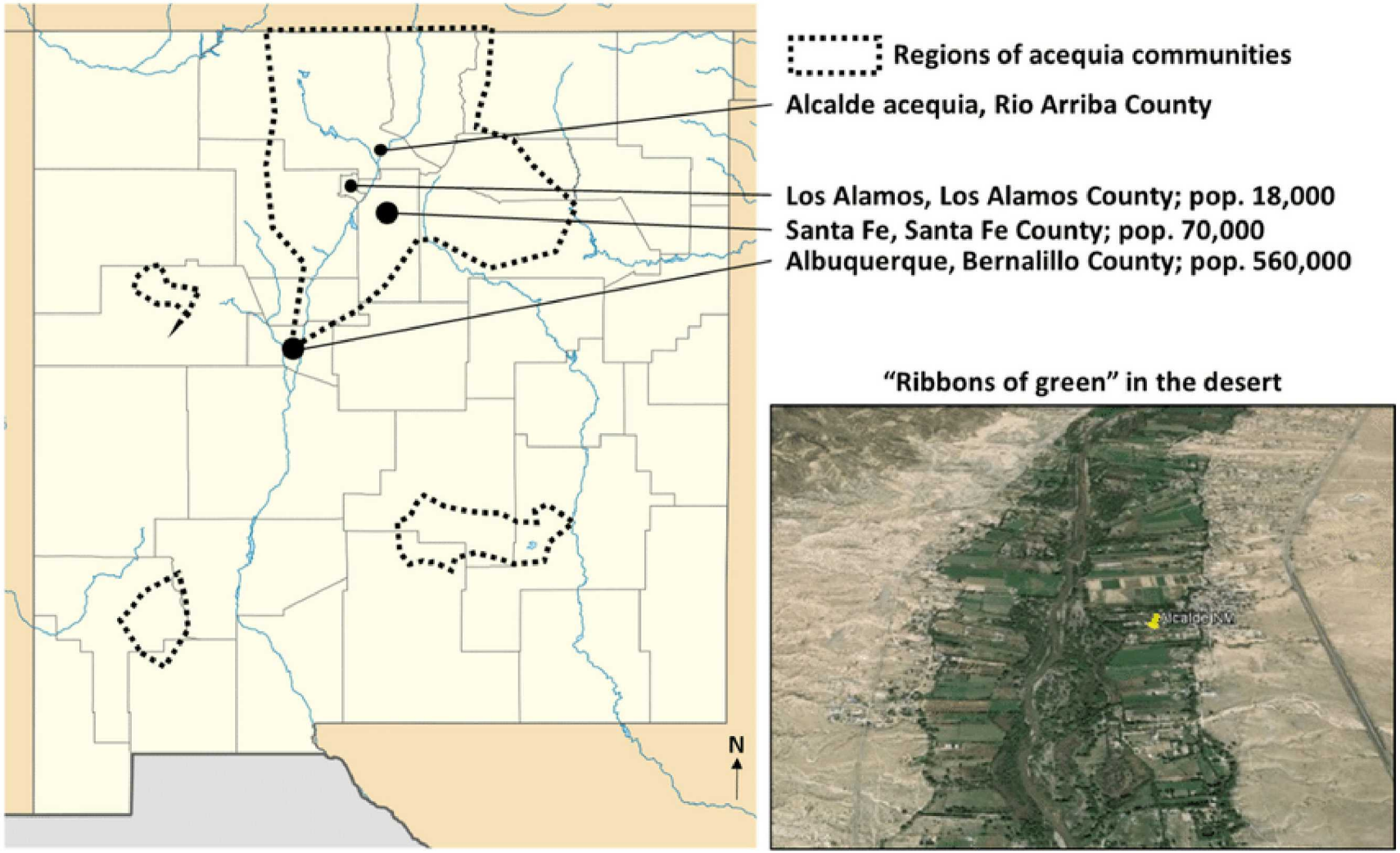
# SocioHydrology

- Incorporate interdisciplinary physical and social insights
- Increased our understanding of hydrological system behaviors
- For example, Di Baldassarre et al. (2013) demonstrated that when levees are affordable, societal awareness shifted risks from low-impact, frequent flooding to high-impact, infrequent flooding.
- Challenge: Current models often treat 'society' as a homogenous actor rather than true state of social interaction




Source: Di Baldassarre et al., 2013

# Acequia Communities




Source: Turner et al., 2016

"Ribbons of green" in the desert



"green ribbons" in the desert

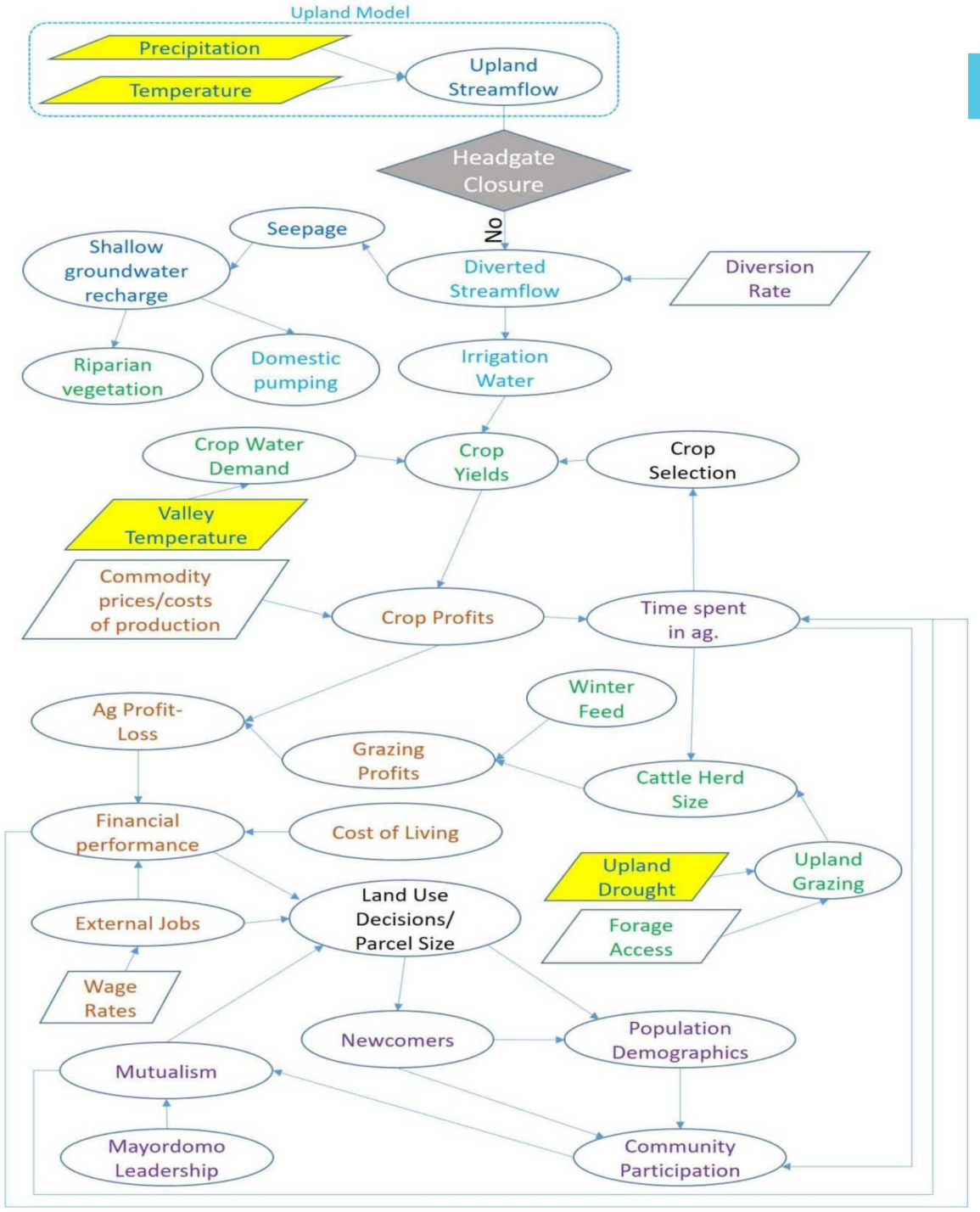
Indicate their ability to co-adapt with natural and social shocks reflect values centered around mutualism (social cohesion)…

Mutualism is strongly intertwined in the social dynamics of the community, which interface with hydrological characteristics

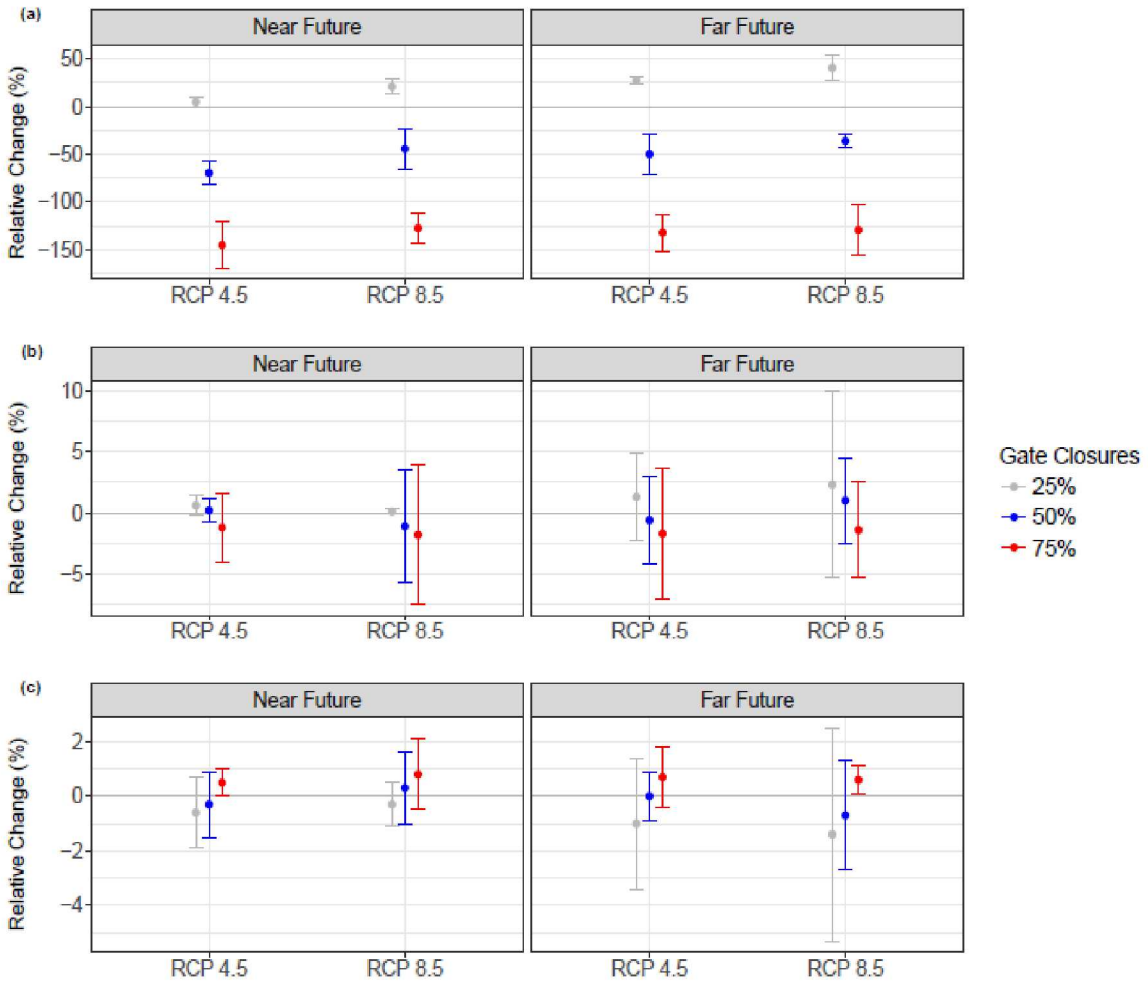
- Maintained through annual ditch cleaning
- Eroded through farmer migrations

# Study Approach

- Developed system dynamics model
- Informed by interdisciplinary perspectives and stakeholder engagement
- Calibrated to historical data
- Evaluated counterfactual scenarios to understand community's response to hydrological stress
  - Climate change scenarios
  - Headgate closures



# Results: Paradoxical?




Comparison of (a) agricultural profitability per *parciante* parcel, (b) *parciante* parcel size, and (c) community size under the different climate pathways and head gate closure scenarios. Points indicate the normalized difference in mean from the historical, calibrated values and the bars represent +/- 1 standard deviation, normalized relative to the standard deviation of the historical values.

- With more water stress, agricultural profitability and mean parcel size are larger while community size is smaller in the 25% gate closure scenario
- Dynamics influenced by mutualism and newcomer introduction into communities as well as water buffer
- Limitations: high water stress scenarios

# Implications for Community Water Resilience

- Acequias
  - Learning from their past
    - Buffers in resource allocations reduce sensitivities to stresses
    - Mutualism is a central piece in their community structure
  - Importance of being flexible
    - Diverse economic opportunities
    - Introduction of ideas from newcomers
- Value of understanding community structures
  - Can moderate impacts of stressors
  - Different communities might react differently to same set of stressors

# Contact Information

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## References

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