Adaptive Capacity and Potential Roadmaps

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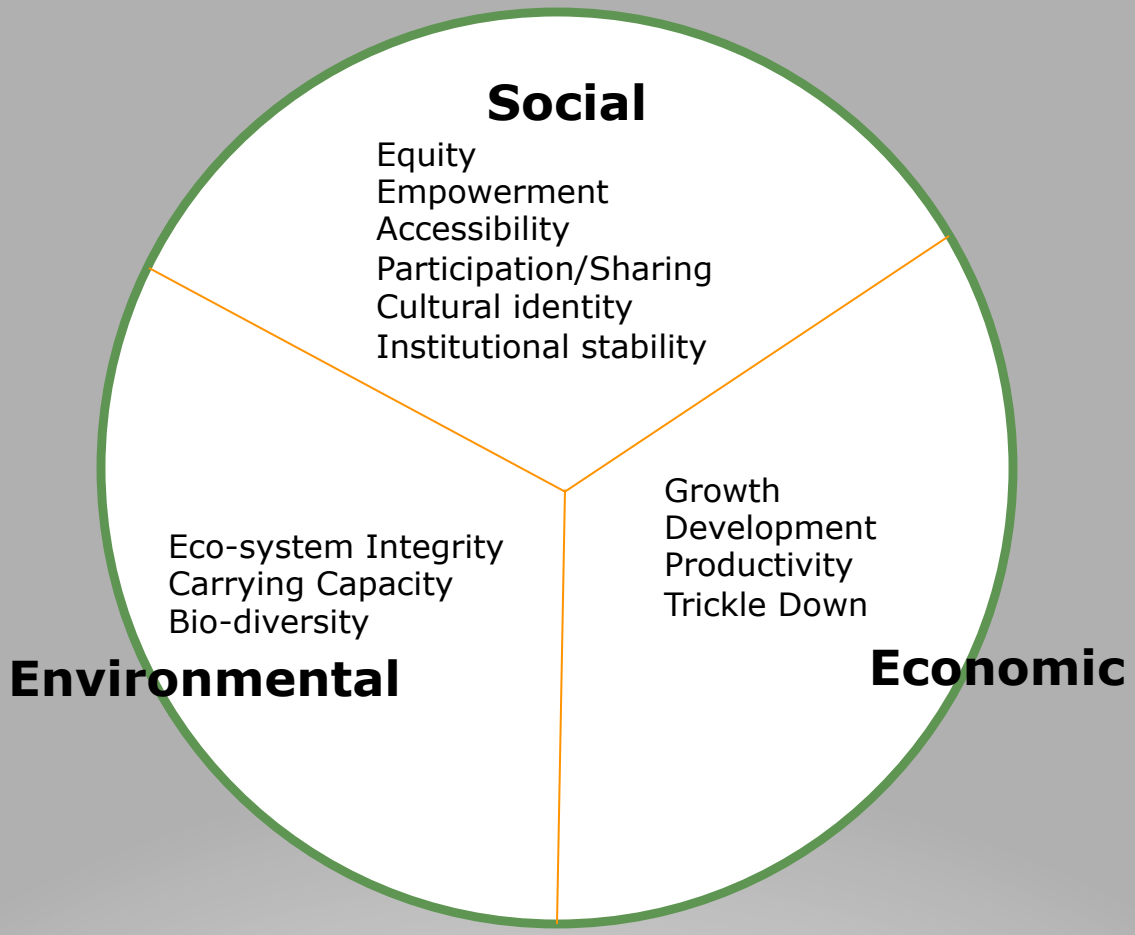
Sustainability

- **Sustainable Development** defined as "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" according to the World Commission on Environment and Development (Brundtland Commission) 1987 report, *Our Common Future*



Khan, M.A. 1995. Sustainable Development: The Key Concepts, Issues and Implications. *Sustainable Development* 3:63-69 and LeLe, S. 1991. Sustainable Development: A Critical Review. *World Development* 19(6): 607-621.

Sustainable Development (SD) – triple bottom line paradigm

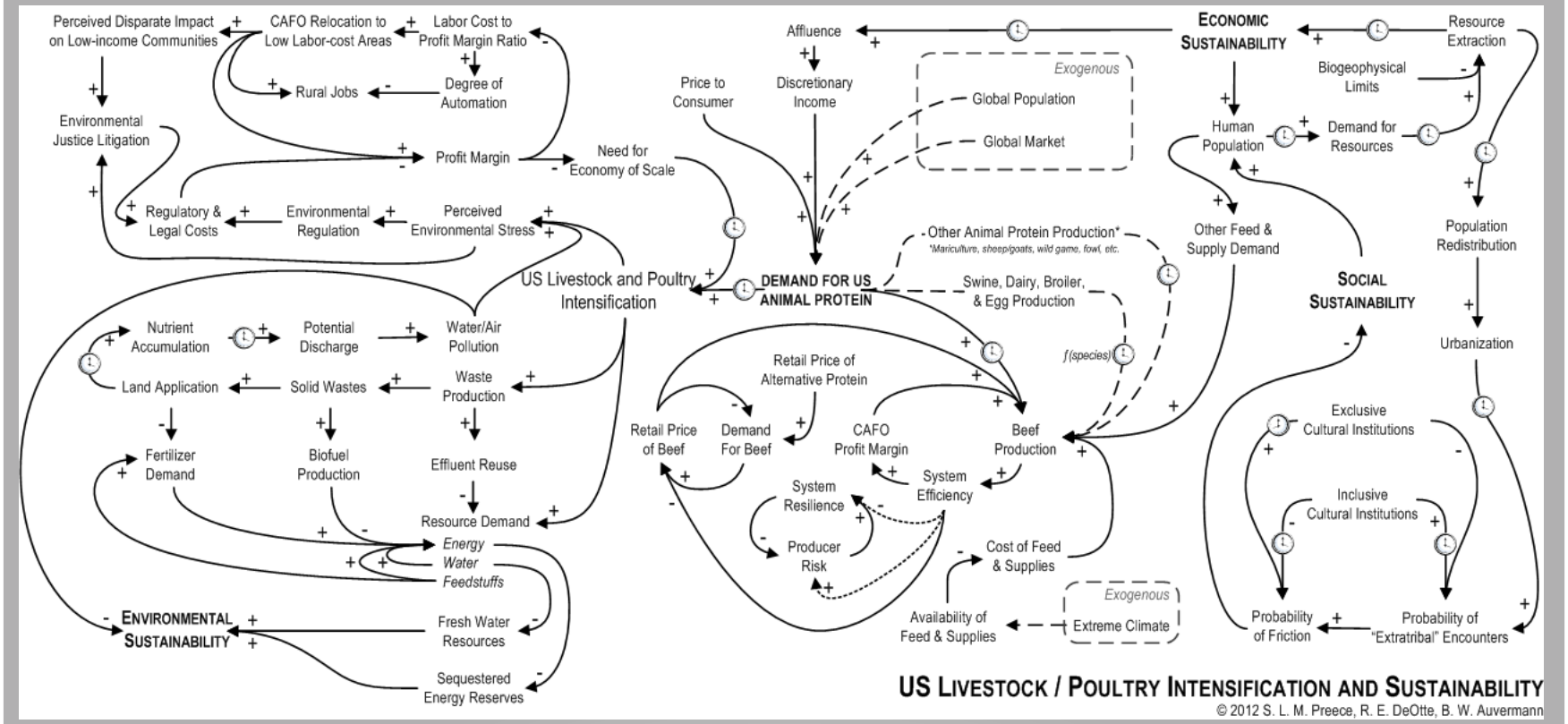


Figure 1. Preliminary causal-loop diagram relating the three pillars of sustainability (social, economic, and environmental) to animal-protein production in the United States. The relative density of interactions in the "environmental" and "economic" sustainability sections of the CLD, together with the relative scarcity of interactions in the "social sustainability" section, reflects our Multistate Research Committee's need to establish constructive, long-term collaboration with researchers in the social sciences and related disciplines.

Taken from OBJECTIVE 3. Discover, substantiate, and interpret the broader impacts of component-level modifications to animal-production systems.

- **Where do people fit?**
  - Ecologically, people viewed in relation to environment --
    - *threat* to natural resources
    - *solution* through stewardship function
  - Economically, people viewed in relation to economy --
    - *input* (labor or consumers)
    - *meeting basic needs* a function of reducing costs and improving quality of labor force

Taken from Magis, K., & Shinn, C. (2009). Emergent themes of social sustainability. In J. Dillard, V. Dujon & M.C. King (Eds.), *Understanding the Social Aspect of Sustainability. New York, NY: Routledge.*

Sustainability

- **Where do people fit?**
  - Socially, people viewed as
    - having intrinsic value (value in their own right)
    - as an end in and of itself, not as a means (paraphrasing Kant)
    - as inseparable part of the entire SYSTEM whose constituent parts are economic, ecological and social

Taken from Magis, K., & Shinn, C. (2009). Emergent themes of social sustainability. In J. Dillard, V. Dujon & M.C. King (Eds.), *Understanding the Social Aspect of Sustainability. New York, NY: Routledge.*

Sustainability

- **Three questions about sustainability**
  - What is it that we are sustaining?
  - For whom are we sustaining it?
  - Who gets to decide?

Sustainability?

http://goorcasisland.com/PhotosProperty.aspx

What is this a picture of?

Social construction

- **A social construction is**
  - "…an entity that exists because people behave as if it exists and whose existence is perpetuated as people and social institutions act in accordance with the widely agreed upon formal rules or informal norms of behavior associated with that entity" (from Conley, D. You May Ask Yourself: An Introduction to Thinking Like a Sociologist. New York: Norton and Company, p. 30)
- **Examples** – freedom, food, nature

Social construction of nature

- **Symbolic environments**
  - "…created by human acts of conferring meaning to nature and the environment, of giving the environment definition and form from a particular angle of vision and through a special filter of values and beliefs…(they) reflect our self-definitions that are grounded in culture" (from Greider, T. and Garkovich, L. 1994. Landscapes: The Social Construction of Nature and the Environment. *Rural Sociology* 59(1):1-24)
- **Implies contested meanings**
- **Example**
  - Wilderness

- **Which picture shows "wilderness"?**

http://www.thesafetycenter.us/wilderness-first-aid/

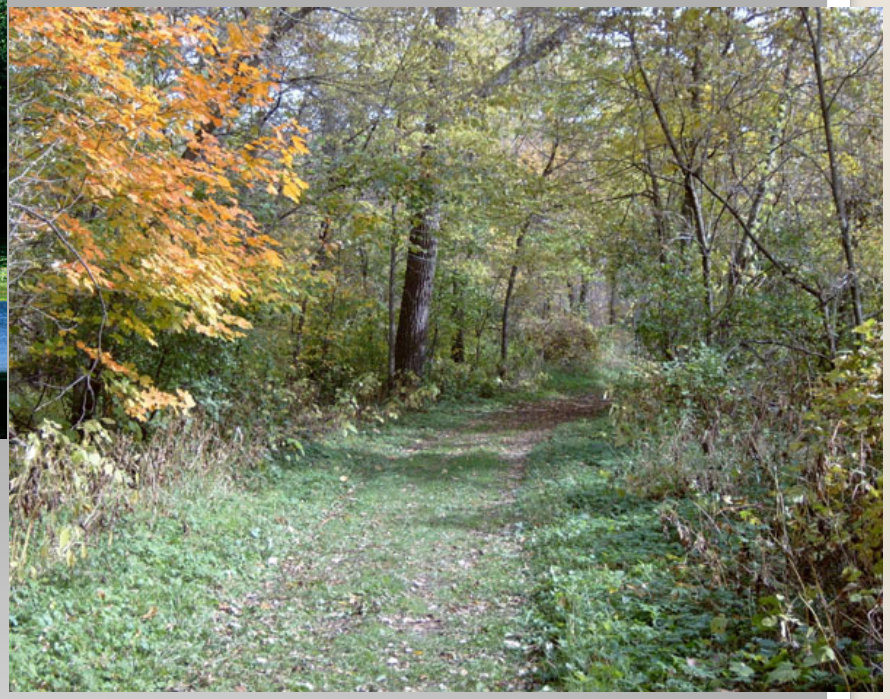


Photo by Zola K. Moon

Social construction

- **Which picture shows "wilderness"?**

The border of WILDERNESS. This picture used on a website to capture the spiritual content of WILDERNESS.

http://thelatterdays.blogspot.com/2010/04/wilderness-survival-for-christians-part_2773.html

"Set in Yosemite at the turn of the century, Disney's Wilderness Lodge uses trees, carvings and even a geyser to transport you from the middle of Florida to the Northwest." from http://hotels.about.com/od/disneyworld/ss/disney_deluxe_4.htm

Social construction

- **Which picture shows "a farm"?**

In an old Japanese Sony semiconductor factory, a plant physiologist used special GE LED lights and 25,000 square feet of space to create an indoor farm. So far, it only grows cucumbers and tomatoes, but there are big plans for the space. The 17,500 lights in the building use special wavelengths that are great for growing crops.

http://www.techrepublic.com/pictures/photos-11-of-the-worlds-most-high-tech-farms/11/

Tomato Farm, Washington County, TN. Picture by Mark W. Peacock.

http://www.panoramio.com/photo/3550458

Social construction

- **Which picture shows "a factory"?**

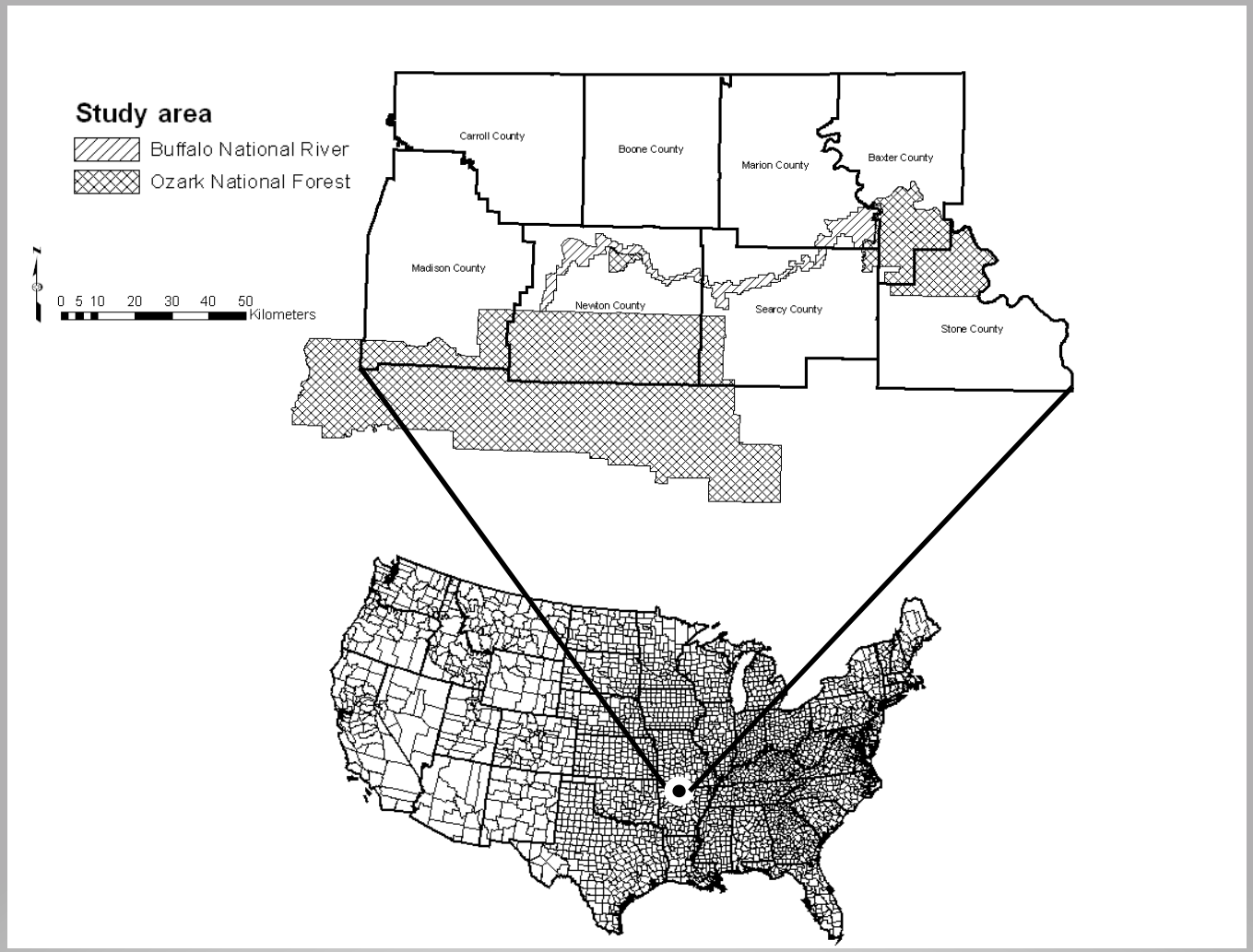
No caption on picture but taken from an article titled "Strong 'Concentrated Animal Feeding Operation' Rules Needed" by the Delaware Chapter of the Sierra Club

http://delaware.sierraclub.org/content/strong-concentrated-animal-feeding-operation-rules-needed

Textile factory in Vietnam, photo by Ms. Hoerline

http://i1.ytimg.com/vi/6TrfxelfXCU/0.jpg

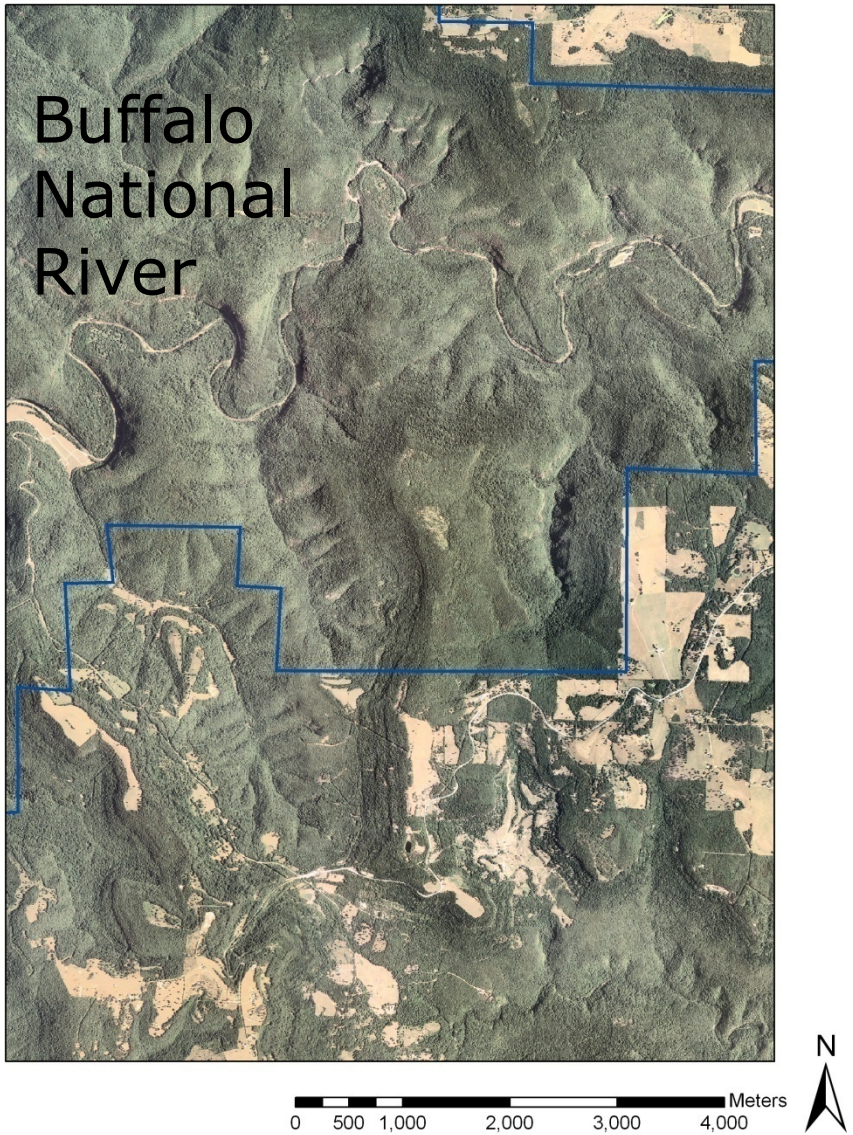
Social construction



Research Application: Study area

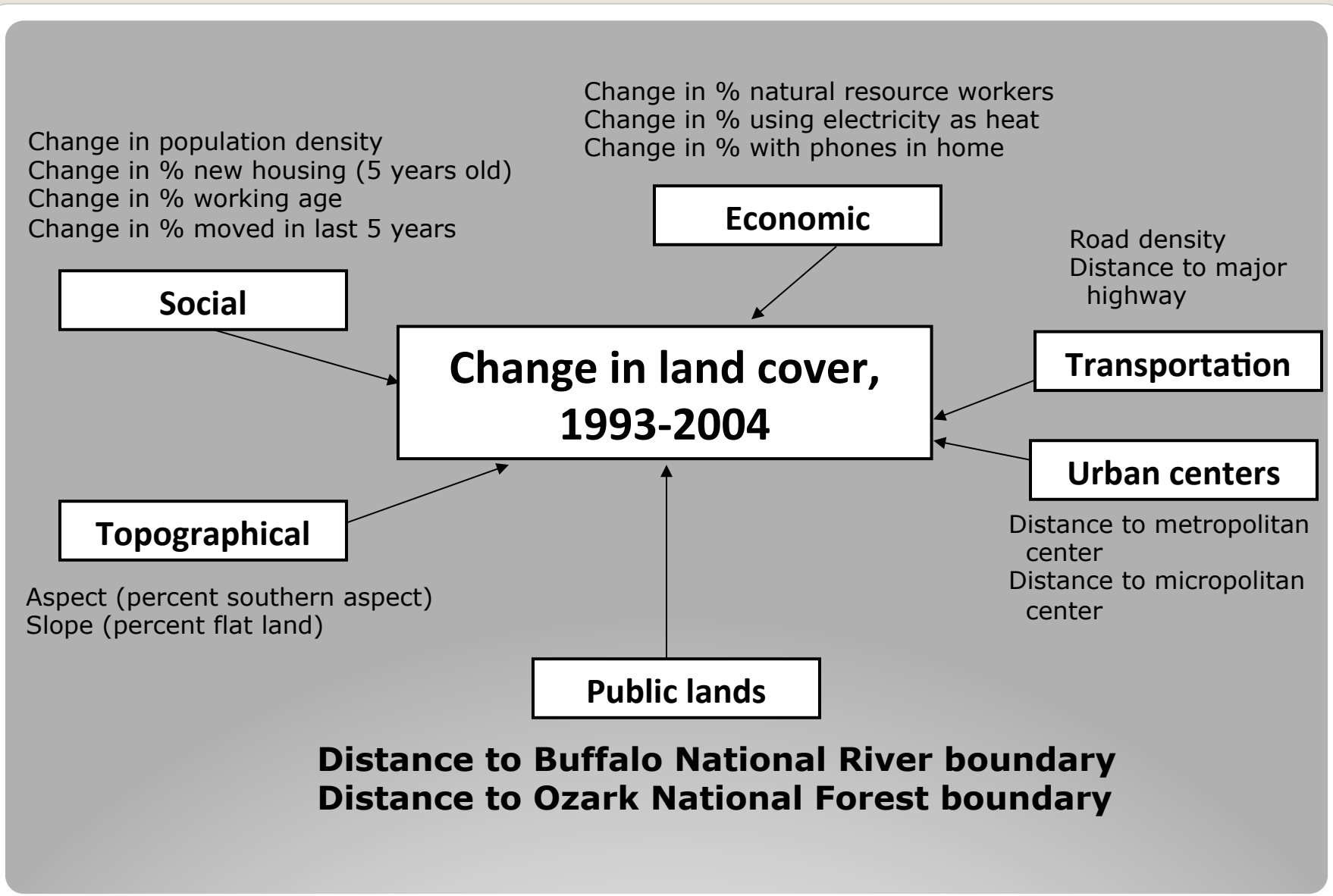
Theoretical frameworks

- Social Construction
- Island biogeographic theory (IBT)
- Ecological switches



Research questions:

- What are proximate factors for land cover change near public lands?
- Do public land boundaries
- (in blue) act as ecological switches?
- Does social construction explain landscape change patterns?



Schematic of model variables

- Set-aside lands with *different policy mandates* function differently within the larger social and geophysical landscape matrix
- The *social construction* or symbolic meaning of the landscape associated with each *different policy mandate* is reflected in land cover changes

Social-ecological synthesis

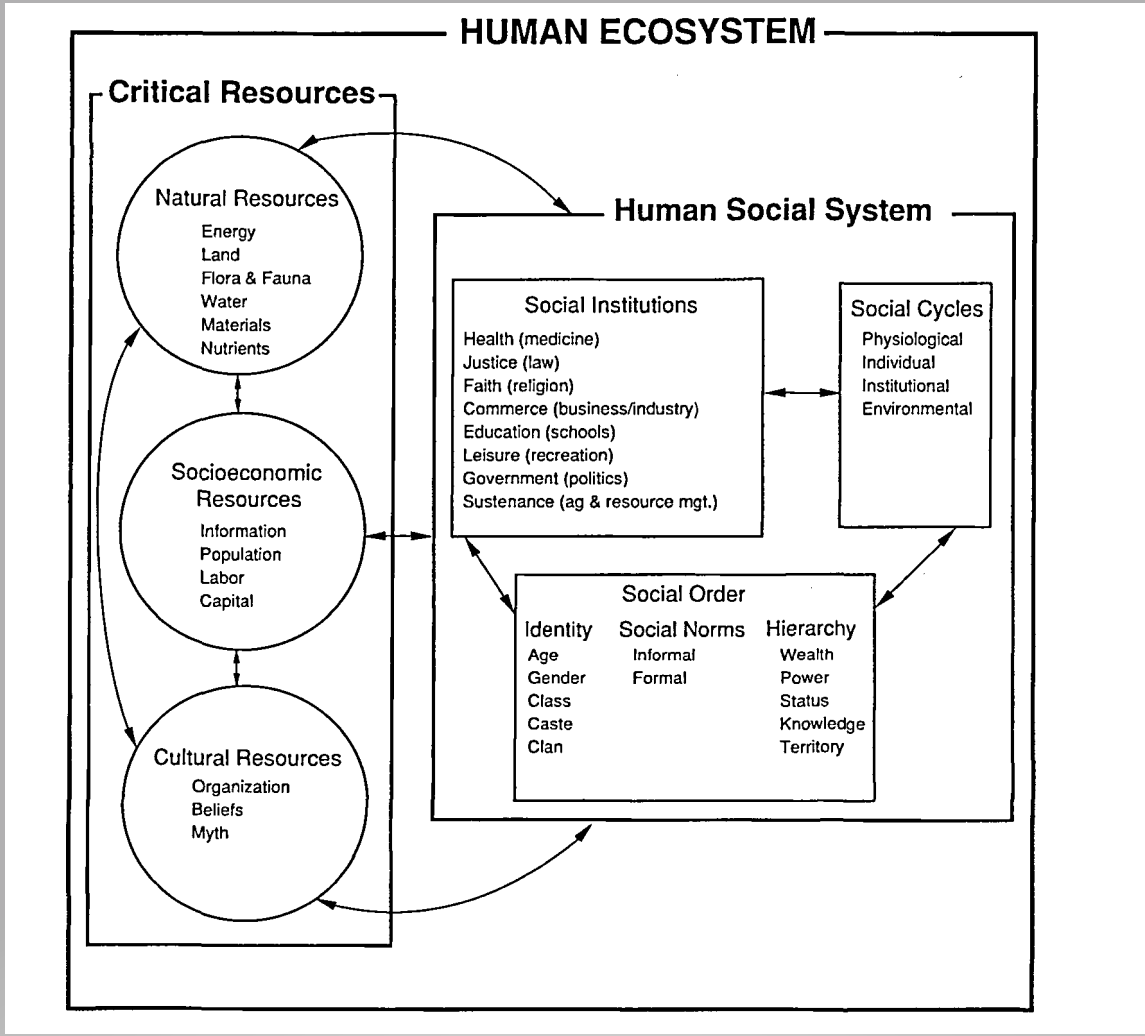
http://www.ehartwell.com/Apollo17/BlueMarblePhotoTimeline.htm

Social-ecological systems

- **2 paradigms**
  - Human Exemptionalist Paradigm (HEP)
    - Sometimes "Human Exceptionalist Paradigm"
    - Assumes humans are "outside the system" – we are the exceptions to the biological, ecological rules by virtue of our unique human-ness (reason, intelligence, technology, etc.)
    - "Progress" is inevitable, unlimited
    - All problems can, eventually, be solved
    - Humans are external to the model
    - Often argues against ideas of carrying capacity through the concept of substitutability, technological innovation

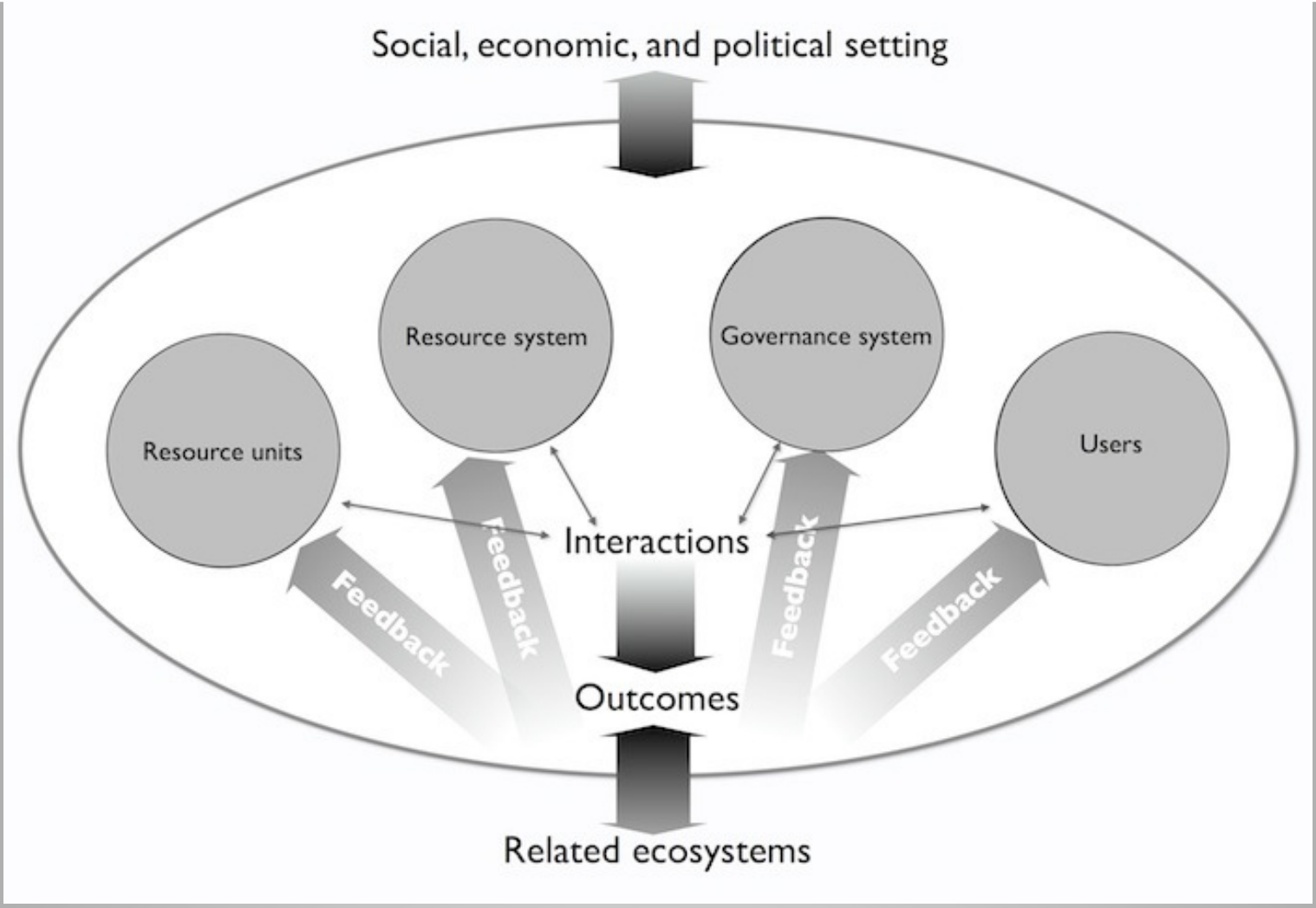
Social-ecological systems

- **2 paradigms**
  - New Environmental Paradigm (NEP)
    - Argues humans are subject to biophysical limits and ecosystem "rules" – we are not exempt
    - Carrying capacity is a limiting factor, natural resources are finite
      - We may be able to put off some of the consequences for a while but ultimately we are subject to the same feedbacks and limits as any biological species
    - Humans are internal to the model
    - Paradigm out of which social-ecological systems (SESs) and coupled human and natural systems (CHANs) arise



Taken from Machlis, G. Force, J., Burch, Jr., W. 1997. The human ecosystem Part 1: The human ecosystem as an organizing concept in ecosystem management. *Society and Natural Resources* 10(4):347-367.

Human Ecosystem Model



Conceptual framework of a social–ecological system taken from Ostrom, E. 2009. A general framework for analyzing sustainability of social-ecological systems. *Science* 325:419-422. http://dx.doi.org/10.1126/science.1172133.

Social-ecological system (Ostrom)

Complex systems

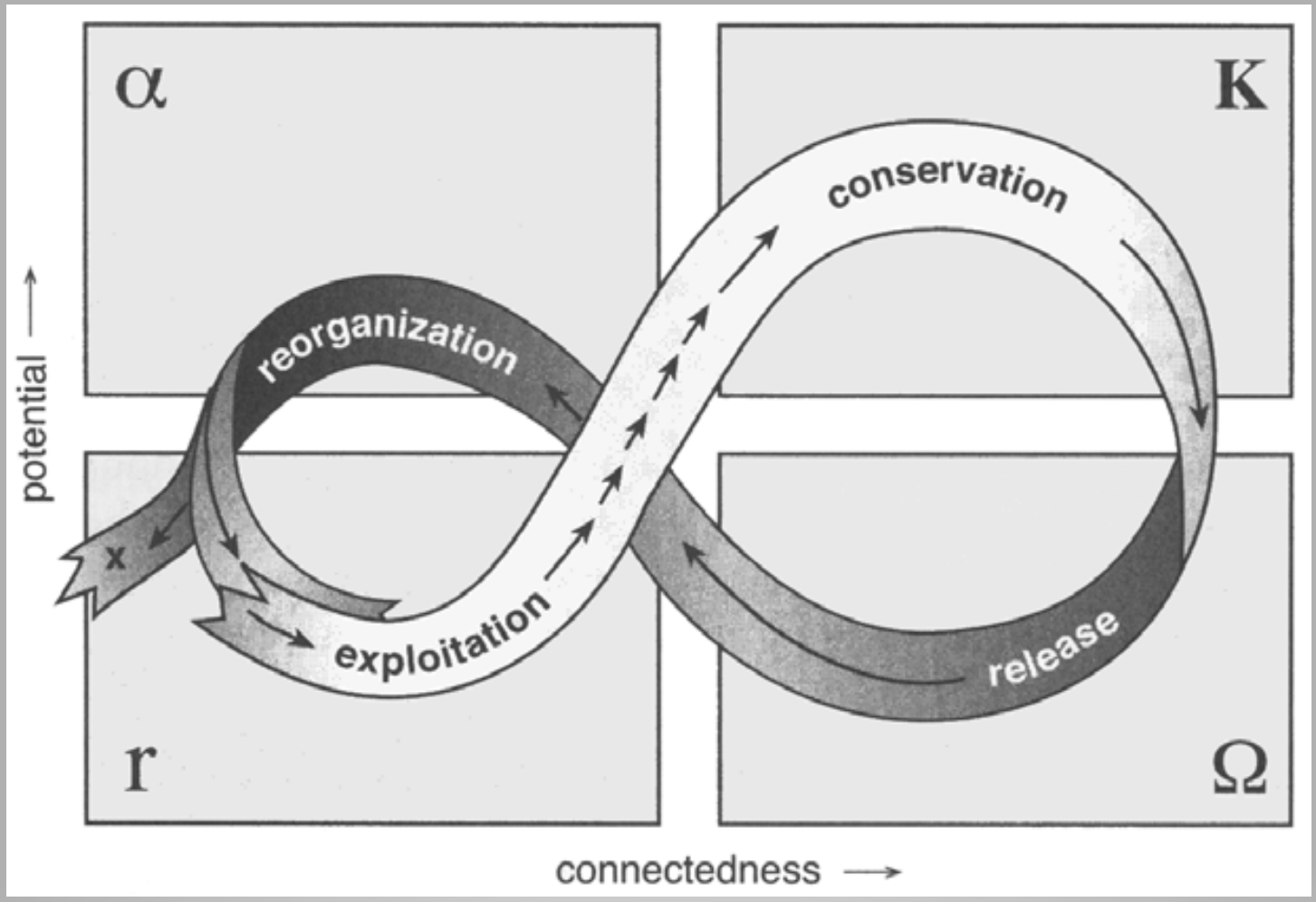
- Coupled social-ecological systems (SESs) are *complex* systems
- Complex systems are characterized by
  - Emergent properties
  - Self-organization
  - Historical patterns of abrupt, non-linear change
  - Unpredictable dynamics

Resilience

- "engineering" definition:
  - more traditional definition
  - refers to stability near an equilibrium state
  - where resistance to disturbance and speed of return to the *equilibrium* are used to measure the property

Resilience

- "ecosystem" definition:
  - emphasizes conditions far from any equilibrium
  - where instabilities can flip a system
  - measured by the magnitude of disturbance that can be *absorbed* while the system still retains its fundamental structure, function, and internal feedbacks(before it flips to an alternative state)



http://www.resalliance.org/index.php/adaptive_capacity

Adaptive Cycle

Photos and captions from http://edis.ifas.ufl.edu/pdffiles/fr/fr06800.pdf
Berkes, F., J. Colding and C. Folke, eds. 2003. *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change.* Cambridge University Press.

farm field is surrounded by pine-hardwood forests, typical of Piedmont in southeastern US

In about 150 to 200 years, in the absence of fire, an oak-hickory forest may replace the pine stand

The grass-forb stage would be gradually replaced by a shrub-pine-seedling community that will last perhaps 15 to 20 years

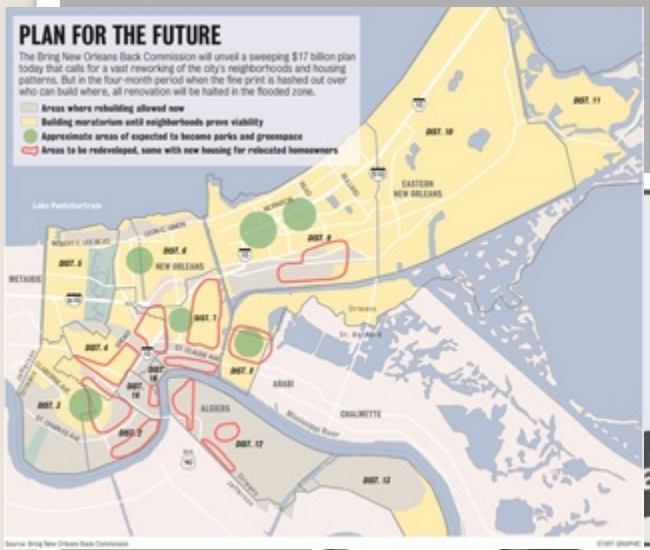
During the first year or two, annual forbs cover the field

Historical fires … are examples of naturally occurring disturbances

Adaptive Cycle

www.museumofthecity.org

Berkes, F., J. Colding and C. Folke, eds. 2003. *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change.* Cambridge University Press.



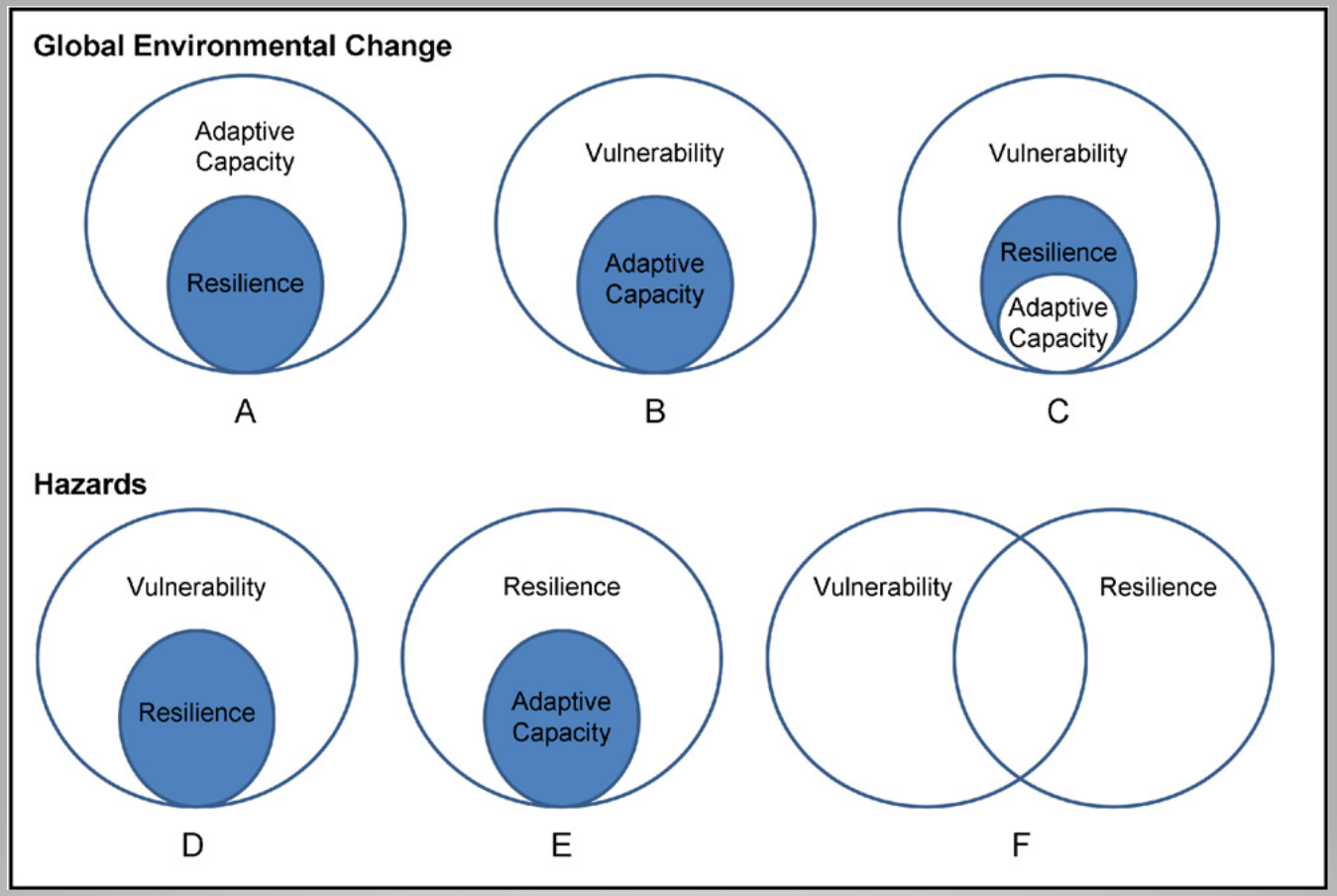
connectedness →

Adaptive Cycle

- **Social vulnerability** plays an important role in understanding differential impacts of environmental events (slow ones like drought or fast ones like hurricanes)
- **Social resilience** is a concept related to the capacity of a social system to absorb/ respond to disturbances
- Complexity, unpredictability, uncertainty are features of both natural and social systems

Social-Ecological Systems

Conceptual linkages between vulnerability, resilience, and adaptive capacity – applies to any SES



Taken from Cutter, S. L., L. Barnes, M. Berry, C. Burton, E. Evans, E. Tate, and J. Webb (2008), "A place-based model for understanding community resilience to natural disasters." Global Environmental Change 18: 598-606.

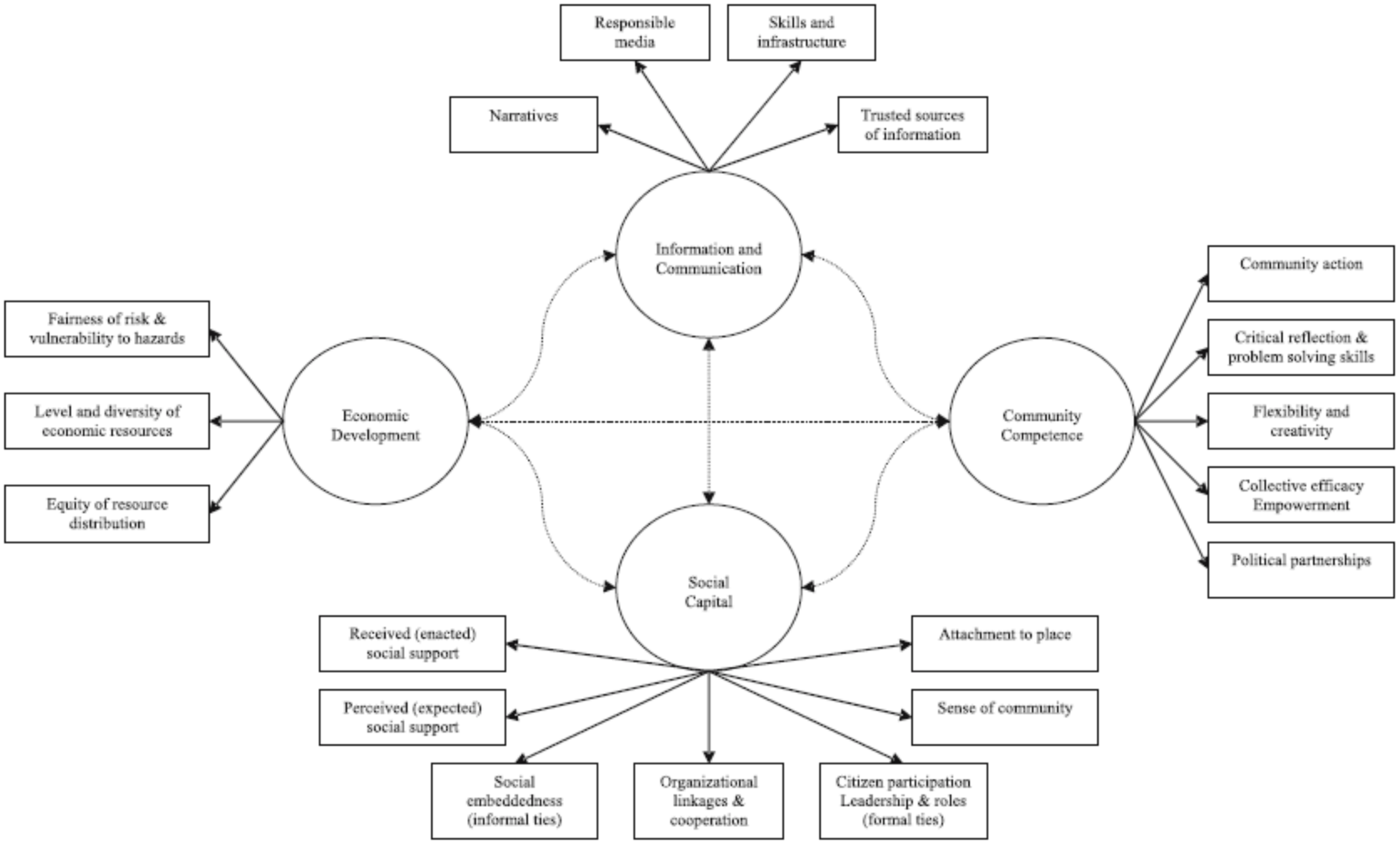
What are we measuring?

Community resilience indicators

Dimension	Candidate variables
Ecological	??
Social	Demographic (age, race, class, gender, occupation)
	Social networks and social embeddedness
	Community values - cohesion
	Measures of inequalities (power, participation, resources)
Economic	Income, profitability, risk
Institutional	??
Infrastructure	??
Community competence	Local understanding of risk
	Symbolic meanings of nature, landscape
	Support services (healthcare, social services, etc)
	Health and wellness measures (rates of illness, stress, on-job injuries, etc)
	Quality of life (satisfaction)

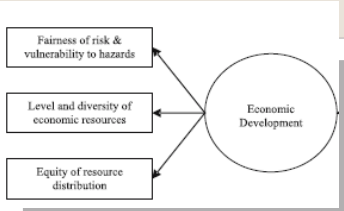
Adapted from Cutter, S. L., L. Barnes, M. Berry, C. Burton, E. Evans, E. Tate, and J. Webb (2008), "A place-based model for understanding community resilience to natural disasters." Global Environmental Change 18: 598-606.

What are we measuring?



Norris, F., S. Stevens, B. Pfefferbaum, K. Wyche and R. Pfefferbaum. 2008. Community Resilience as a Metaphor, Theory, Set of Capacities, and Strategy for Disaster Readiness. *American Journal of Community Psychology* 41:127–150.

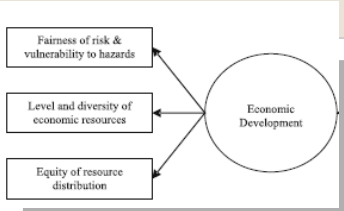
Community resilience



- Fairness of Risk and Vulnerability to Hazards
- Level and Social Diversity of Economic Resources
- Equity of Resource Distribution

- **Resilience is decreased when:**
  - Lower socio-economic status participants experience more adverse psychological consequences than participants from higher SES.
  - There is a dependency on a narrow range of natural resources can increase income fluctuations and decrease social resilience.
  - Societies don’t allocate risks (environmental/economic) equally

Economic Development

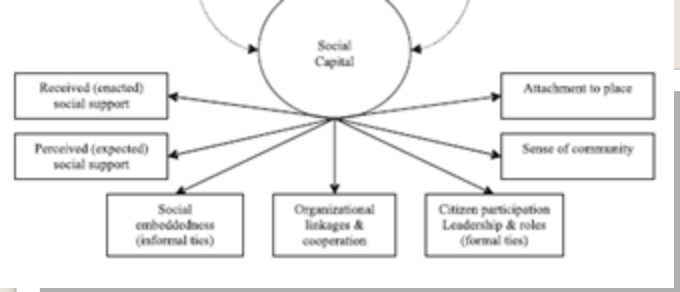


Relevance to Agriculture

Agriculture's resilience is decreased when:

- Low income agricultural producers, or alternatively those with little access to credit, are subjected to natural or economic disasters. They are less likely to weather these storms as well as higher income producers.
- The agricultural community is mono-commodity based. Don't put all your eggs in one basket. Example: impact of closing of the US border to Canadian beef after cases of BSE.
- Farmers' share of resources are inequitable (marginal lands, drought areas, flood plains, access to government programs, access to commodity insurance coverage, unequal exposure to agrochemical hazards).

Economic Development

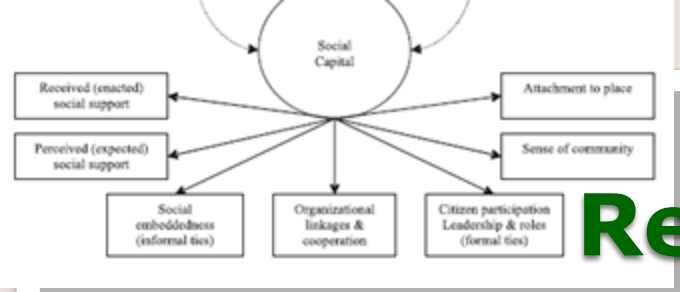


- Received and Perceived Social Support
- Social Embeddedness (informal ties)
- Citizen Participation (formal ties)
- Organizational Linkages and Cooperation
- Sense of community
- Attachment to place

Resilience is decreased when:

- Support systems are lacking or are not engaged.
- Less embedded in the community, less access to information and support.
- A sense of community and an attachment to place are lacking, making it less likely that a community can recover from an unexpected negative event.

Social Capital



Relevance to Agriculture

Agriculture's resilience is decreased when:

- A sense of independence overwhelms received and perceived support. Agricultural producers can hold an attachment to place without a strong sense of or engagement in community.
- Lack of informal and formal ties lead to less access to support and information and thus reduce the ability to prepare for and recover from unexpected circumstances.
- Agricultural sector participants lack a sense of community and attachment to place, making it easier to walk away from agriculture and perhaps lose that land to other activities forever.

Social Capital

- Community Action
- Critical Reflection and Problem Solving Skills
- Flexibility and Creativity
- Collective Efficacy
- Political Partnerships

Resilience is decreased when:

- Communities lack the skills and capacity to take collective action lack of action can lead to a loss in ability to recover and/or transform their social/physical environments to minimize future problems. Such communities lack empowerment.
- Political partnerships are adversarial.

Community Competence

Relevance to Agriculture

Agriculture's resilience is decreased when:

- The agricultural community lacks the scientific skills of data collection and analysis, conflict resolution, communication and critical assessment that empower agriculture to recover from and adapt to changing environmental, political and economic uncertainties.
- Political action is taken that divides, not unites, agricultural interests.

Community Competence

- Narratives
- Responsible Media
- Skills and Infrastructure
- Trusted Sources

Resilience is decreased when:

- Communities lack a shared understanding of reality.
- Media and other information sources bias reporting in ways that negatively influence capacity to truly understand the event.
- Lack of trusted sources for clear and accurate information (or lack of trust in valid sources) and lack of skills (conflict resolution; data collection/analysis) impede the ability to solve problems.

Info & Communication

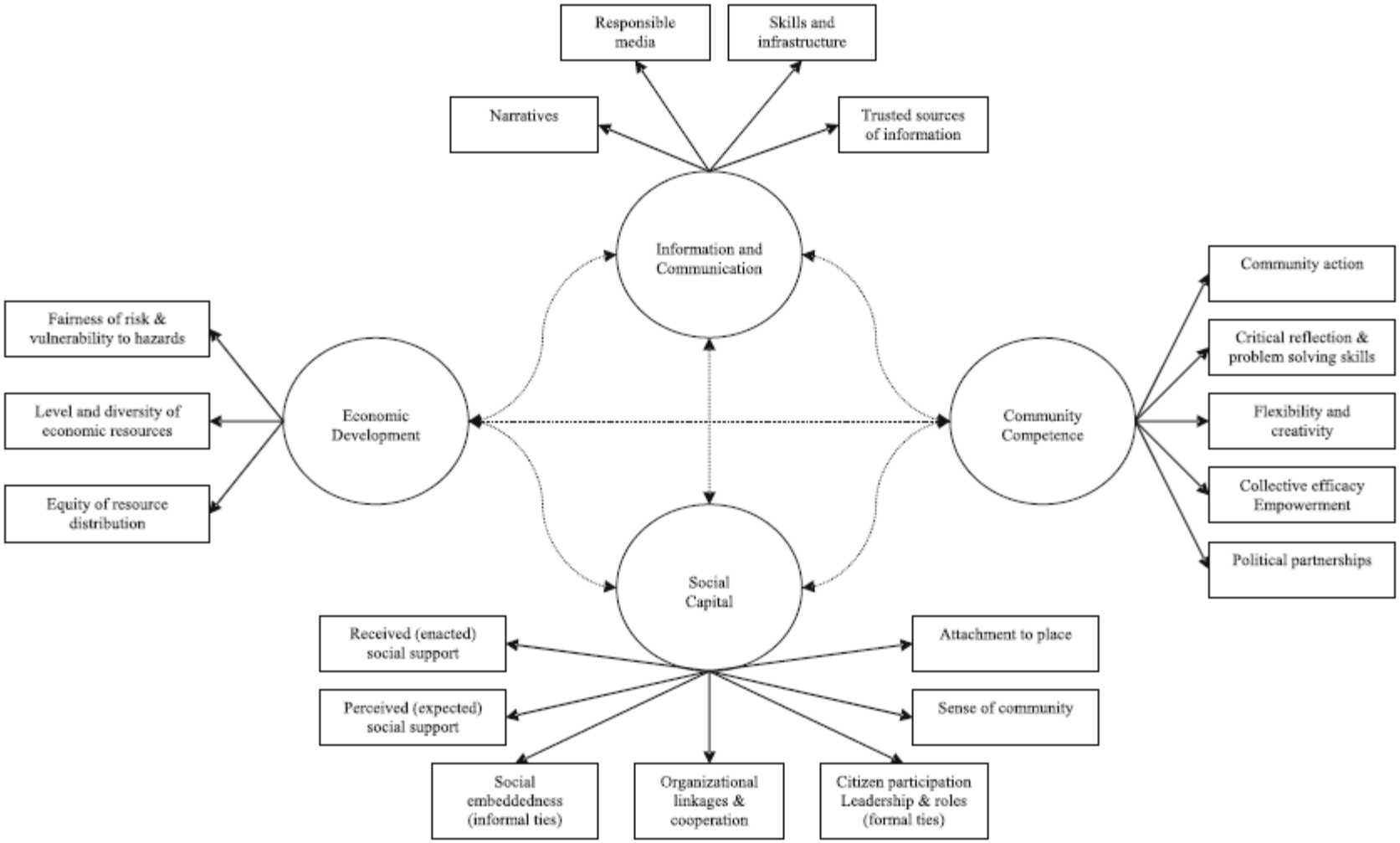
Relevance to Agriculture

- Narratives
- Responsible Media
- Skills and Infrastructure
- Trusted Sources

Agriculture's resilience is decreased when:

- Different community players perceive the community narrative differently (e.g. ag improves/decreases animal habitat in a community).
- Media/ lack of understanding of agriculture ("go to the store and buy the meat that was made there, where no animals were harmed") and agriculture's contributions to society and the environment.
- Lack of trust of scientists, government, and lack of skills (or time to implement skills) leave some agricultural producers with inability to develop recovery/preparedness plans.

Info & Communication



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Connecting the Dots

Roadmap to Adaptive Capacity for Agriculture

- Focus Economic Development
  - Access to economic resources (credit, insurance).
  - Integrated system development (production diversity).
  - Attend to areas of greatest risk (marginal natural resources; technical and infrastructure support).
- Improve Access to Social Capital
  - Focus on community level (ag commodity groups, conservation district, etc.) to empower the agricultural community and direct those economic development efforts.
  - Work with established networks (regional/national) groups to build support when unexpected things happen.

Roadmap to Resilience

Relevance to Agriculture

- Increase Community Competence, Info and Communication
  - Engage with the scientific community in the process of data collection and analysis
  - Improve conflict resolution and communication skills (take control of the message based on sound science)
  - Build political partnerships that unite agriculture with agriculture as well as with other stakeholder groups (consumers, environmentalists, government, researchers)

Roadmap to Resilience

Relevance to Agriculture

- Engage with social scientists in the research planning stage. This can
  - help provide more complete framings of complex problems
  - influence research objectives, methods and timelines
  - strengthen community engagement as both project participants as well as recipients of new knowledge gained through project

Collaborations with Social Scientists

- Socio/political acceptability & economic feasibility of agricultural technology
  - of an agricultural technology/economic barriers to BMP adoption
- Broader societal engagement and/or participation
  - decision making with other stakeholders
  - building/ sustaining social capital and cohesion
  - building trust, relationships
- Risk
  - Understanding risk, voluntary and involuntary
  - Addressing risk paralysis
  - Improving community decision-making around relative risk

Fundable Research & Outreach Objectives

Thank you

Time for discussion/questions