

**team science is a
reproducible solution to many
environmental challenges**



superb example of how team science works



Review |  [Free Access](#) |

Improving the culture of interdisciplinary collaboration in ecology by expanding measures of success

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rers

novelty

costs and benefits

broad definitions

provide best practices to implementing this tool

considers networking important to management

recognizes many outcomes from science

team science

disciplinary or interdisciplinary

collaboration a powerful solution to
challenges



NCEAS



needs

scale

macrosystems

expertise

skills

specialization

avoid disciplinary silos

grand challenges





methods

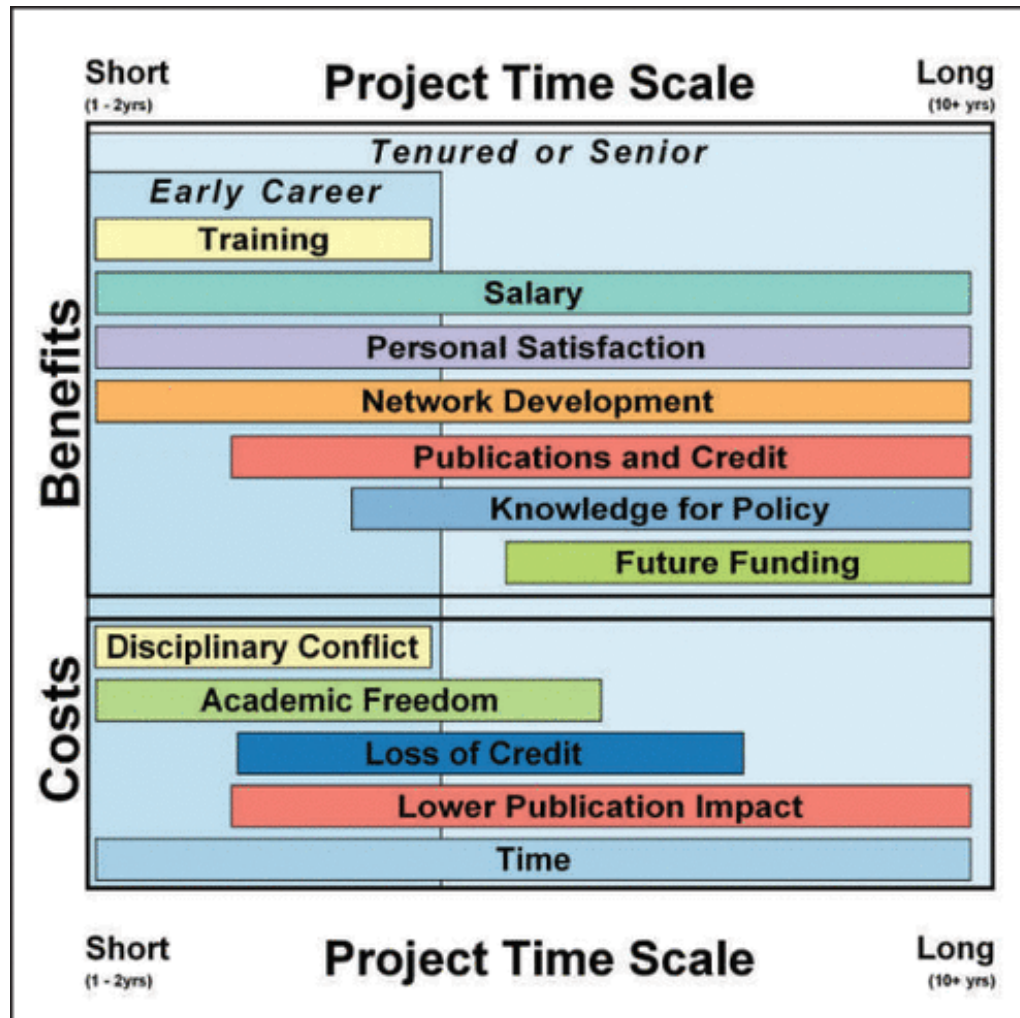
conceptual model

scope of challenges and solutions

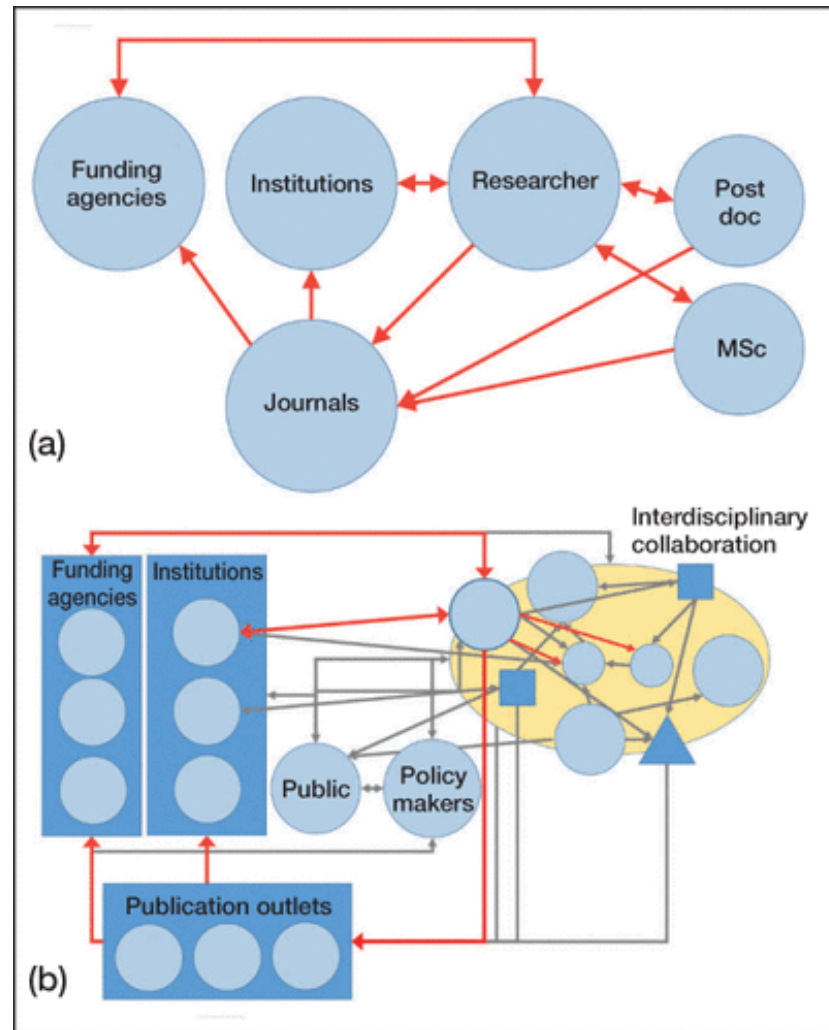
connectivity of people

strategies for deploying solutions

evidence



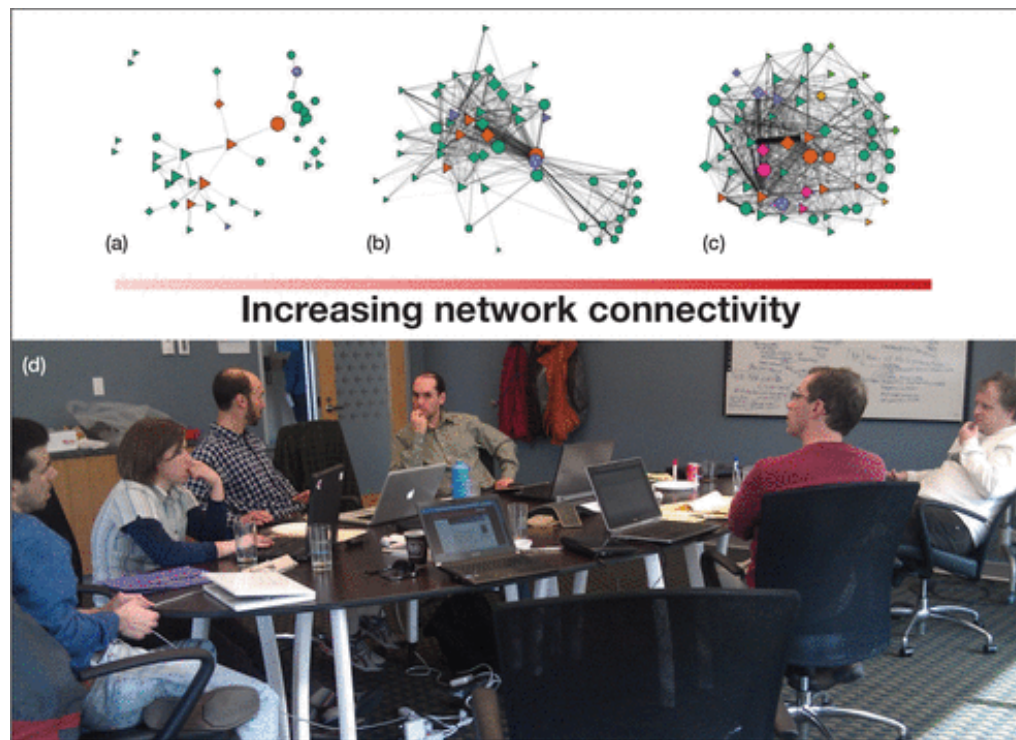
outcome-connections



<i>Metric objective</i>	<i>Highest and high weight</i>		<i>Moderate to low weight</i>	
	<i>Outcome</i>	<i>Evaluation</i>	<i>Outcome</i>	<i>Evaluation</i>
Research scholarship				
Knowledge generation	First-authored publication, graduate student publication (lead), PI as co-author	Impact factors, citations	Co-author publication	Impact factors, citations
Funding success	Grants as lead PI	Impact by content and competitiveness of program	Grants as co-PI	Impact by content and competitiveness of program
Intellectual and administrative leadership				
Academic leadership	Organization leadership	Administrative roles in organizations		
Disciplinary leadership	Scientific society leadership	Role and prestige of organization		
Mentoring and training	Graduation of advisee's graduate students	Number of students graduated	Serving on graduate committees	Number of committees served

Metric objective	Individual metrics		Team metrics	
	Outcome	Evaluation	Outcome	Evaluation
Research scholarship				
Knowledge generation	Lead or co-lead as defined by authorship statement	Impact factors, altmetrics (cf Piwowar 2013), citations	Number of team publications (regardless of authorship)	Impact factors, altmetrics, citations, except that weighting for interdisciplinary publications should be weighted more highly due to (generally) lower citation rates
	Co-authorship		Publications with interdisciplinary co-authorship	
	Graduate student publication with PI as co-author		Publications in interdisciplinary journals	
Funding success	Grants as lead or co-PI	Impact measured by content and competitiveness of program	Number and breadth of team-related grants	Impact measured by the individual role, even if not co-PI
Policy and management outcomes	Change in agency or governmental management or practice	Quantitative indication of the number or extent of changes based on research; qualitative description of the nature and extent of change	Participation in decision making process	As in individual metrics
	Participation in decision-making processes		Knowledge sharing	
	Direct application of science in management			
Data and product creation	Dataset publication	Impact based on re-use, citations, altmetrics, or in data utility for policy (see above)	All datasets and secondary products	As in individual metrics
	Software or code development and dissemination			
Team functioning, leadership, and training				
Interdisciplinary broker*	Facilitation of interactions across disciplines	Qualitative assessment		
Stakeholder or partner broker	Facilitate interactions with stakeholders and partners outside of the team	Qualitative assessment		
Public outreach				
Dissemination of research knowledge	Broader outreach	Radio, print, blog, video outputs for the public	All team contributions	As in individual metrics
Notes: *denotes an individual who is able to bridge knowledge or approaches across disciplines.				

people use and make solutions



solutions are active

data

fix

change

bio4enviro connection

grand challenges > need teams > benefits can exceed costs

strategy & application

with any reverse-engineered reproducible solution,
strategic application is critical

implications

team science protects through global solutions shared



PROTEGO