Supplementary Materials

The following items are included to support the teaching of the case:

- **Background reading questions for the 4 specialty groups**
  These questions, developed by Richard Nevle and given to the undergraduates who were in his course, are included as an optional resource.

- **Actor map cards**
  Prepare 4 sets of cards for each of the 4 small groups. Print out the cards and cut them do that each card has just one actor on it. Notice that there are 4 place marker cards that separate the cards into 5 categories: *Individual, Non-profit organizations, Government agencies, Networks, and Media.* You may want to print each category on a different colored paper; in other words all of the cards that are individuals are one color and all the cards that are non-profit organizations are another color, etc. **Note:** *Participants do not need the category cards.*

- **Event cards**
  Prepare 4 sets for each of the 4 small groups. Each set should be printed out on four different colored paper, corresponding to the 4 specialty areas. Cut them up so that each event is on a different card.

- **Sample network map**
  This network map is a resource for the instructor. You may want to distribute it to students/participants after they have completed their own map. If you want to create your own version, you can use the free software, Kumu.

- **Slides to describe *transdisciplinarity***
  The slides may be a useful resource as a way to visually describe transdisciplinary research. They were created by Susanne Moser, who both does transdisciplinary research and teaches others how to co-design, co-produce, and co-implement.

Background reading

Questions for media perspectives

1. How were Bd and Bsal discovered?
2. Why are Asian species of salamanders resistant to Bsal?
3. What ecosystem services do salamanders provide?
4. What does the *Science* paper by Tiffany Yap and her colleagues (according to the news article by Lizzie Wade) identify as a likely avenue for Bsal entering the U.S.? What policy action does the paper recommend for mitigating this threat?
5. In Lips and Mendelsohn's NYT op-ed published on 11/14/2014, which agency do they recommend should take action to limit salamander imports?
6. What is the mortality rate of European salamanders exposed to Bsal (refer to the 11/14/14 Op-Ed by Lips and Mendelsohn)? What is the mortality rate reported for Eastern newts according to the 10/31/14 Dot.Earth post by Andrew Revkin?
7. Why is it particularly important, from an amphibian conservation standpoint, to protect U.S. salamander populations from Bsal?
8. What bill, aimed at preventing introduction of wildlife pathogens, was introduced in Congress in 2013? What was its fate?
9. What interests stymied action by Congress to grant the U.S. Fish and Wildlife Service the authority to impose import restrictions on wildlife imports?
10. Why might it be of concern to import salamander species that are resistant to Bsal?
11. What is the legal basis for restricting animal imports under the Lacey Act?
12. What was unusual about the ruling enacted under the Lacey Act to prevent introduction of Bsal into the U.S.?
13. What about Revkin made him a natural ally in communicating the chytrid story?

Questions for policy perspectives group

1. What is the basis for listing 201 salamander species as injurious? What is the meaning of injurious in the context of the ruling? What are some of the criteria considered in determining injuriousness?
2. What is the primary purpose of the interim ruling?
3. What is the main pathway for the spread of Bsal?
4. What actions does the rule require? What action(s) does it prohibit?
5. What are the some of the key scientific findings that motivate the rule?
6. What are some of the organizations that initiated actions to motivate the U.S. Fish and Wildlife Service to enact the ruling?
7. Why was it important for the rule to be implemented in a shorter-than-normal time period?
8. What legislation does the ruling amend?
9. What kinds of information do the authors of the interim ruling indicate would be valuable as input for consideration in drafting the final ruling?
10. The text of the interim rule argues that protecting amphibian populations in the United States from Bsal is of particular importance. Why?
11. What are some of the ways that the text draws on the history of the spread of Bd as justification for the ruling?
12. What are some of the scientific concerns related to the spread of Bsal?
13. How does the text of the interim ruling incorporate economic arguments and consideration of policy alternatives (i.e. alternatives to the banning of import and interstate trade of the listed species) to increase the robustness of its case?
14. What are some of the shortcomings and vulnerabilities of the ruling?

Questions for science group

Martel et al. (2014)

1. What factors contributed to the sudden emergence of Bsal? How are these factors contributing to the sixth extinction?
2. How did the authors of the paper go about assessing the potential impact of Bsal on amphibian biodiversity? How did they go about determining the current range of Bsal? What other important scientific contributions does the article make?

3. What is the basis for the claim that Bsal is endemic to East Asia?
4. What groups of amphibians does the study identify as being vulnerable to Bsal?
5. What are some of the policy implications for this study?
6. What is the Bsal reservoir hypothesis, and what evidence supports it?

Yap et al. (2014)

1. What is the basis for identifying North America as an area of particular concern with regard to the introduction of Bsal?
2. What practice do the authors identify as posing a risk for Bsal introduction?
3. How do salamanders figure as ecologically important members of woodland communities? What important ecosystem service do they provide?
4. What did the authors of the paper do to assess the vulnerability of salamanders to Bsal?
5. Why do the authors consider American newts (Family Salamandridae) to be potential 'superspreaders' of Bsal?
6. Why are salamander species in the *Cynops* (fire belly newts) and *Paramesotriton* (warty newts) genera of particular concern?
7. How do conditions that exist during the import of salamanders potentially contribute to the spread of Bsal?
8. The authors advocate for action by the U.S. Fish and Wildlife Service to mitigate the spread of Bsal. Why is such action, although important, insufficient to ward off the introduction and spread of Bsal in North America? What other policy steps do the authors recommend? What do the authors identify as key areas of further research?

Questions for Karen's perspective and policy analysts' perspectives group

1. Following the narrative of Karen Lip's *Seeing the Before and After,* describe the history of the spread Bd in Latin America.
2. What were the key discoveries that led to the realization of the cause of amphibian decline in Central America? What was the role of the media in facilitating collaboration among scientists that led to the realization of the existence of a pandemic affecting amphibian populations?
3. How were the impacts of Bd's spread through salamander populations in Appalachia different from the impacts on amphibian species in the Neotropics? What is it about salamanders – "small, brownish animals" as Karen Lips describes them – that made recognition of the Bd pandemic in Appalachia challenging?
4. What enabled Karen Lips to realize that "straightforward analysis of existing data could help answer questions that were directly relevant to policy choices?"
5. What are several of the key roles that scholars can take to help advance policy?
6. What is meant by *orienting to the landscape* when taking on the role of a policy advocate?
7. What are some ways that Lips framed her communication to policymakers in order to yield maximum impact? What preparation does she recommend doing in advance of meeting with legislators?

Excerpt from Matson et al. (2016)

For this reading, rather than asking you to think about specific questions, we would like you to focus on understanding several concepts that relate to linking knowledge with action. More specifically, after completing this reading, you should be able to explain the concepts of *saliency, credibility, legitimacy*, and *boundary work* and be able to apply them in a discussion about the development of policy-based solutions to address the chytrid crisis. Furthermore, you should be able to articulate the barriers to producing *influential knowledge* and approaches to overcoming these barriers. Finally, you should be able to identify the four mindsets described in this reading as characteristic of sustainability leaders.

Individuals

Karen Lips

Peter Jenkins

Su Jewell

Dan Ashe

Andy Revkin

Joe Mendelson

James Lewis

George Rabb

CONS 680 students

Chad English

Angela Picco

An Martel

Chris Tomassi

Harry Burroughs

Carl Zimmer

Richard Coniff

Priya Nanjappa

Tiffany Yap et al

Non Profit Organizations

Defenders of Wildlife

Center for Invasive Species Prevention

COMPASS

Zoos

Government Agencies

US Fish & Wildlife

Assc. Of Fish & Wildlife Agencies

US Senate & House of Representatives

Networks

Scientific societies

Amphibian Survival Alliance

Pet Industry Joint Advisory Council

Media

New York Times

Wired magazine

Prior to 2010

Bd causes mass extinction of amphibians worldwide.

Amphibian researchers form an action-oriented network.

Karen seeks leadership training through the Leopold Leadership Program on how to work across boundaries.

Karen meets Peter Jenkins, a policy analyst.

Peter Jenkins completes groundbreaking report on regulation of live animal imports.

Peter Jenkins (Defenders of Wildlife) submitted petitions to Dept. of Interior and Dept. of Agriculture to prohibit import of amphibians unless free of Bd

CONS 680 students helped Peter Jenkins address issues for petition.

US Fish & Wildlife receives the Defenders of Wildlife petition from other government agencies.

Peter Jenkins leaves Defenders of Wildlife.

2010 - 2013

USFWS drafts notice in *Federal Register* seeking biological, economic, data to address 14 questions related to chytrid fungus and receives 5000 comments. The agency sends an update to responders that this is an inquiry not a proposed rule. Su Jewell is reassigned to another project.

CONS 680 students work with Su Jewell on Bd issues.

Defenders of Wildlife petition stalls.

An Martel publishes paper about discovery of new strain of chytrid amongst fire salamanders.

Leopold Leadership Program announces new training, *Hitting the Policy Mark*. Karen signs up and interviews a number of decision makers and policy analysts to get more information regarding wildlife import, specifically amphibians. Congressman Burroughs agrees to write USFWS about its priorities and resources for addressing injurious wildlife issues. She also renews connections with Peter Jenkins.

Peter Jenkins invites Karen to give presentations to numerous organizations to share her concern about the discovery of new chytrid fungus in fire salamanders.

2014

CONS 680 students work again with Su Jewell on understanding risks of amphibian importation to US amphibian biodiversity. (risks to pet industry, live food, zoos and aquaria, research and education). Students communicated results to USFWS staff.

An Martel publishes paper in *Science* that names new strain of chytrid fungus as Bsal and gives evidence that it has spread to four continents and is transported through pet trade. No evidence yet in North America. Karen meets with Peter Jenkins to discuss.

After An Martel paper published, Karen seeks strategy help from Chad English. He suggests that she meet with USFWS.

Various journalists write articles about Bsal.

Karen and Joe Mendelson write an Op-Ed for NY Times which Andy Revkin helps get published.

2015

Peter and Karen get their networks to start a letter-writing campaign to USFWS.

Andy Revkin writes in the *Dot Earth blog* about a letter writing campaign with all the signatures of the key networks involved.

Amphibian Survival Alliance hires Peter Jenkins as a part-time consultant to keep the Bsal issue front and center.

Karen joins with Priya Nanjappa to meet with various Congressional offices and staffers.

USFWS refocuses on ban of salamander imports and begin gathering necessary data to inform ruling. Dan Ashe and Su Jewell seek help from Peter Jenkins and Karen Lips to get data.

Tiffany Yap et.al publish a paper in *Science* describing the risks to biodiversity, trade, and biosecurity and recommend immediate response.

US Geological Society convenes a meeting of stakeholders and researchers to create an emergency response and monitoring plan for detecting Bsal.

Peter Jenkins meets with pet industry trade groups. Pet Industry Joint Advisory Council calls for voluntary ban on two species of newts.

Peter Jenkins, Peter Lewis, and Karen Lips strategize together on how their networks can work together to stop imports and prevent Bsal from entering North America.

2016

USFWS publishes an interim rule making it illegal to import 201 species of salamanders.

New York Times, federal agencies, and NGOs report the new ruling.

SUSANNE MOSER
RESEARCH & CONSULTING

Transdisciplinarity Framework as cited by:

Susanne C. Moser, Ph.D.

Susanne Moser Research & Consulting

Stanford University

Transdisciplinary Research

Drawing some conceptual boundaries

I. Co-design:
Joint problem-framing

II. Co-production:
Integration and
joint knowledge production

III. Co-dissemination:
Collaborative experimenting
and learning

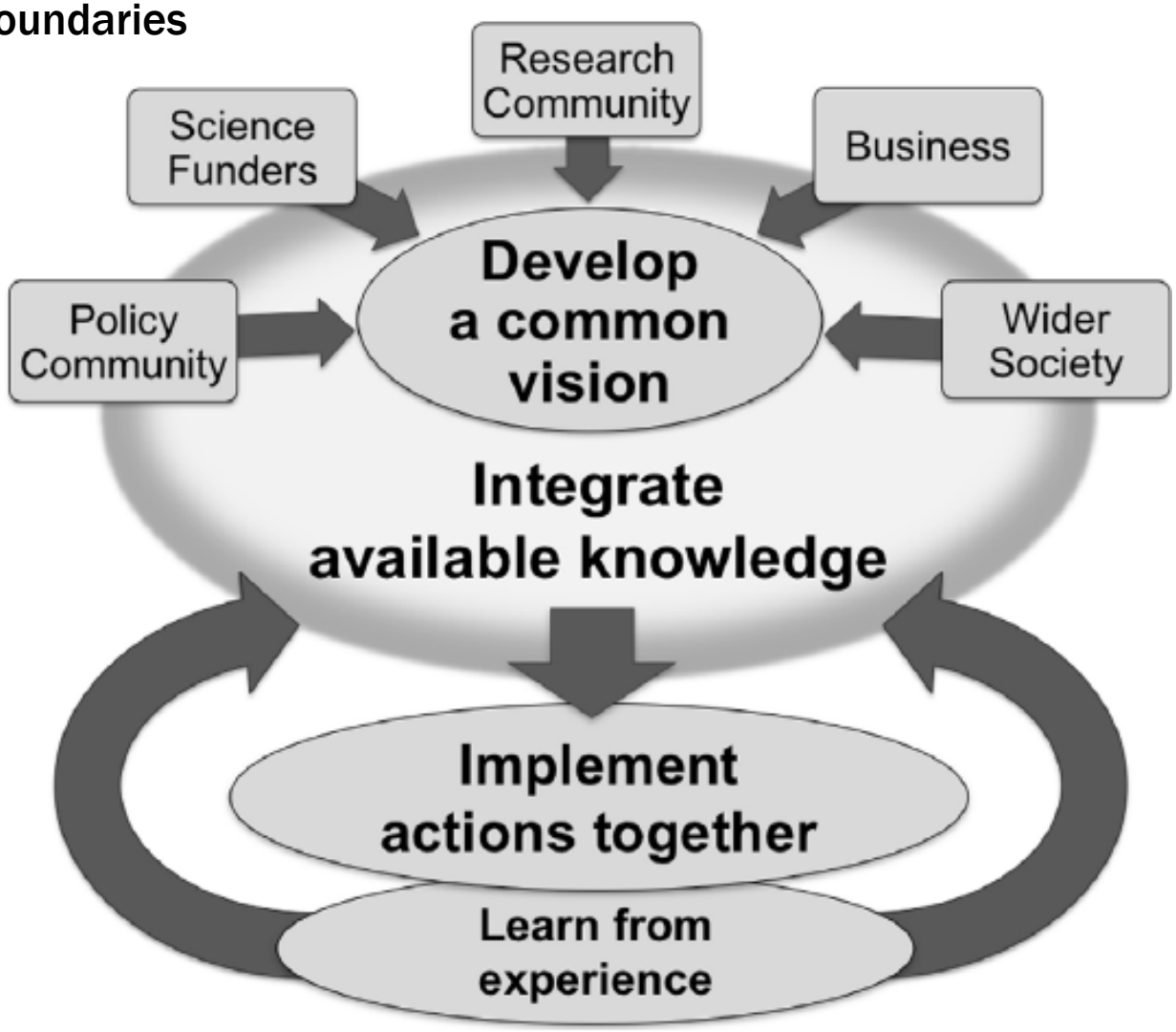
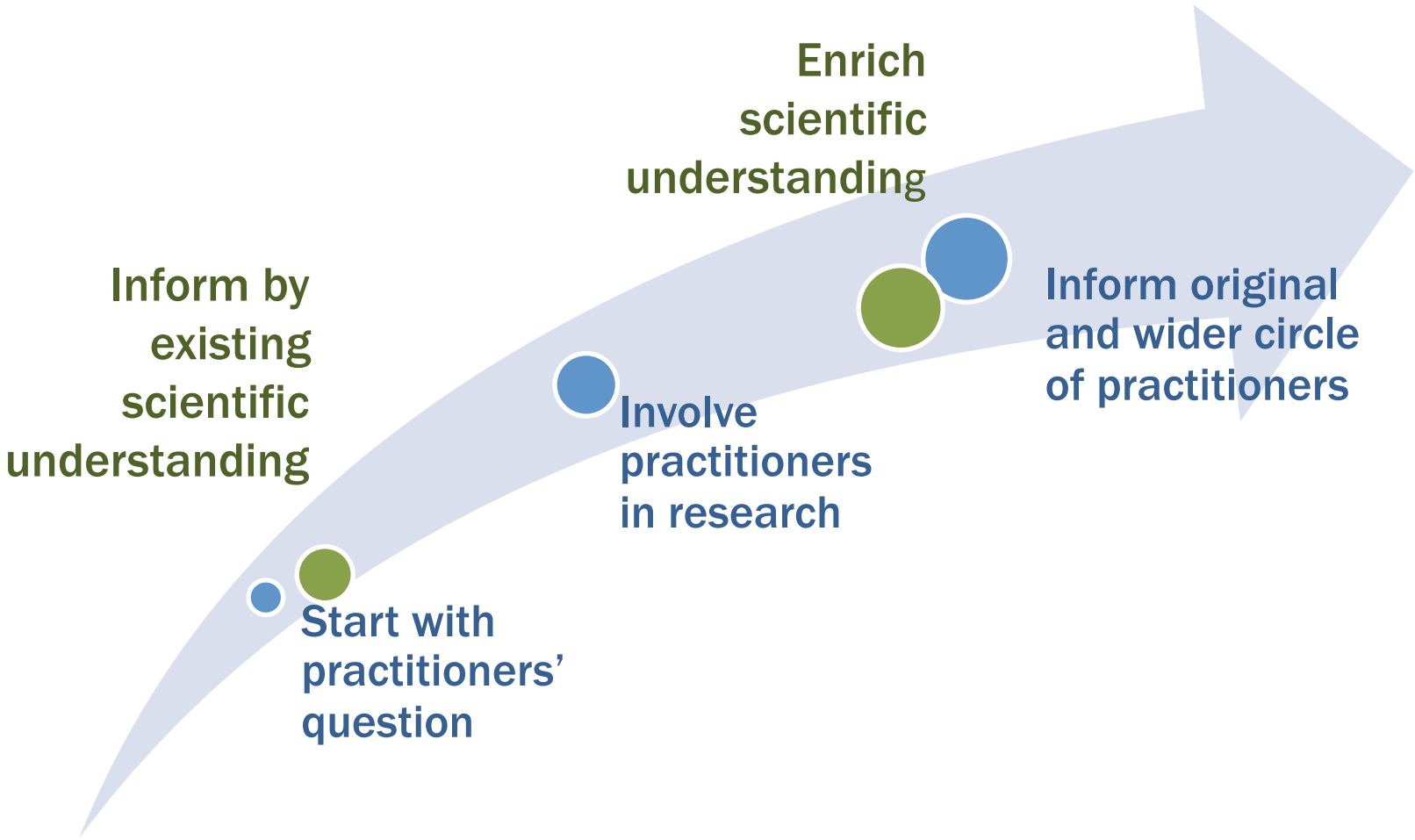


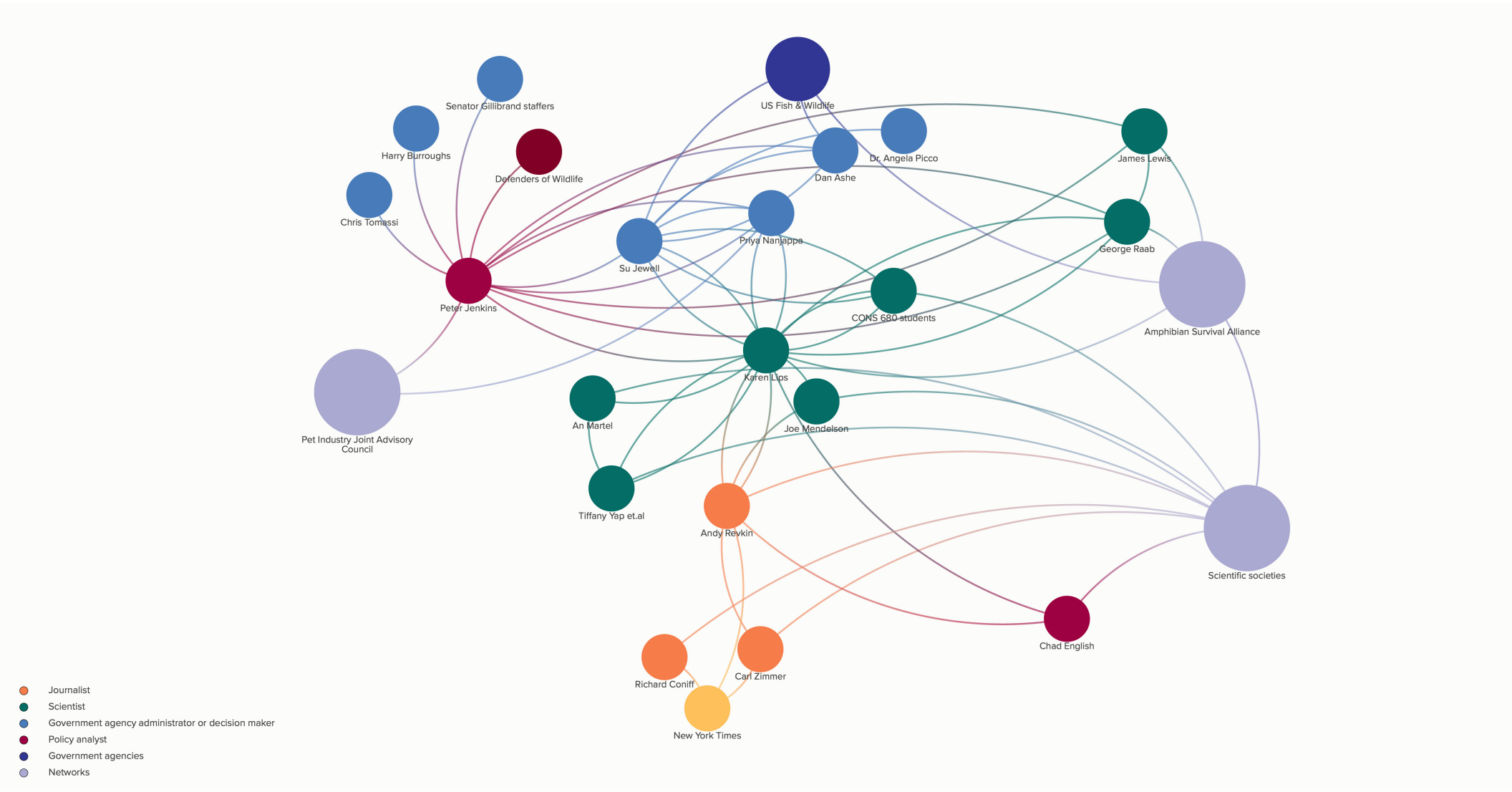
Fig. 1 – The knowledge arena: sustainability science as a collective learning process.

Source: Cowell et al. (2013)

Project Approach:

Use-Inspired Action Research




Senator Gillibrand staffers
US Fish & Wildlife
Harry Burroughs
Defenders of Wildlife
Dr. Angela Picco
James Lewis
Dan Ashe
Chris Tomassi
Priya Nanjappa
George Raab
Su Jewell
Peter Jenkins
CONS 680 students
Amphibian Survival Alliance
Karen Lips
Pet Industry Joint Advisory Council
An Martel
Joe Mendelson
Tiffany Yap et.al
Andy Revkin
Scientific societies
Chad English
Richard Conniff
Carl Zimmer
New York Times
Journalist
Scientist
Government agency administrator or decision maker
Policy analyst
Government agencies
Networks