The Architecture of Integration: Coordinated Agricultural Projects

Lois Wright Morton, Iowa State University

Sanford D. Eigenbrode, University of Idaho

Tim Martin, University of Florida

Agriculture & Natural Resources Science for Climate Variability and Change:
Transformational Advancements in Research, Education, and Extension Symposium

Session #5. Translating Climate Science into Actionable Knowledge: The Role of the Social Sciences

ASA, CSSA, SSSA International Annual Meeting Cincinnati, Ohio
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U.S. agriculture is increasingly impacted by the effects of a changing climate


2012 Midwest drought


2011 cropland scouring

Southern pine beetle infestation


Hurricane damage

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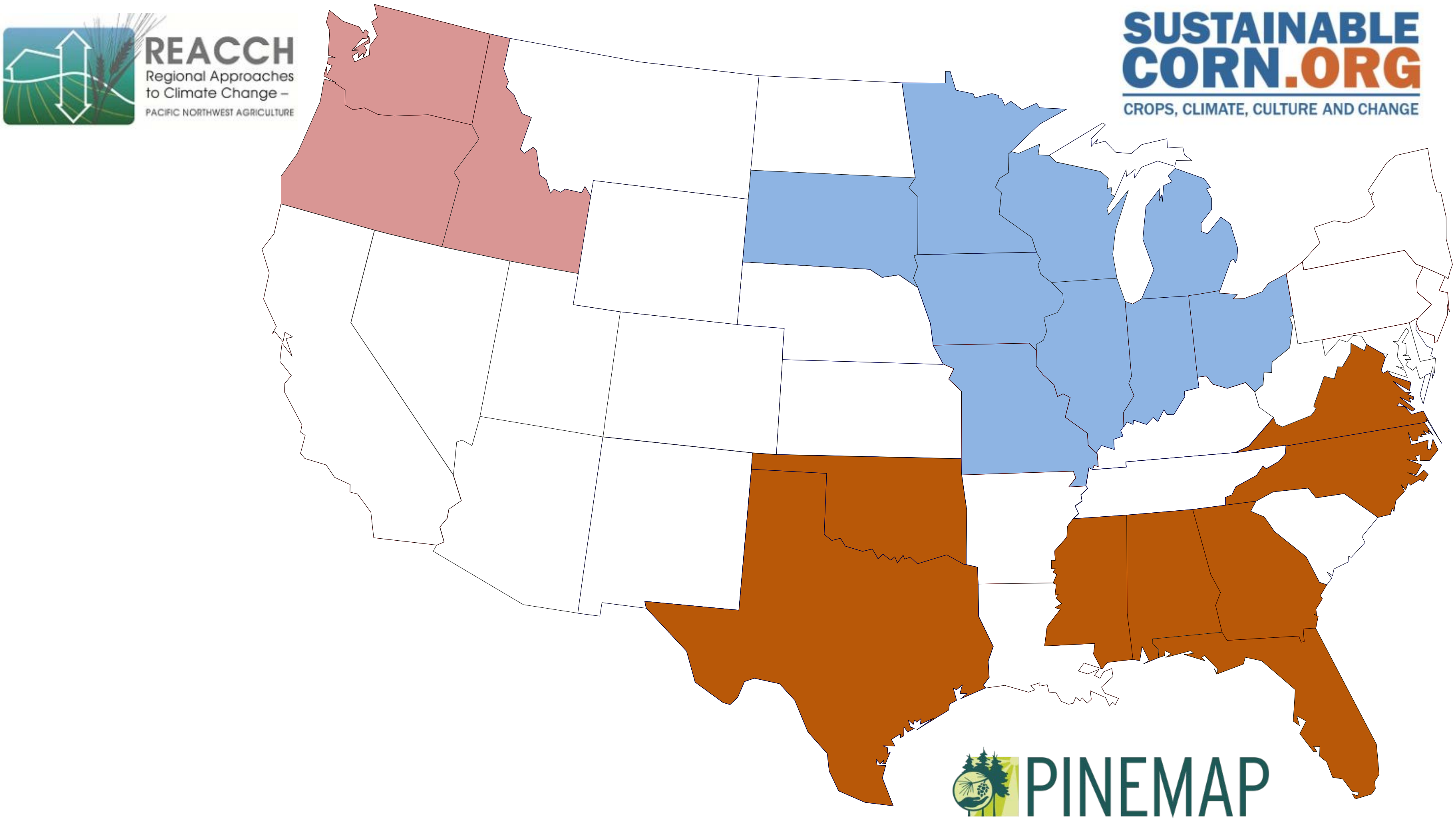
- 3 Coordinated Agricultural Projects (CAP)
- 115 PI’s across 20 states



New Opportunities and Challenges

The integration of science is essential to:

1. Address complex, difficult problems
2. Identify processes and structures needed to answer complex questions
3. Create new knowledge
4. Bi-directional testing & evaluation of new knowledge with stakeholders
5. Prepare the next generation of scientists

Directing three separate projects while working to integrate science goals, learn from each other, and finding ways to connect our teams.

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Team Integration Architectures

Are highly complex and diverse with similarities and differences. Understanding these architectures provide operational guidance to leadership and offer a valuable platform for exploration, innovation, and achieving the practical work of the team.

USDA-NIFA Climate & Corn-based Cropping Systems CAP; 2012 Annual Meeting in Wooster, Ohio.

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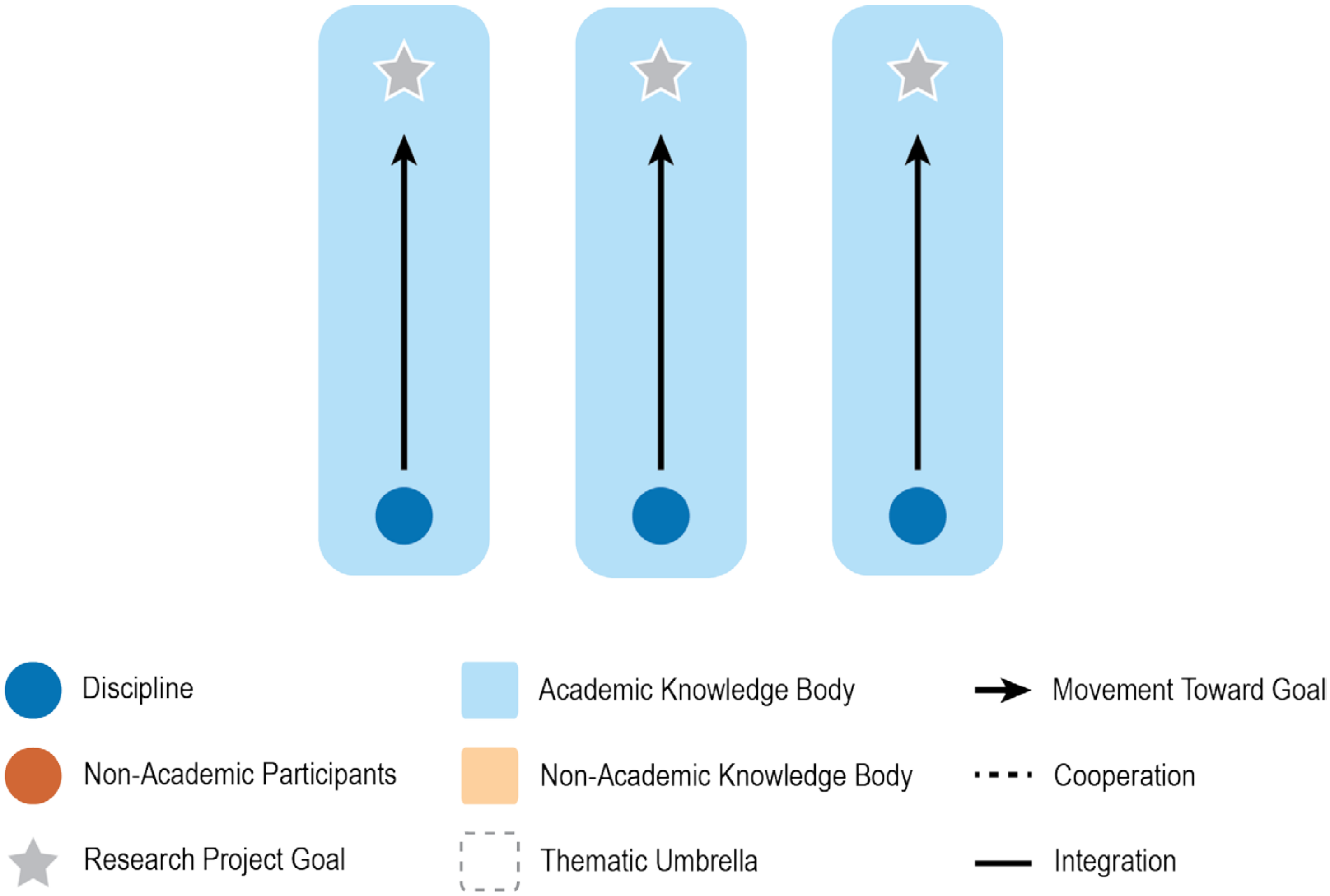
The trend to classify cross-disciplinary research is useful to generate dialogue that illustrates relationships



Tress, Tress, & Fry 2004

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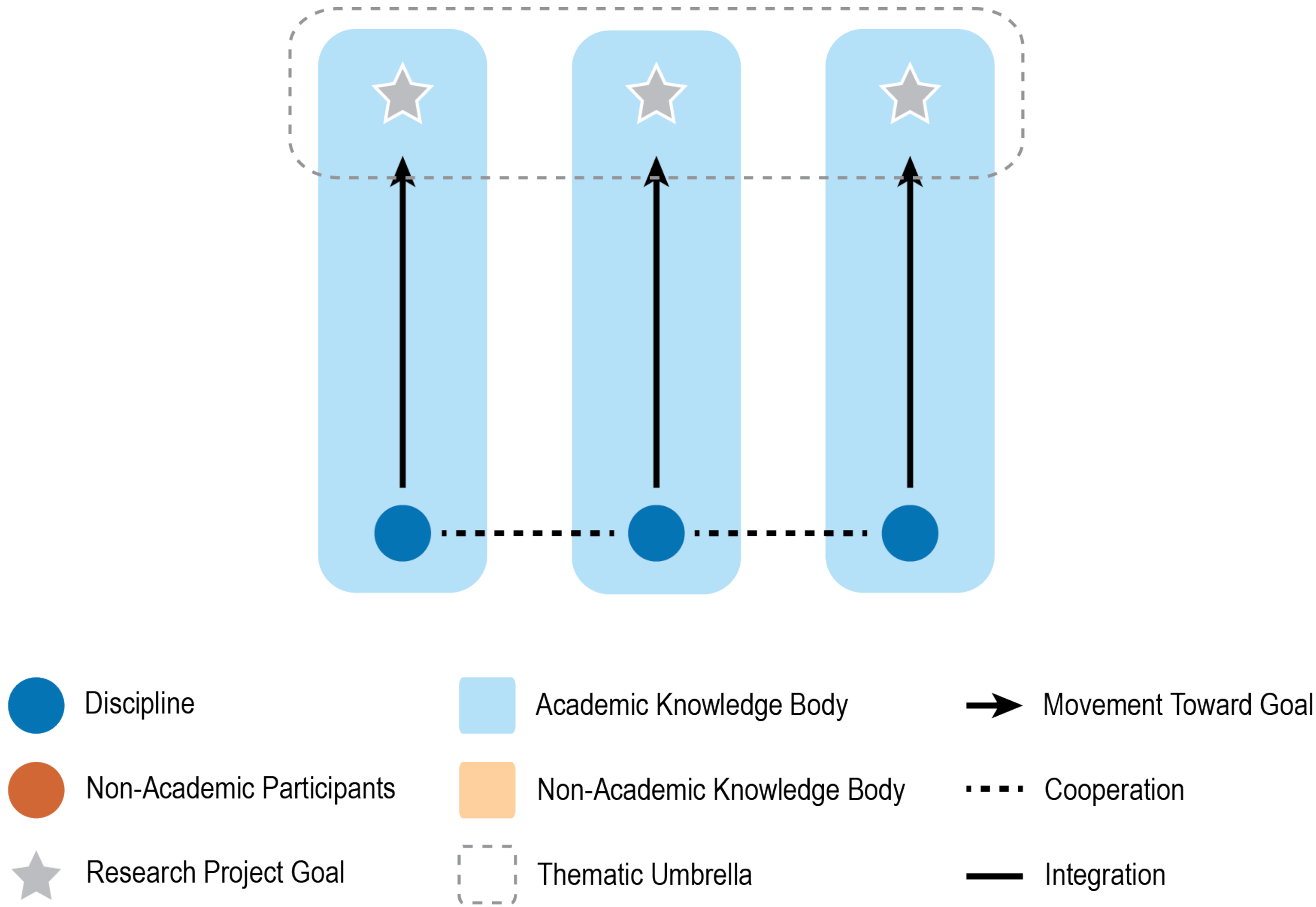
Multidisciplinary



Tress, Tress, & Fry 2004

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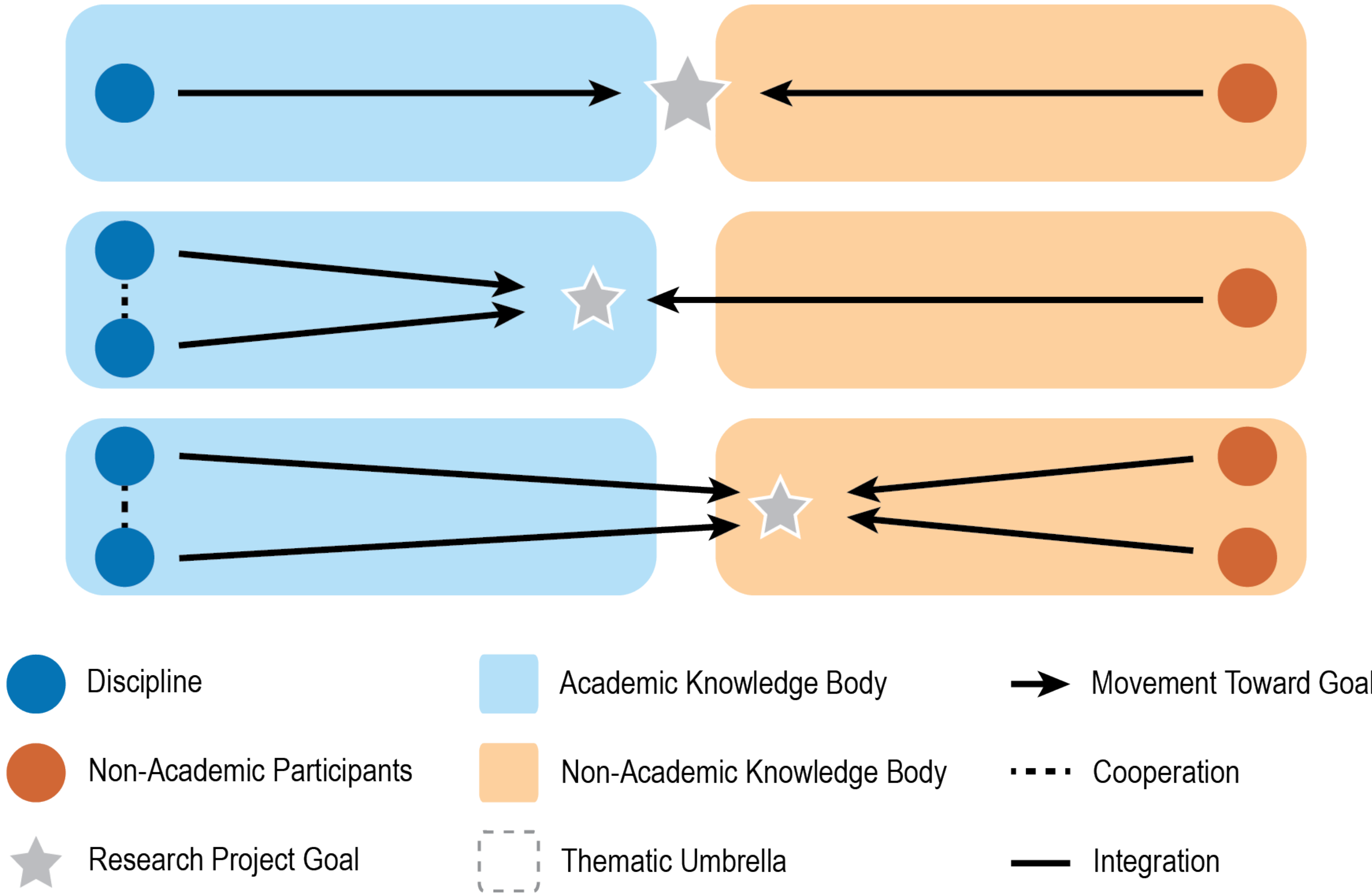
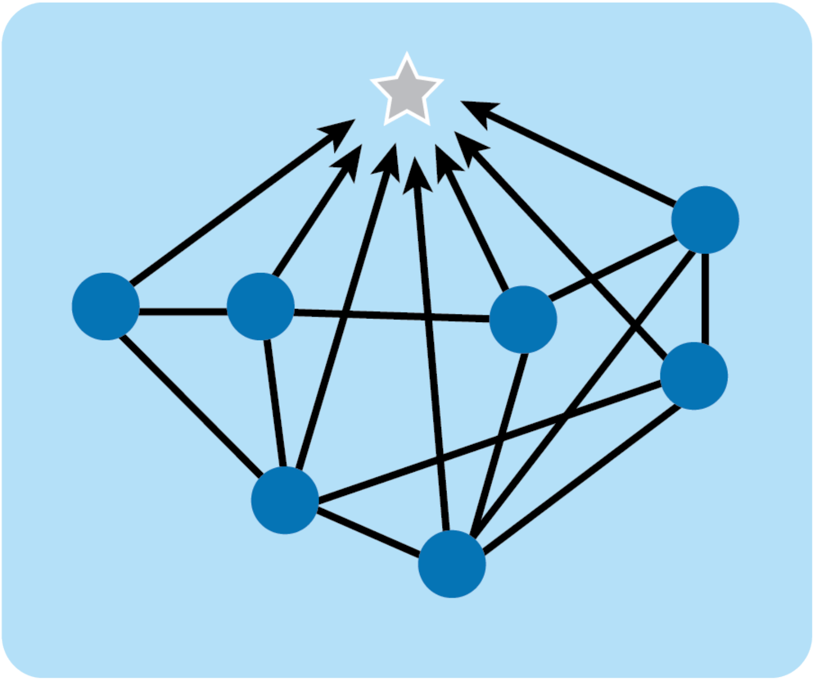
Participatory



Tress, Tress, & Fry 2004

Interdisciplinary



Discipline

Non-Academic Participants

Research Project Goal

Academic Knowledge Body

Non-Academic Knowledge Body

Thematic Umbrella

Movement Toward Goal

Cooperation

Integration

Tress, Tress, & Fry 2004

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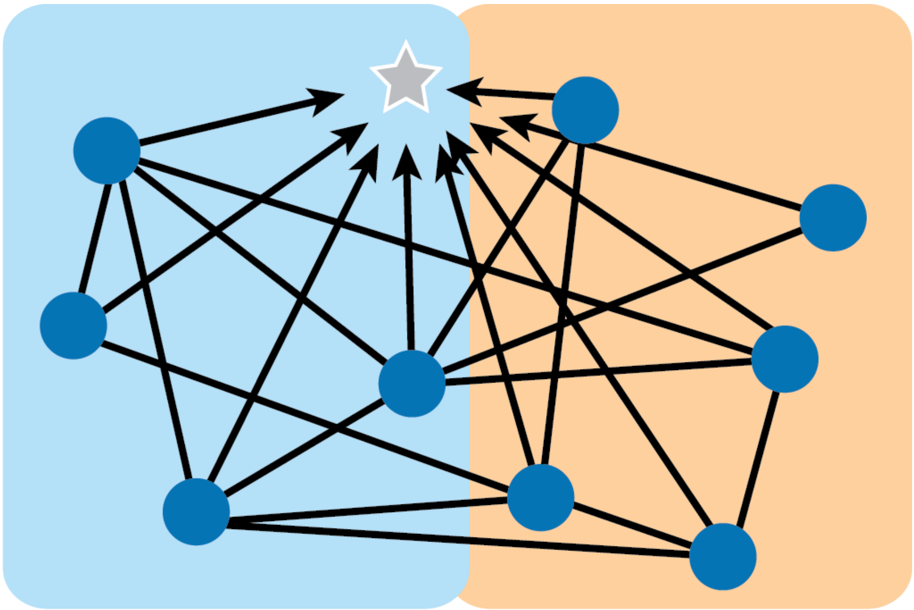
Transdisciplinary



Discipline

Non-Academic Participants

Research Project Goal

Academic Knowledge Body

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Thematic Umbrella

Movement Toward Goal

Cooperation

Integration

Tress, Tress, & Fry 2004

Categorization serves as a start…

Terminology and framework provides a useful start but doesn't represent complexity of large projects like the USDA-NIFA Climate CAP's



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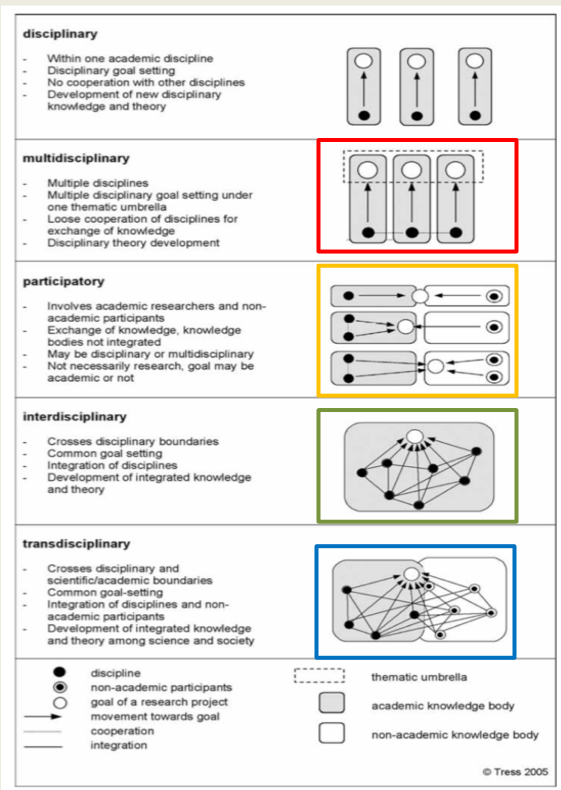
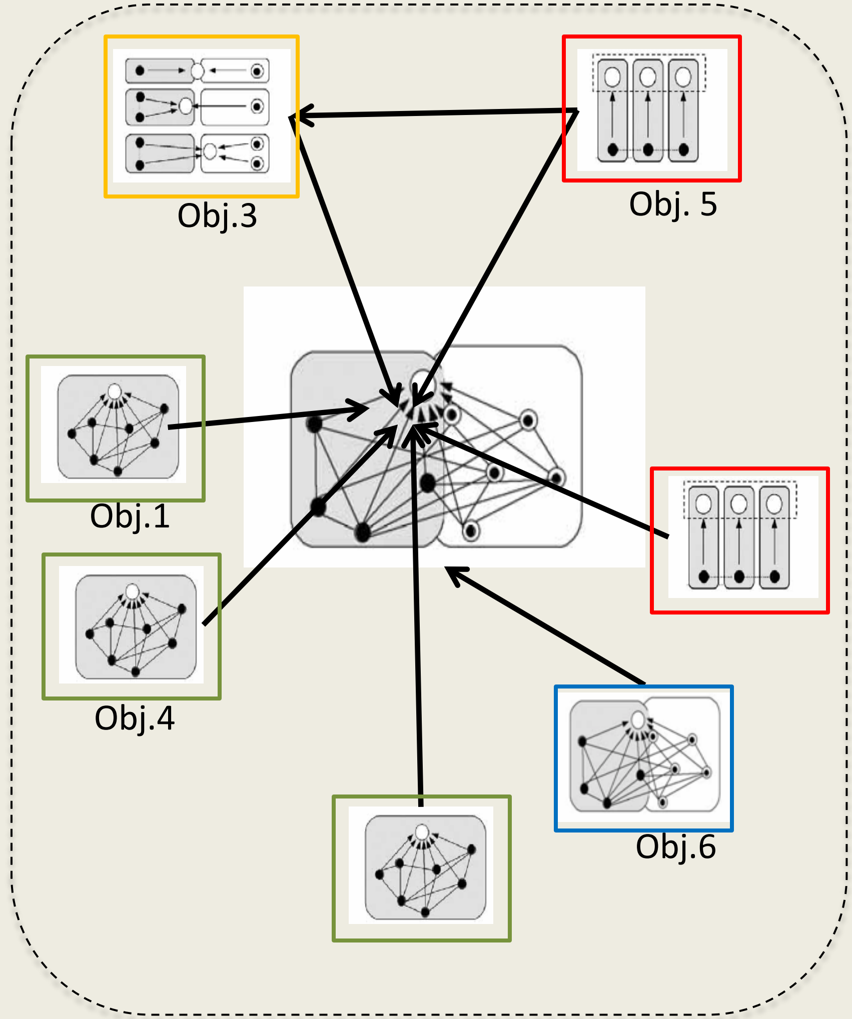
Big Project Integration Architecture

- Each project and each team's collaboration is unique
- These collaborative structures are dynamic throughout project life





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How to cultivate and enhance team capacity to accomplish big science?

Create a team structure that:

- Functionally meets objectives and goals specific to the team
- Has clear connections and lines of accountability between and across individuals
- Places individuals into specific working groups based on their expertise
- Places individuals in "gaps" - key roles to help bridge and connect working groups
- Boundaries, but flexible

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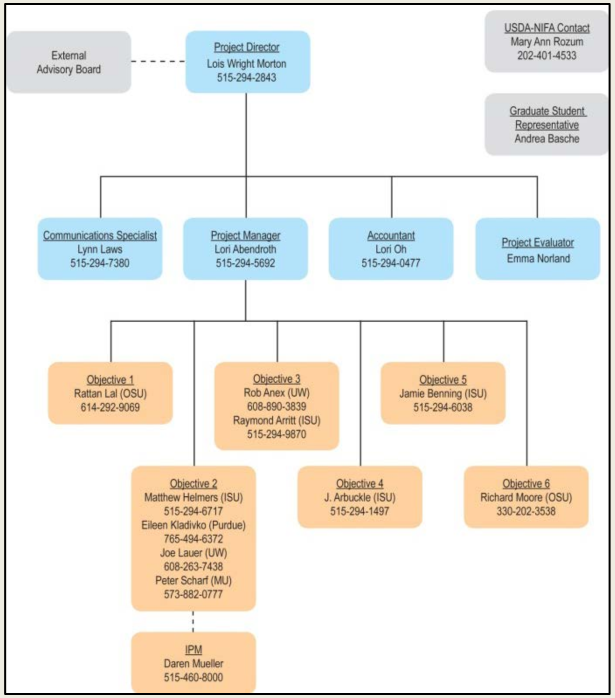
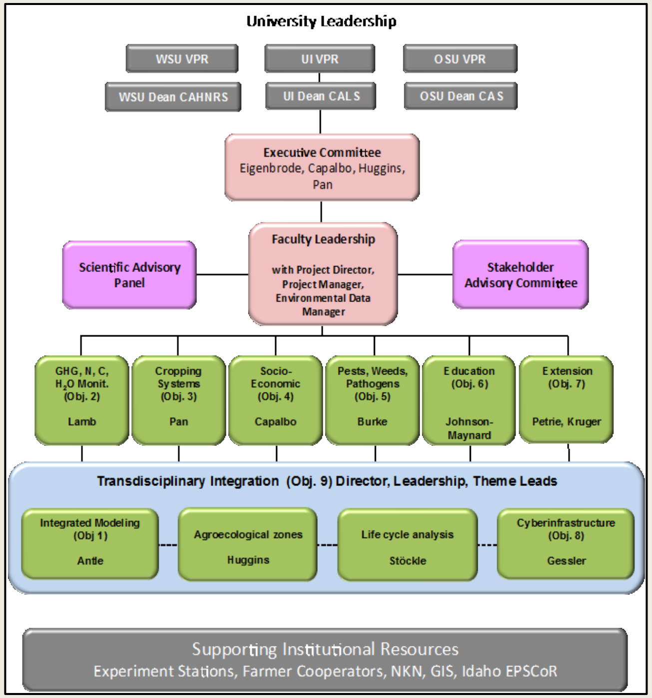
Traditional Organizational Charts

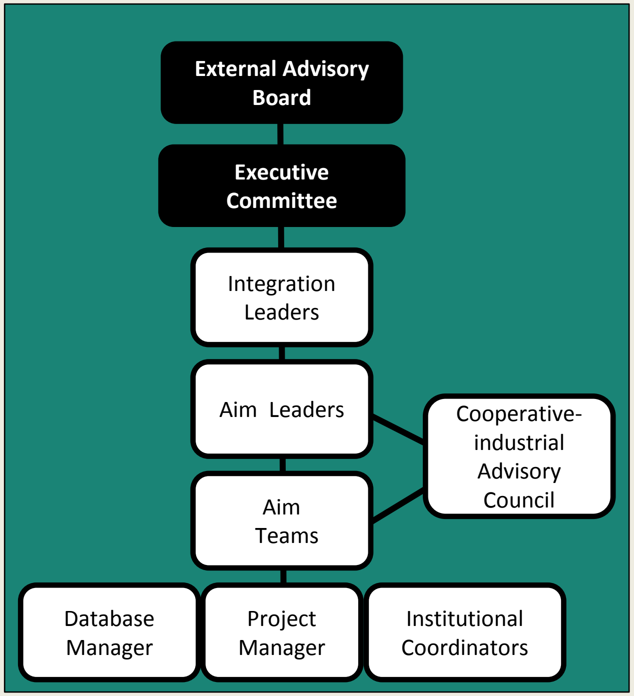
CSCAP Organizational Chart



REACCH Organizational Chart



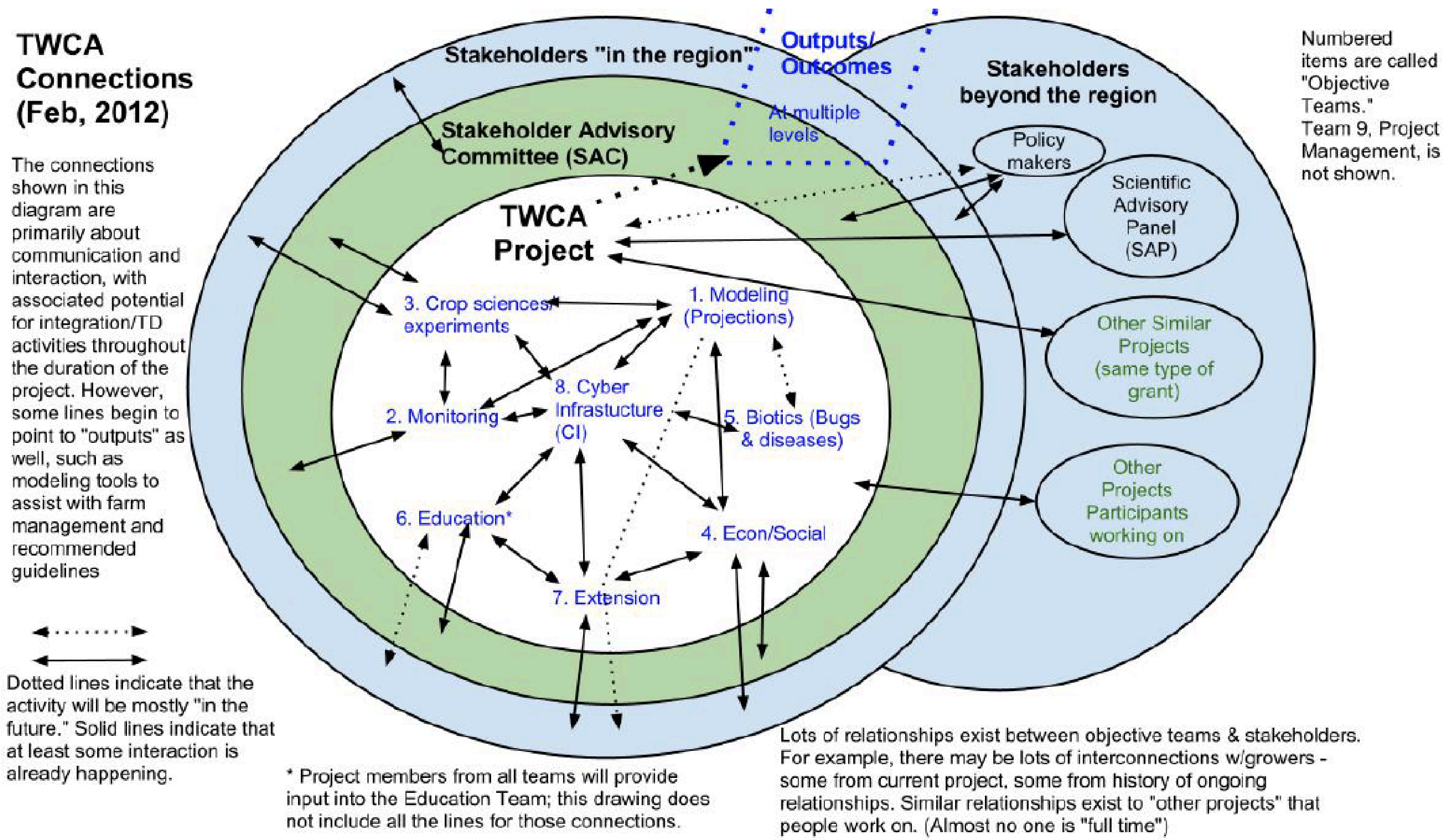
PINEMAP Organizational Chart



Organizational Reality

Interactions emerge dynamically within a project

Figure 3. TWCA Connections



May, 2012 Report: Transdisciplinary Science at Work
Linda Urban, IPT532, Spring 2012

Ways to Document & Understand Team Processes and Integration

Multiple data sources available to identify areas of integration and discover where, when, and how future integration can be encouraged:

- Surveys
- Focus groups
- Qualitative interviews
- Archival analysis of meeting activities and action items/or lack of
- External evaluator observations
- Social Network Analysis
- Ethnography

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Baseline Team Assessment

- Online survey of project participants
- Pre-existing multi, interdisciplinary relationships

Collaboration questions modified from the Transdisciplinary Research on Energetics and Cancer Initiative, published in American Journal of Preventive Medicine, 2008

	Never	Once or twice a year	Quarterly	Monthly	Weekly
a. Read journals or publications outside your primary, secondary, or third disciplines (listed in response to Question #2)	12.4%	21.5%	19.8%	28.9%	17.4%
b. Attended meetings or conferences outside your primary, secondary, or third disciplines	38.8%	45.5%	12.4%	3.3%	0.0%
c. Participated in working groups or committees with the intent to learn from researchers in other disciplines	24.8%	40.5%	20.7%	12.4%	1.7%
d. Submitted grant proposals, other than the CSCAP, in partnership with colleagues or others outside your primary, secondary, or third disciplines	51.2%	36.4%	10.7%	1.7%	0.0%
e. Received grant funding awards, other than the CSCAP, in partnership with colleagues or others outside your primary, secondary, or third disciplines	57.0%	36.4%	6.6%	0.0%	0.0%
f. Obtained new insights into your own work through discussion with colleagues from other disciplines	10.7%	26.4%	23.1%	18.2%	21.5%
g. Modified your own work or research agenda as a result of discussions with colleagues from other disciplines	18.2%	32.2%	28.1%	18.2%	3.3%
h. Established links with colleagues from other disciplines that led to or may lead to future collaborative work	14.0%	47.1%	18.2%	14.9%	5.8%

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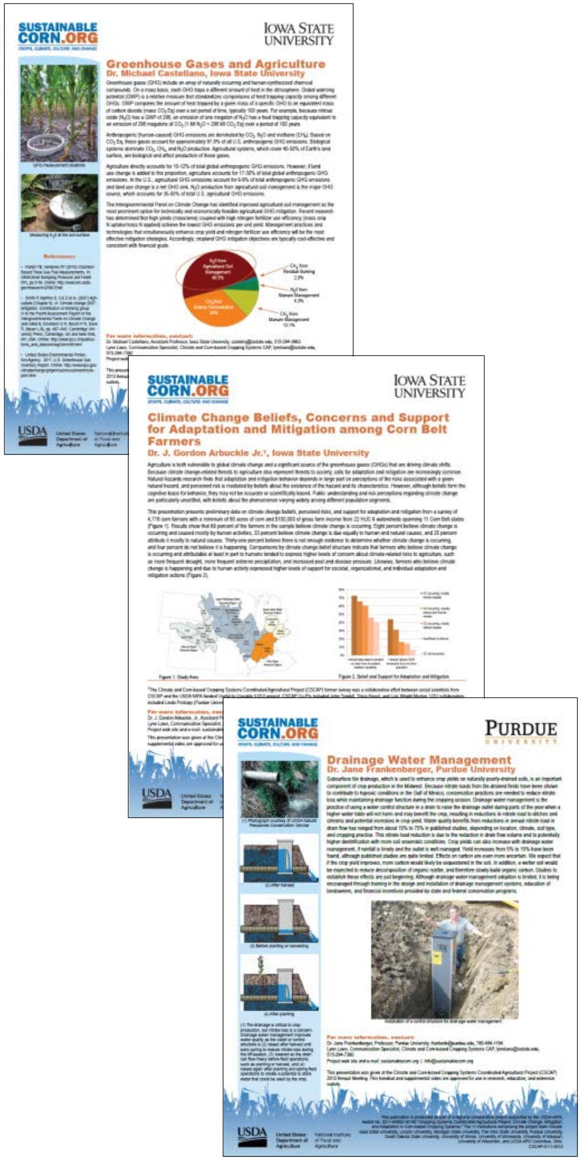
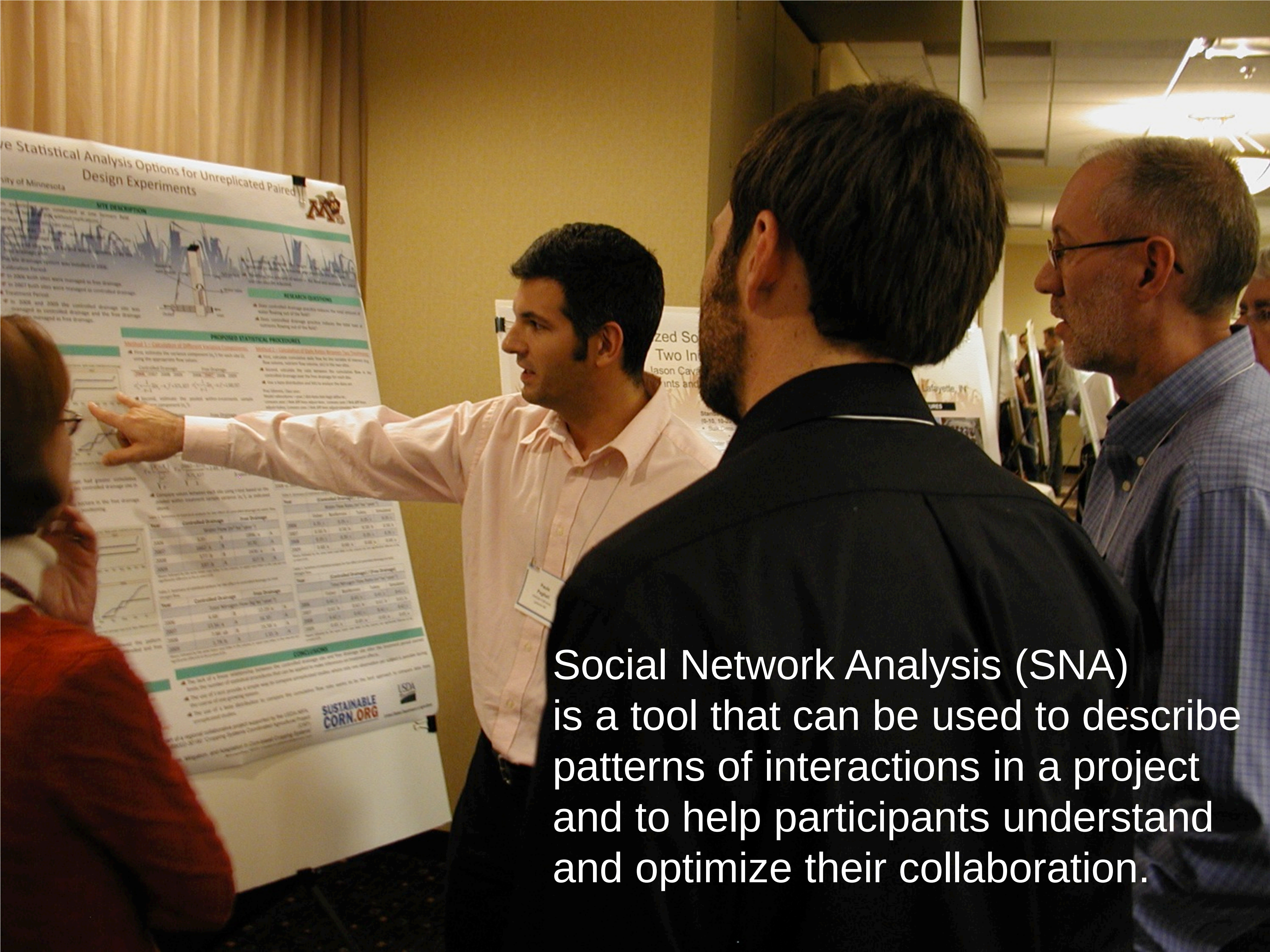
Baseline Key Findings & Next Steps

1. Learn about each other’s science
2. Find connections among our sciences
3. Ask complex questions that our sciences, when integrated, might answer
4. Create clusters of individuals willing to ask new questions and seek new solutions





Social Network Analysis (SNA)
is a tool that can be used to describe patterns of interactions in a project and to help participants understand and optimize their collaboration.

Sociocentric Network Analysis (SNA) as a Monitoring Tool for Reflection & Learning

1. Collect data from members
2. Create social network diagram
3. Revealed patterns
4. Participatory SNA perceptions of interactions
5. Repeat during project life cycle

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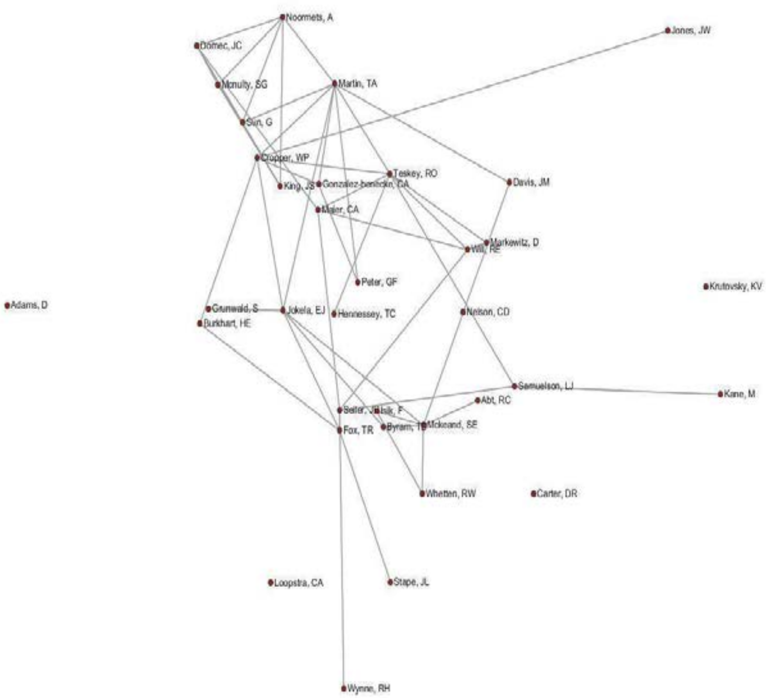
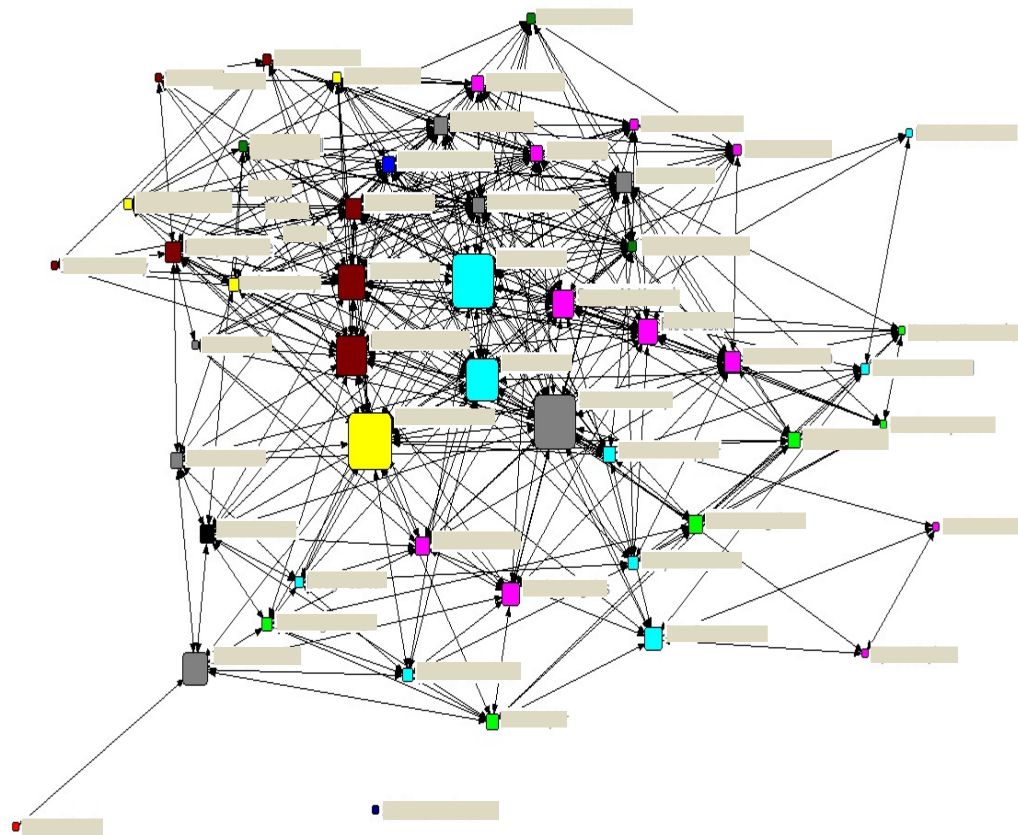
Highlights the strength of existing networks, as well as challenges of integrating across networks and pulling "unconnected" collaborators into the network.



PINEMAP SNA



Survey to gather social network data

REACCH SNA (Connections between individuals)

No awareness: You do not know who this person is.

No direct contact: You know who this person is, but do not have direct contact with them. (You might have met them or seen them at a meeting.)

Communication/Coordination: You share (or have shared) information and/or align activities with this person, to support mutually beneficial goals.

Collaboration: You have actively worked together to set common goals, realize a shared goal, or develop integrated knowledge.

Identified wish/need for future interaction: You think there is an opportunity for cooperation or collaboration with this person, but that hasn't happened yet.

Unification/coadunation. You think there is a merging of identities, structure, and culture. Unification through growth.

1. What interaction have you had with each person?

	No awareness	No direct contact	Communication/Coordination	Collaboration	Unification/coadunation	Need for future interaction
Person A	○	○	○	○	○	○
Person B	○	○	○	○	○	○
Person C	○	○	○	○	○	○
Person D	○	○	○	○	○	○
Person E	○	○	○	○	○	○

Done

Unexplored Territory

Understanding the architecture of integration with our teams, and quantifying or otherwise measuring that structure as we go is helping us venture out into unexplored territory.

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Institutional Adaptation

- Institutional change in how we think about and do science, strengthen our capacities to better connect theory, data, and reality
- Integrate science
- Accomplish innovation

Adaptation Needed Across Many Systems

1. **Resistance** *(status quo; manage to resist change disturbance)*
2. **Resilience** *(moderate effects but retain form and function after disturbance)*
3. **Transformation** *(transition to a new system with different structure and function better suited to new conditions)*

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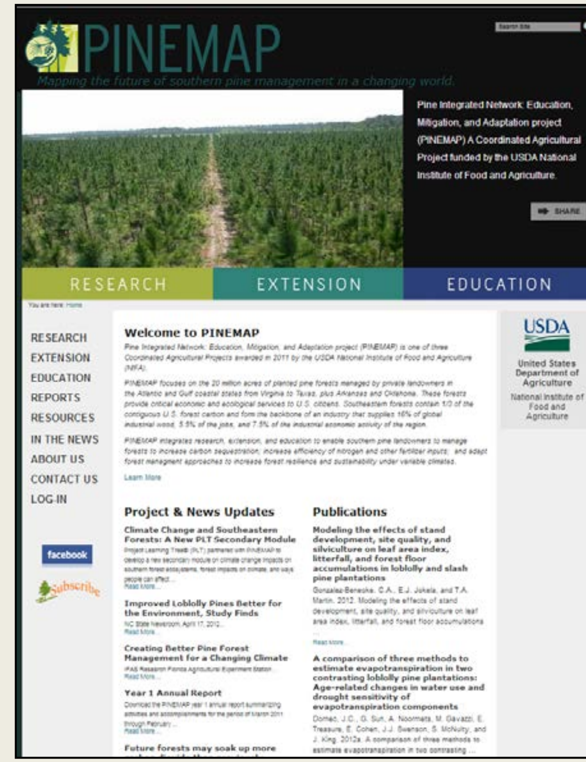
Thank You!



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