Critical Conversations about Environmental and Natural Resource Governance

A Report from the 2011 Environmental and Natural Resource Governance Fellows Program
Michigan State University

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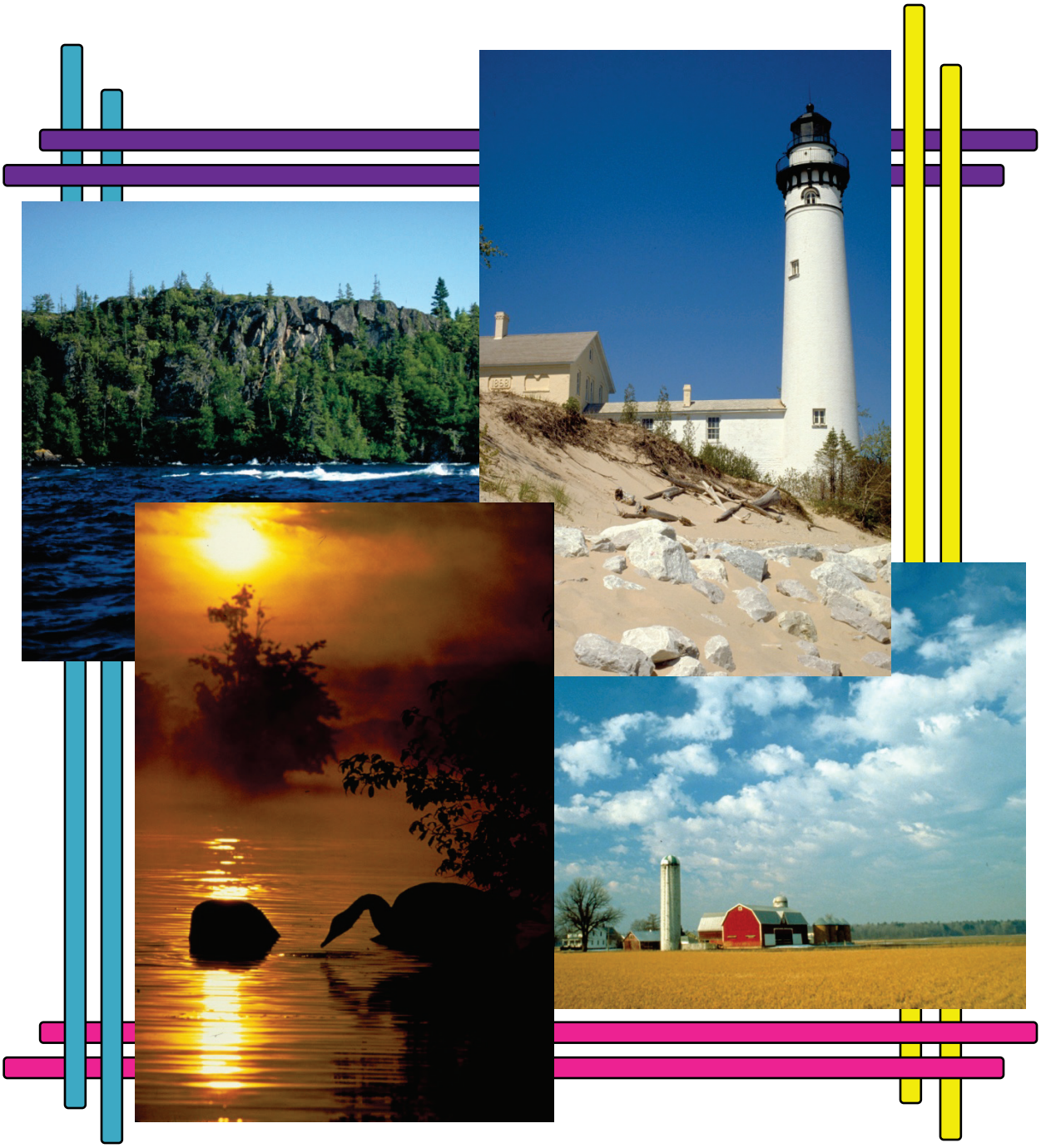

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Sleeping Bear Dunes, Lake Michigan, Empire, MI; Robert De Jonge

I. Executive Summary

In 2009, Michigan's Environmental Advisory Council concluded that diminishing effectiveness of the current model of governance and the growing scarcity of resources require transition to a new model of environmental and natural resource governance in Michigan. In its *Roadmap* report, the council recommended that Michigan State University and the Michigan Department of Environmental Quality partner to initiate and foster statewide conversations about ways to improve environmental and natural resource governance in Michigan. The Environmental and Natural Resource Governance Fellows Program was created in response to this recommendation.

The fellows were convened to explore critical questions about a change in governance. The implications of issues discussed at each of seven workshops for governance and for changes in governance were the central points of inquiry. The fellows program modeled the engagement and deliberation that are critical to emergent learning, co-creation of knowledge, and empowered participatory governance.

The workshops:

1. Seeking a Common Understanding of Environmental and Natural Resource Governance
2. Framing Tame and Wicked Problems
3. Science, Literacy and Governance
4. Ethics, Expectations and Governance
5. Assessment and Monitoring
6. Alternative Models of Governance
7. Critical Conversations about Environmental and Natural Resource Governance

From the opening discussion question in the first workshop (What is governance?) to the analysis of various models of governance in the final workshop, four principal types of choices surfaced repeatedly in fellows' discussions about governance. These choices are at the core of governance decisions:

- Who has access, standing and influence?
- What are the goals?
- Who has agency? That is, who is empowered to pursue goals?
- How and by whom is implementation resourced and guided?

Future discussions about governance and the appropriateness of any governance model will be driven largely by the context within which governance is debated, and the success of deliberations about governance will turn on the processes by which important choices are made.

The messages heard and questions deliberated during the fellows program suggest five principal conclusions:

1. An effective environmental and natural resource governance model will need to reflect broad public views of resources to be protected, problems to be addressed, and management outcomes to be pursued.
2. A clear process for setting goals is necessary, and the rules for changing goals need to be understood and agreed upon.
3. A new model may well require that individuals and groups beyond traditional state government structures play important roles in implementing management initiatives and monitoring outcomes.
4. Decisions about how to allocate scarce resources are an important part of governance and reflect the values of those involved; conflicting values may make allocation decisions difficult.
5. Most governance choices are not made with a blank slate. Key choices will be influenced by structures already in place, even if those structures are changed when new choices are made.

II. Environmental and Natural Resource Governance Fellows

The public and our elected leaders are asking more of policy as we face increasingly difficult problems. New types of problems will require new and different knowledge and new and different policy responses. Yet, in the presence of increasingly complex and intractable problems, future environmental and natural resource management in Michigan will be undertaken with increasingly limited financial resources.

As a result, our traditional approach to public responsibility for environmental and natural resource management will no longer be sufficient or appropriate. A new model of governance will be necessary. But what that new model should be is not clear.

In 2009, Michigan's Environmental Advisory Council recommended that Michigan State University and the Michigan Department of Environmental Quality partner to initiate and foster statewide conversations about ways to improve environmental and natural resource governance in Michigan. The Environmental and Natural Resource Governance Fellows Program was created in response to this recommendation.

What is governance, exactly? Among the many definitions of governance to be found in the political science and public administration literature, Kooiman's definition (2000) is "arrangements in which public and private actors work to solve societal problems, create societal opportunities, and design the societal institutions within which governing actions take place." The Environmental and Natural Resource Governance Fellows Program was initiated with the working assumption that governance is the steering (or purposing) that undergirds the goal-directed rowing (or performing) actions of government (Rhodes, 1996; Kooiman, 1993).

The fellows program brought together thought leaders from around the state, representing state and local government, non-profit organizations, the private sector and citizen-led initiatives for a series of seven workshops designed to initiate the critical conversation about changes in governance. The fellows explored opportunities for broadening participation in conversations about governance and for broadening participation in governance. The fellows deliberated the context for changes in governance and identified key assumptions about, opportunities for and barriers to change. The long-term outcome desired for the fellows program is that the fellows will provide leadership for further statewide conversations about what environmental and natural resource governance model is right for Michigan.

This report describes the seven workshops and the fellows' conversations. It brings forward key points and compelling questions raised by the fellows during their discussions. The following sections also describe how those points and questions provided the basis for a framework to support further conversations about environmental and natural resource governance in Michigan.

Environmental and natural resource governance fellows were:

Ed Anderson, Bloomfield Hills resident and volunteer.
Anne Couture, Couture Environmental Strategies.
Doug Craven, Little Traverse Bay Bands of Odawa Indians.
Shari Dann, Michigan State University.
Jeremy Emmi, Michigan Environmental Council.
Emily Finnell, Michigan Department of Environmental Quality.
Jim Frey, Resource Recycling Systems.
Lee Gaddies, Detroit artist and community activist.

Randy Gross, Michigan Department of Environmental Quality.
Ponsella Hardaway, Metropolitan Organizing Strategy Enabling Strength (MOSES).
Brian Kandler, Detroit Regional Chamber.
Ellen Kohler, attorney, The Watershed Center.
Claire Layman, Michigan State University Extension.
James Lloyd, Highland resident and volunteer.
Russ Mason, Michigan Department of Natural Resources.
Erin McDonough, Michigan United Conservation Clubs.
Dennis McGrath, The Nature Conservancy.
Mark Meadows, Michigan House of Representatives.
Tom Middleton, farmer and Oakland County commissioner.
Jimmie Mitchell, Little River Band of Ottawa Indians.
Tremaine Phillips, Prima Civitas Foundation.
Scott Piggott, Michigan Farm Bureau.
Doug Roberts, Jr., Consumers Energy.
John Robertson, Wavelength, Inc.
Paul Seelbach, U.S. Geological Survey.
Liane Shekter Smith, Michigan Department of Environmental Quality.
Julie Sims, National Oceanic and Atmospheric Administration.
Sanjiv Sinha, ECT Inc.
Bill Stough, Sustainable Research Group.
Mark Swartz, Michigan Department of Agriculture.
Dennis West, Northern Initiatives.
Kyle Whyte, Michigan State University.
Bob Williams, Stewart Farm Ecology Center.
Bob Wilson, Michigan Senate Majority Policy Office.

Keweenaw River Lighthouse at McLain State Park, Houghton County, MI; Michigan Travel Bureau

III. Background – The Roadmap

In December 2008, then Department of Environmental Quality (DEQ) Director Steven Chester asked his Environmental Advisory Council (EAC) to consider Michigan's current approach to addressing environmental issues and the need for a new direction. Then, when Gov. Jennifer Granholm issued the executive order[1] creating the Department of Natural Resources and Environment (DNRE) from the former DEQ and Department of Natural Resources (DNR), she charged her appointed transition manager with developing a "proposed transformation in the way the state manages environmental quality to meet the needs of the 21st century that focuses on environmental integrity rather than concentrate on permitting."

Subsequently, in December 2009, the EAC presented Director Chester with its report, *A Roadmap to a New Environmental Management Model for Michigan: Recommendations of the Environmental Advisory Council*.[2] In its report, the EAC offers three important conclusions:

1. Michigan's current model of environmental and natural resource management is based on a media-specific framework developed through state law, largely in response to federal law. Policy tools reflect traditional single-issue emphases (for example, point-source pollution control or endangered species protection) with a focus on regulating and monitoring human behavior. This approach has been successful over the past four decades, and many serious problems have been addressed. However, this approach will not likely continue to be successful because of several contextual challenges. First, remaining problems often are not adequately addressed by the current regulatory and single-issue model (for example, nonpoint pollution control or biodiversity protection). Second, remaining and newly discovered difficult problems require a more sophisticated understanding of coupled human and natural systems and a specific and targeted focus on system resilience. Third, greater reliance on permit and license fees in the face of increasing scarcity of state and federal funds to be allocated among competing environmental and natural resource concerns will limit flexibility needed to respond to new problems and changing priorities.

2. Michigan will benefit from a new model of environmental and natural resource governance that "benefits from collaborative efforts to develop agreed-upon outcomes, focuses on prioritization and relative public health/environmental risk, encourages innovation, provides for continuous assessment and improvement, promotes performance above minimal compliance, and engages voluntary environmental stewardship."[3]

3. A wide range of parties should be included in conversations about environmental and natural resource governance to provide "additional perspectives on the current state of environmental management and governance and to identify ways to improve and implement new methods."[4]

[1] Executive order 2009-45.
[2] Available at: http://www.michigan.gov/documents/deq/EAC_Roadmap_12-16-09_306213_7.pdf
[3] Page 1 in the *Roadmap.*
[4] Page 10 in the *Roadmap.*

IV. The Workshops

The *Roadmap* document suggests that the diminishing effectiveness of the current model of governance and the growing scarcity of resources require transition to a new model of environmental and natural resource governance in Michigan. The *Roadmap* also recommends that conversations about governance involve a wide range of individuals in an exploration about needed changes in Michigan's environmental and natural resource governance. To begin these conversations, the environmental and natural resource governance fellows were convened in a series of seven workshops to explore critical questions about a change in governance.

Each of the seven workshops focused on a specific topic. The topics served to provide structure to the fellows' discussions. For each of the first six workshops, a subject matter expert presented an overview of the topic as a catalyst for discussion. Then, a set of framing questions or tasks urged fellows toward a deeper exploration of each topic. The seventh workshop provided an opportunity to apply lessons from the first six sessions in a case study analysis. For each workshop, the implications of the issues discussed for governance and for changes in governance were the central points of inquiry.

The workshop topics and the framing questions were derived from a series of foundational questions posed by the program planning and steering committees:

- How has Michigan come to its current environmental and natural resource governance model?
- What is the difference between government and governance?
- What social, economic and environmental changes and challenges are we experiencing that may suggest the need for a new model of environmental and natural resource governance for Michigan?
- What are Michigan citizens' expectations for environmental and natural resource governance?
- How does public understanding of and interaction with the environment and natural systems influence views about governance and people's willingness and ability to engage in public debate and deliberation about and even to take an active role in environmental and natural resource governance?
- What do differing governance models imply about public and private responsibilities?
- How are desired outcomes identified, and how do we monitor for progress toward those outcomes?
- What can we learn from successes and failures of other states that have grappled with these kinds of questions?
- By what criteria would a new governance model be evaluated?

The fellows program was explicitly designed to model the engagement and deliberation that are critical to emergent learning, co-creation of knowledge and empowered participatory governance.

The workshops:

1. Seeking a Common Understanding of Environmental and Natural Resource Governance
2. Framing Tame and Wicked Problems
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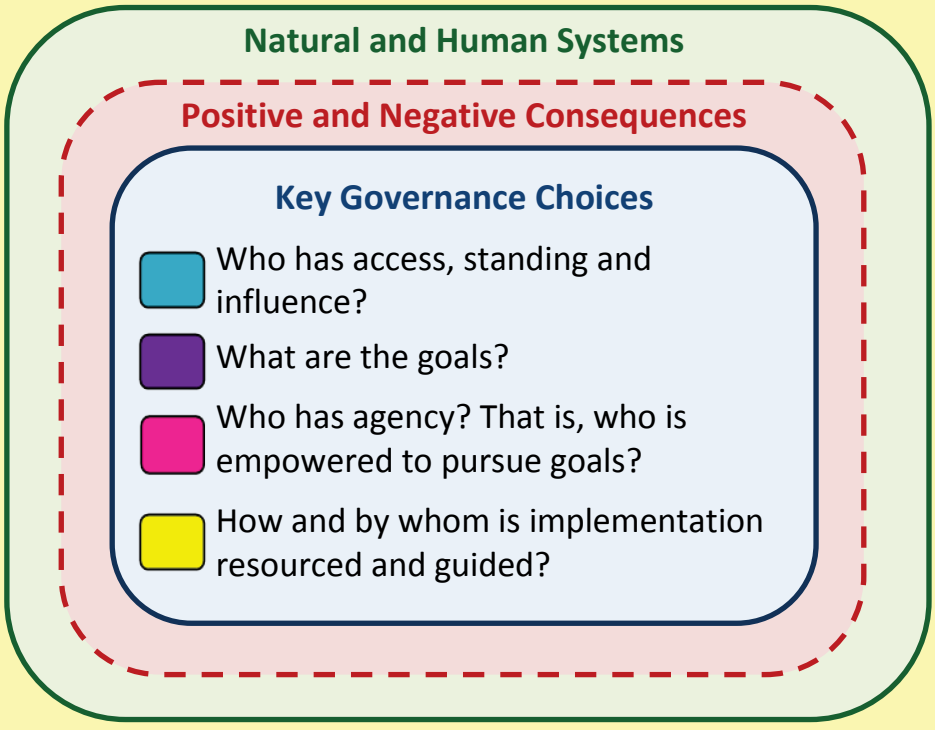
V. Workshop Summaries

The tangible outcome of the environmental and natural resource governance fellows' work is a framework within which to deliberate important questions about governance. This framework is shown below. From the opening discussion question in the first workshop (What is governance?) to the analysis of various models of governance in the final workshop, four principal types of choices surfaced repeatedly. The four choices are at the center of the framework. The conclusion was that effective, resilient models of governance require attention to these four questions. In addition, discussions about governance and the appropriateness of any governance model will be driven largely by the context within which governance is debated. Context includes both natural systems (the environmental and natural resource issues of interest) and human systems (the social and cultural structures within which those issues are confronted). It also includes the consequences of decisions about governance and implementation of those decisions for natural and human systems. Finally, the success of deliberations about governance will turn on the processes by which important choices are made.

In the remainder of this section, a brief synopsis of presentations made by subject matter experts at each workshop is provided. Then, key points raised and questions generated during fellows' discussions are presented.



Framework for Conversations about Governance

The colors in the framework diagram are used throughout the rest of this section. In the summary of each workshop, key points and compelling questions raised at the workshop are listed under color-coded categories that correspond to one of the four key governance choices, to matters of context or to the process by which choices are deliberated.

Workshop #1: Seeking a Common Understanding of Environmental and Natural Resource Governance

The Environmental and Natural Resource Governance Fellows Program opened with a formal exploration of the meaning of governance. Definitions of governance in the literature are many and broad, and the fellows themselves expressed a host of ways that *governance* is interpreted.

One goal of the first workshop was to ground discussions of governance within the history of environmental and natural resource policy in Michigan. A second goal was to begin forging a common understanding of what governance is and how governance is distinguished from government.

History of Conservation and Environmental Governance in Michigan

Synopsis of presentation made by Dave Dempsey, policy advisor, International Joint Commission

Environmental and natural resource governance in Michigan is the product both of national impulses and designs and of events and policy responses born uniquely of Michigan's experience. Michigan's experience includes dramatic responses to perceived resource-exploitative disasters followed by implementation of reforms and ongoing political debate about the continued usefulness of the reforms.

Michigan's fisheries and timber resources were the first to face exploitation to the point of destruction. Native populations of pickerel, whitefish, sturgeon and grayling in the Great Lakes and inland lakes and streams were damaged by overfishing and water pollution. Timber resources, especially native white pines, were largely exhausted over a 50-year period, leaving behind open cut-over land in most of the northern two-thirds of the state.

Fellows' interpretations of *governance* fell into four main categories:

1. Recognizing values and translating them into goals.
2. Designing a system to achieve goals.
3. Developing principles and rules to guide decisions.
4. Managing resources.

Michigan responded with the creation of a series of single-purpose statutes and structures. A board of fish commissioners was created to oversee building hatcheries and stocking fish, as well as introducing some non-native sports fish. A forestry commission was created to collect information and do public education and to work toward creation of a state forest preserve. A park commission was created to oversee development of public recreation areas. Subsequently, the commissions were consolidated into a Department of Conservation. The department was overseen by a citizen-member Natural Resource Commission, which was perceived as a way to insulate conservation professionals from political pressures.

Water and air pollution problems characterized the second wave of resource exploitation that resulted in changes in governance. Initially, the Stream Control Commission was created with the goal of reducing pollution, but it had little authority to compel action. It became the Water Resources Commission in 1949, with increased authority, and included citizen members as well as directors of the state departments of Conservation, Public Health, Agriculture and Transportation. In 1965, the state created an Air Pollution Control Commission, which also had both citizens and state department leaders as members.

Michigan's 1963 constitution required that the legislature "provide for the protection of the

air, water and other natural resources of the state from pollution, impairment and destruction." This requirement was put into statute with the 1970 Michigan Environmental Protection Act. The state Department of Natural Resources was modernized, combining pollution control functions with the fish and game management functions of the former Department of Conservation.

Differences among constituencies and perceived mandates led to the 1995 movement of pollution control responsibilities to a new Department of Environmental Quality. Fish and game management remained with the Department of Natural Resources with oversight by the Natural Resources Commission. The air and water commissions were abolished, which meant that the Department of Environmental Quality did not have an oversight board.

More recently, the two agencies have been recombined and re-separated, raising concerns about too much preoccupation with organizing and insufficient attention to creatively addressing environmental and natural resource concerns. Greater emphasis on voluntary compliance and pollution prevention may signal early interest in participatory problem solving for environmental issues. But what will assure transparency and citizen participation in decision making?

Government and Governance: Complementarity as a Mode of Action

Synopsis of presentation made by G. Tracy Mehan, III, principal, The Cadmus Group

Without civil society, government and governance are essentially the same. With civil society, government is simply part of the complex web of governance by which a society orders itself as well as the state. The early colonies functioned with minimal government and relied on civil society and institutions which, as observed by Alexis de Tocqueville in the early 19th century, served as voluntary, intermediate associations mediating between solitary individuals and government. Today "government" refers to formal political institutions at federal, state and local levels. Current interest in governance issues, over and beyond the traditional role of government *per se*, suggests a reinvigorated civil society. Challenges are created, though, by the fact that communities and networks may be less dominant in society than was traditionally the case – an issue discussed by Robert D. Putnam (2000) in *Bowling Alone: The Collapse and Revival of American Community*.

From where does interest in new governance models for environmental and natural resource management arise? At least some of our major, contemporary environmental problems require a new portfolio of solutions that will involve public-private partnerships and intergovernmental cooperation, in a kind of matrix approach, that cuts across the public, private and not-for-profit sectors as well as government at all levels. Notably, many environmental problems arise from the decisions of thousands of small firms and choices of more than 300 million Americans, the impacts of which are small individually but cumulatively very large. As such, the role of government is narrowing, and the responsibilities of the private sector and non-governmental organizations are broadening. As one example, land trusts and conservancies have become increasingly central in land conservation activities.

Expanding the focus of water management from isolated point-source discharges of pollution to entire watersheds at the landscape scale is another area that could benefit from an expanded civil society approach to environmental problem solving. The Milwaukee Metropolitan Sewerage District provides a useful model of utility leadership in collaborative watershed governance to address wet weather issues. The Southeast Wisconsin Watershed Trust has evolved to implement watershed restoration plans across the region's

six subwatersheds through partnerships, collaborative decision making and joint project implementation that involve government, business, the building industry, agriculture, and environmental and other stakeholder organizations.

> Fellows noted that collaborative governance may require more resources. Where will those resources come from?

Reflecting on the Milwaukee example raises six points:

- ❖ Federal regulation is driving the search for innovative governance responses.
- ❖ Motivation includes economic efficiency and functionality of collaborative enterprise in response to a systemic problem.
- ❖ Cost savings are not the only benefits. Others include a greener urban environment, carbon sequestration, reduction of the heat island effect, improved habitat, aesthetic benefits and community support.
- ❖ Leadership, imagination and perseverance are essential.
- ❖ Success requires a key entity to anchor, convene, provide start-up capital, sustain, drive or otherwise instigate new collaborative partnerships.
- ❖ Robust data and monitoring are required to target major problems, direct scarce resources, evaluate outcomes, and ensure social and political legitimacy.

Key Points and Compelling Questions

Access, standing and influence

- Do we actually or always want citizens and/or business organizations making governance decisions? When and where? [Who are *we*?]
- How can differing interests/values be balanced?
- Even as the push for greater citizen engagement in environmental and natural resource governance grows, we see evidence that people are less and less connected to the out-of-doors.
- If individuals are less likely to be part of an association or network (Mehan's reference to *Bowling Alone*), what does this loss of social capital mean for the likelihood of greater participation in governance? For coalescing around collectively agreed-upon outcomes?
- What are the human capital needs for greater public participation in governance?

Goals

- What are the implications of current emphasis in Michigan on entrepreneurialism, business development and economic recovery?
- If we historically saw a transition from viewing environmental and natural resource damages as the "price of economic progress" to a focus on the need to sustain environment/natural resources, are we now in another transition whereby sacrifices in environmental and natural resource quality and quantity will be viewed as the "price of economic recovery"?
- What is meant by environmental and/or natural resource outcomes?

Implementation resources and guidance

- Would a new governance model require more time and money than the current model? In particular, does it mean spending more money in being proactive?
- How can certainty and predictability be balanced with flexibility?

- What is the role of science and what is the role of story-telling in communicating about environmental and natural resource issues? Which one is more likely to endure?
- Many governance meanings articulated by fellows referred to rules or principles. Is there a difference between a rule and a principle? If so, what are the implications for governance?

Lake Michigan beach, Frankfort, MI; Michigan Travel Bureau

Workshop #2: Framing Tame and Wicked Problems

At the second workshop, fellows worked toward an understanding of tame and wicked problems and the difference that framing a problem as tame or wicked can make in how successfully it is addressed. The case of hydraulic fracturing, a technology that enhances natural gas recovery from deep gas-bearing shale formations, was introduced. Using this case, fellows explored the characteristics of problems that make them wicked or tame.

Fellows were tasked with planning a meeting at which the issue of hydraulic fracturing would be addressed. They were asked to work in small groups to describe the meeting purpose, develop an agenda, decide who would be invited to the meeting and craft the language of a letter of invitation. Generally, fellows chose to plan meetings through which understanding of hydraulic fracturing would be increased, including the technology, risks and benefits of its use, long-run and short-run impacts, and risk mitigation options. The groups chose not to address the question of whether hydraulic fracturing should be the subject of greater regulatory oversight.

After a presentation on framing problems as tame or wicked, fellows revisited their planned meetings, and several groups increased the level of public involvement in the meetings. However, for their task of planning a meeting, hydraulic fracturing was not perceived as a wicked problem because no strong feelings about the issue were evidenced in the groups, and they were not charged with developing a policy response.

What fellows said about what makes hydraulic fracturing a difficult issue:

- The public lacks a thorough understanding of the issue, including uncertainty and the risks involved, the geology involved, the science and the benefits.
- Questions of science remain unanswered.
- The public finds it difficult to trust corporations.
- Problems could cause long-term environmental effects.
- Various interests are perceived as being politically motivated.
- Private property rights are at issue.
- There may be social impacts.
- Gas recovery is tied to the concerns about addiction to petroleum and the lack of a national energy policy.
- The culture at the Environmental Protection Agency may limit its responsiveness.
- Adoption of the practice seems to occur very quickly.
- Distribution of wealth is at issue.
- Agreement on an assessment standard has not been reached.
- Local citizens want control.
- Available geological data do not appear to be sufficient for addressing concerns.
- Whether state or federal agencies have sufficient resources to adequately regulate the practice is in question.
- Various interests have used very vivid images that stir emotion and passion.
- The process is so remote, so far underground.
- A one-size-fits-all solution seems unlikely.
- Risks involve threats to basic needs and to resources of which there is a finite supply.

Wicked Problems: The Difference Framing Makes

Synopsis of presentation made by Sandra S. Batie, Elton R. Smith Chair in Food and Agricultural Policy, Michigan State University

As used here, "framing" means "principles of selection, emphasis, and presentation composed of little tacit theories about what exists, what happens, and what matters" (Gitlin, 1980) and by which we interpret the nature and dimensions of a perceived problem. How one frames a problem affects how the nature and dimensions of a perceived problem are interpreted and influences choices made, approaches adopted and outcomes. A particular distinction important for policy issues is whether they are framed as *tame* or *wicked* problems. For environmental and natural resource management, the problem-solving approach is not about finding the right answer. Rather, given social, political and economic complexities and scientific uncertainties, it is about making improvements and advancements.

The traditional framing of problems has relied on a traditional linear model of the relationship between science and policy in which scientific findings flow into a reservoir of knowledge that can then be accessed by society to create beneficial technologies and outcomes. This linear model works well if problems are tame but not so well with wicked problems. Whether a problem is framed as tame or wicked will influence the perceived role of science and policy options.

Tame problems have a clear problem definition and clear solutions. Problems are stable and outcomes are definitive – either the problem is solved or it is not. Tame problems are characterized by widely shared values on the desirability of outcomes. There is limited uncertainty about cause and effect, and causes and solutions are determined by experts. In contrast, wicked problems do not have a clear problem definition, and they are highly resistant to resolution. There is no definitive end point; problems tend to morph over time as they are changed by attempts to solve them. Values on the desirability of outcomes are not widely shared, and potential responses are subject to considerable debate. Recognition of these problems arises from civil society and not from experts, and experts are not allowed by stakeholders to dictate outcomes. Goals are negotiated, not determined analytically. Uncertainty about cause and effect is high, and there are no solutions *per se*, just better or worse potential outcomes. That is, wicked problems cannot be solved, but they can be managed.

Addressing wicked problems requires moving from a linear science model to a stakeholder model conducted at the system level and across academic disciplinary boundaries. Participation or engagement by those affected or who have interests in the management of the problem is important – stakeholders and experts collectively create new knowledge about the problem and management options.

Treating wicked problems as though they are tame in science and policy discussions can make difficult situations worse. Political gridlock is often the result. On the other hand, treating tame problems as if they are wicked is also problematic. Too much time and too many resources are spent attempting to solve the problem, and people become disillusioned and refuse to participate in unnecessarily long, complicated processes.

Wicked problem framing leads to different approaches and different outcomes compared to tame problem framing. Because science and technology alone do not suffice, collaborative approaches are more effective. This framing requires agencies to modify their procedures, practices and philosophies about their role in governance.

Key Points and Compelling Questions

Access, standing and influence

- Who should be involved in which governance discussions? Who decides and how?
- What are the appropriate processes for achieving collaboration? What is the catalyst? What is the forum?
- If issues of concern are perceived differently by individuals or groups because of differing values or knowledge, how is collaboration facilitated?
- How does the homogeneity or heterogeneity of a group affect its ability to collaborate effectively?

Goals

- How is success measured?

Agency

- How do we move governance discussions beyond language of solving problems to language of re-framing and managing problems?

Context

- Does the need to effect change make a problem more wicked than does simply seeking and sharing information? Are there degrees of *wickedness*?

Process

- How can we create a decision environment in which we have the luxury of time to spend framing problems before tackling them?
- The issue evolution process has been described as inform, norm, storm and conform. Do all issue discussions follow this path? Does it matter whether they are tame or wicked problems?

Workshop #3: Science, Literacy and Governance

At the third workshop, fellows explored how the understanding and use of science influences how we identify and contextualize problems, how we respond to problems, and what outcomes we want or expect. Presumably, ecological literacy is necessary for individuals to participate effectively in environmental and natural resource governance. However, ecological or scientific literacy is about more than just knowing ecology or learning about science. It is also deeply informed and shaped by whom we listen to, whom we trust, the kind of language we use, the way we interpret and process information, and the way we connect scientific knowledge to our daily experiences.

Environmental Science Literacy and Effective Governance

Synopsis of presentation made by Jonathon W. Schramm and Charles W. (Andy) Anderson, Department of Teacher Education, Michigan State University

Few students finish formal schooling with a sufficiently strong foundation to evaluate scientific evidence and arguments that they encounter in public discussions, especially when uncertainty is large. For scientific literacy to be improved, nonscientists must go through three transitions.

The first transition is in the type of discourse or way of reasoning. Using *force-dynamic discourse* or reasoning, nonexperts construe the events of the world as caused by actors (including people, animals, plants, machines and flames), each with its own purposes and abilities, or by natural tendencies of inanimate materials. To accomplish their purposes, the actors have needs that must be met or enablers that must be present. Force-dynamic predictions involve identifying the most powerful actors and predicting that they will be able to overcome antagonists and achieve their purposes as long as their needs are met. In contrast, scientists communicate using *principled scientific discourse* or reasoning. This discourse construes the world as consisting of hierarchically organized systems at various scales, and the systems are constrained by fundamental laws or principles (rather than powerful actors), which can be used to predict the course of events.

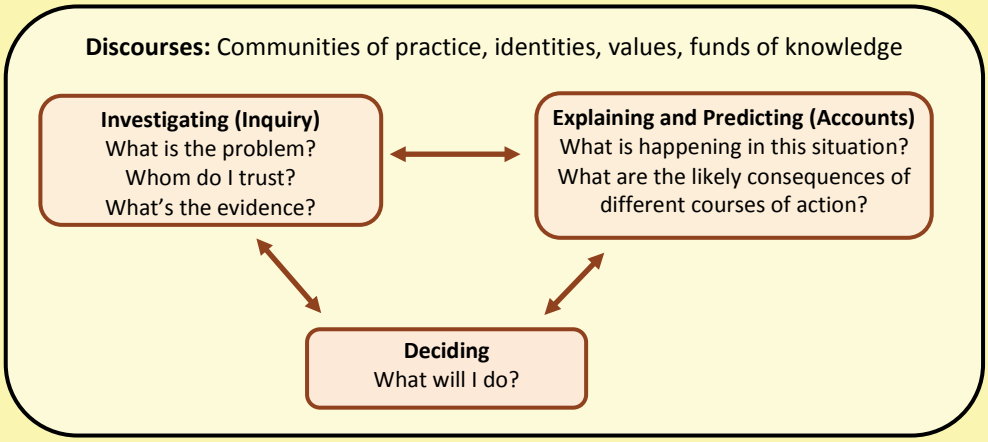
In the conceptual model of ecological literacy provided by Jordan et al. (2009), an ecologically literate person possesses: scientific habits of mind in ecology that promote the ability to reason about ecological science and issues; understanding of ecological connectivity and key concepts; and appreciation of the links between human actions and the environment.

The second transition is to a different way of accounting for how scientific knowledge is connected to action or inaction to anticipate outcomes or, more precisely, of explaining what is happening and what the consequences are likely to be. At the macroscopic scale, more principled ways of observing and interpreting processes are needed. Lower level scientific reasoning construes biological processes, such as plant and animal growth, on the basis of the needs of plants and animals. In contrast, higher level reasoning focuses on the functioning of complex systems involving interconnected biological and chemical processes. At the atomic-molecular scale, the ability to use subsystem models to explain how larger systems work is needed. Nonexperts learn facts about atomic and molecular systems but generally are unable to incorporate them into a model that helps to explain or predict outcomes. At the larger scale, nonexperts need to better understand how smaller scale processes can have cumulative effects.

The third transition involves the use of scientific standards for inquiry and argument. Learners at

all levels extend and make sense of their experiences by engaging in formal and informal investigations, either through firsthand investigations (relying on personal experience) or secondhand investigations (relying on reports from other people or the media). Scientific investigations rely on established methods of inquiry including giving priority to arguments from evidence rather than belief, a commitment to rigor in use of the scientific method and collective validation of findings (i.e., peer review). On the other hand, nonexperts' standards for investigations more commonly involve aspects of distrust (people are biased) or unwarranted credulity (truth is easy if you know whom to trust), accepting as trustworthy sources that offer information that seems reasonable or right on the basis of their experiences with the world.

Science literacy is important because reaching collective decisions about governance is hindered so long as experts and nonexperts practice different kinds of discourse, use different methods of inquiry, and go about understanding and explaining biological and chemical processes differently. Absent basic scientific literacy, people make decisions about lifestyle or policy without being able to predict the consequences. Alternatively, scientific literacy, or the ability to evaluate arguments from evidence and use them to explain and predict, enables people to evaluate trade-offs and make more broadly informed choices.



This framework from Schramm and Anderson connects the three key practices of scientifically literate decision makers.

Key Points and Compelling Questions

Access, standing and influence

- If educated people can get the science wrong, what are the implications for governance?
- Are there really science-based political discussions? Or are political discussions values-based?

Suggestion from a fellow: Might we construct a visual framework for governance decisions in the fashion of the Schramm and Anderson decision framework?

- How do we deal with discourse that is not informed by science?
- If stakeholders have a role in governance (framing), how is their role affected when issues move into the political process?

- We need to talk and think with greater nuance and not assume that a monolithic perspective exists.

From a fellows' work group: Governance involves setting goals (defining expectations) and creating performance standards that guide actions toward meeting the goals.

Goals

- Part of the policy-making culture in the United States is to act on scientific knowledge. Is this, in fact, a process for deciding what is important?
- Science is necessary but not sufficient in governance discussions.
- Science clarifies trade-offs.
- Scientists may agree on the process of discovery but disagree on the implications of the findings.

Agency

- How is it decided who does the framing?
- Knowledge and reason cannot win over power and fear.

Implementation resources and guidance

- What institutional structure or expectations exist for connecting science to the polity?
- Is norming (framing) a role of government? Or a product of collaborative governance?
- Science as the honest broker broadens rather than narrows options.
- Science aims to reduce uncertainty, but rarely does it eliminate uncertainty.

Context

- If, within the context of governance, values have been agreed upon, is there more space for science in the discourse?

From a fellow: Before setting goals for environmental and natural resource quality, a thorough assessment of natural and social systems is necessary.

Process

- Policy discussions often pit science against values rather than use science as a tool to inform on ways to reach desired outcomes that are consistent with values.
- Might the actual content of science be less important than what science offers in how to think about problems?

Workshop #4: Ethics, Expectations and Governance

The fourth workshop provided an opportunity for fellows to focus on how people engage with the environment and natural resources and what informs their decisions. The topic was ethics in governance, especially the interplay between ethics, attitudes, expectations and behavior in creating and responding to governance.

The Promise and Peril of Ethics within Environmental Governance

Synopsis of presentation made by M. Nils Peterson, Department of Forestry and Environmental Resources, North Carolina State University

Governance, defined as a group's processes and mechanisms for direction, coordination and control, is evolving, with important implications for natural resource management. Equating governance with government without involvement of civil society can lead to a costly lack of citizen oversight. In response, demand for greater citizen involvement in governance has tended to result in a process in which a public entity decides on an action, announces the decision, receives public feedback, and then defends (and implements) the previously decided-upon action. This decide-announce-defend model of public involvement often creates public cynicism and exacerbates conflicts.

How to make public engagement in governance more productive has been the subject of considerable research, but the interplay between ethics, attitudes, expectation and behavior has received little attention.

Peterson introduced the "trinity of voice" model. As described by Senecah (2004), the trinity of voice includes access, standing and influence, which can be used to frame effective engagement in governance. In the fellows' evolving framework, trinity of voice addresses the question of "who decides."

In general, research suggests that pro-environmental attitudes are more common among more educated, urbanized and affluent groups. However, environmental attitudes are not good predictors of environmental behavior. Some researchers have found relationships between some demographic variables and pro-environmental behavior — female, better educated and higher income members of the population appear more likely to engage in pro-environmental behavior – but again demographics explain only a small fraction of variation in behavior.

What is clear from the research is that environmental behavior is context-dependent. For example, citizens of poorer countries may have stronger pro-environmental attitudes than citizens of wealthier countries and may be as willing to make economic sacrifices for environmental protection because they are more likely to face immediate consequences of degradation. Additionally, education and pro-environmental attitudes have been linked to environmentally harmful behavior in amenity-rich regions. An important implication is that more research on predictors of environmental behavior will not allow policy makers to accurately predict public responses to environmental policy or to change those responses by manipulating variables such as ecological literacy.

Because environmental and natural resource governance operates in the sphere of wicked problems, values, morals and ethics are part of the process. However, making ethics an explicit part of governance discussions faces two challenges. First, highlighting the moral dimension of environmental governance may exacerbate conflict. Stakeholders often use ethical arguments strategically to bully one another and promote their own agendas rather than to logically delineate between right and

wrong. Second, traditional uses of applied ethics may encourage positional bargaining and neglect stakeholders' interests; in fact, people may simultaneously hold competing ethical perspectives or hold different ethical perspectives toward humans, animals and objects.

Democratizing moral conflicts is one opportunity to address these challenges. Avoiding moral conflicts may benefit from explicitly considering ethics in the context of the governance process rather than as a mechanism of control or a way of determining the right direction. One example of such democratization is Rawls' model for distributive justice. Rawls (1971) argues that principles of justice should be based on what most reasonable people would agree to if they were forced to decide from behind a veil of ignorance. Thus, if stakeholders deliberated governance processes while imagining that societal roles would be completely revised and they don't know where they might find themselves after the shuffle, most people would agree to processes that balance liberties and inequalities across all members of the population. This approach relies on debate and dialogue.

Using the distributive justice framework to make ethics explicit in governance reduces the focus on rightness and wrongness of outcomes, but it does not address the tendency of ethics to encourage a focus on positions. Positions reflect how someone believes an issue should be handled or a conflict resolved. In contrast, interests reflect the needs that must be met before a decision is considered satisfactory. Explicitly applying ethics rooted in pragmatism may shift the focus from positions to interests. Let's use governance related to land use decisions as an example. A planning rule based on pragmatic ethics would focus on stakeholders' interests; development decisions made under the planning rule should create outcomes experienced as good by stakeholders. Since the exact outcome of the planning rule cannot be known, pragmatic ethics would not determine a single right course of action.

What is pragmatism?

- There are no innate beliefs, intuitions or other indubitable "givens" upon which our knowledge is built, or in terms of which the truth or meaning of concepts can be analyzed.
- "What is good?" is really "What is experienced as good in the interaction of the organism with its environment?"
- The first question about value is not "What ought we to desire?" but rather "What do people in fact desire and why?"
- Based on the view that value arises in a dynamic, infinitely complex system of organisms and environments, a basic tenet of pragmatic ethics is that the rightness of an action is largely system-dependent.
- Ethics is an endeavor like creatively making our way through a swamp: after many trips through the swamp, we arrive at the means that serve best. It may not be the best tomorrow, as both swamps and values shift continually.

Source: Parker (1996).

Rather, they would dictate an adaptive approach that would try a variety of planning models until the outcomes began to meet the stakeholders' interests. This approach is amenable to wicked problems, which are often not understood until after responses are formulated.

What Constitutes Voice?

Access means opportunity, potential and safety; sufficient and appropriate opportunities to express choices and opinions; and sufficient and appropriate support (e.g., education, information) to understand process in an informed, active (not reactionary) capacity. Grammars of access include: attitude of collaboration, convenient times, convenient places, readily available information and education, diverse opportunities to access information and education, technical assistance to gain a basic grasp of the issues and choices, adequate and widely disseminated notice, early public involvement and ongoing opportunities for involvement.

Standing means civic legitimacy, respect, esteem and consideration. Grammars of standing include: opportunities for dialogue and deliberation, active listening, courtesy, early and ongoing voice, clear parameters of expectations for authority of participation, clear parameters of investment, collaborative room arrangements, reflections of genuine empathy for the concerns of other perspectives, dialogue, debate and feedback.

Influence means a participant's ideas are respectfully considered along with those of other stakeholders and she or her representative is part of the process. A participant's idea may or may not be incorporated in whole, but access and standing allowed open consideration of what's at stake for everyone as priorities were set and solutions explored. Influence does not mean that a participant *succeeds in convincing, strong-arming or manipulating others to achieve her ideal outcome or position.* Grammars of influence include: meaningful decision space, transparent process that considers all alternatives, opportunities to meaningfully scope alternatives, opportunities to inform the decision criteria, and thoughtful response to stakeholder concerns and ideas.

Source: Senecah (2004).

Key Points and Compelling Questions

Access, standing and influence

- Are people dissatisfied with governance processes because they perceive themselves as losers rather than winners in the outcome? If they help to design the process, does that matter?
- The outcome of explicitly bringing ethics into a governance discussion will depend upon when it occurs – before or after positions have hardened – and the scope of the problem – tame or wicked.
- How do ethics and morals affect assumptions?
- If ethics is about the greater good, whose conception of the greater good gets accounted for?
- What does participation mean?

Agency

- Where do information technology and social networks fit in collaborative governance?

Context

- If ethics do not conflict, does that mean a problem is not wicked?
- Context matters.

Process

- Be careful when talking about *the process*; there are different types of and layers to process.

Workshop #5: Assessment and Monitoring

The fifth workshop turned our focus to assessment and monitoring. Once goals have been established for environmental and natural resource governance, assessment and monitoring answer questions such as:

- Are goals being met?
- Is some sort of management intervention necessary?
- Are interventions having the desired impact?

A central point of discussion for this workshop was the roles that both experts and nonexperts can play in monitoring programs.

Environmental and Natural Resource Monitoring

Synopsis of presentation made by Michael McDonald, deputy national program director for Safe and Sustainable Water Resources, Office of Research and Development, U.S. Environmental Protection Agency

Effective governance requires high quality, accurate information that can be used to make informed decisions. Monitoring provides the data needed to produce such information. Environmental monitoring collects data to describe the chemical, physical and biological quality of the environment. It consists of three critical elements: a statement of the goal of the monitoring, an appropriate monitoring design and appropriate indicators.

Determining the status of and observing changes in ecosystem and natural resource conditions is a typical goal of environmental monitoring. Information based on monitoring data can provide a baseline for environmental or resource conditions at a point in time. Ongoing monitoring may demonstrate progress of protection or restoration efforts or indicate the need for changing policy or management strategies. Stating the objectives for monitoring activities precisely and quantitatively is a key component of monitoring.

Part of the purpose for monitoring and assessment is to evaluate the consequences of human actions. Fellows noted that humans may affect natural and social systems in both positive and negative ways.

The actual design of monitoring programs depends on the spatial and temporal scope of the questions to be answered. Three basic types of sampling designs are common: census, targeted and probability surveys. Census designs monitor each site or member of a target population individually and are typically expensive and not always efficient. Targeted monitoring produces data on the status and trends at a targeted site with statistical confidence on estimates for that site, but general inferences to other sites cannot be made. Probability monitoring (survey) design is more complex, but it provides a cost-effective, representative and scientifically defensible estimate of the condition of the environment or resources over a potentially large area with a relatively small number of samples.

Compliance monitoring of regulated facilities is an example of targeted monitoring done to assess compliance with performance standards. Fellows concluded during session 3 that setting performance standards is part of governance. Is setting performance standards a role for government?

Environmental indicators describe conditions and can be used to diagnose the cause of environmental change. Causes of variability in indicators should be understood so that extraneous factors can be distinguished from true environmental signals. Indicators may reflect biological, chemical or physical conditions in the system of interest.

Historically, chemical indicators have been used to monitor the health of aquatic systems, but the large number of chemicals that could find their way into water bodies has made this approach increasingly costly. Also, aquatic environments increasingly suffer from alteration of hydrologic patterns, introduction of invasive species, habitat alteration and broader landscape alteration. As a result, using biological indicators has become a more common approach. Biological indicators can describe the current condition of the system as well as what happened in the past.

Interpreting indicators requires the establishment of threshold values or reference conditions that distinguish acceptable from unacceptable conditions. These criteria may be based on thresholds documented in scientific literature, regulatory criteria, historical records, experimental studies or selected reference sites.

Governance involves decisions that define expectations and verify performance. Such decisions benefit from information on current conditions of ecosystems, whether conditions are improving or declining, what stressors are associated with declines, and what policies and management practices are working to protect ecosystem health. Monitoring programs can be designed to answer these questions. New monitoring technologies and approaches for collecting data for indicators are continually developed, often focused on reducing the costs of monitoring or enabling monitoring in otherwise inaccessible sites. Citizen monitoring can increase the number of monitoring sites, the frequency of sampling, or the overall scope of data collection and interpretation, although concerns about data reliability have been raised. Finally, collecting more data does not in itself provide more information; analysis and interpretation of the data are required. Ensuring that changes in technologies or monitoring protocols allow for cross-comparisons and calibrations of the new techniques with the old will ensure that older and newer data can be linked and changes in conditions can be accurately assessed.

Citizen Science and Environmental Monitoring

Synopsis of presentation by Rebecca Jordan, Department of Ecology, Evolution and Natural Resources, Rutgers University

Resources for environmental management professionals to collect and analyze data across large time and spatial scales are limited. One option for growing an environmental workforce is to engage trained volunteers. Issues to be considered if volunteers are involved in environmental monitoring include: what data are to be gathered; what incentives exist to encourage volunteer participation; the validity of the data; and how programs can be sustained.

Engaging volunteers in environmental monitoring may also improve the volunteers' understanding of environmental science. Researchers have observed that the general public has limited ability to understand science and transfer ideas to personal behavior, which can lead to public detachment and reliance on others to investigate scientific solutions for technical, health and environmental problems. Citizen science, defined as programs where the public intentionally engages in partnerships with scientists to collect data to be used in real-world settings, is one way to improve scientific and conservation literacy. Citizen involvement may be contributory (such as collecting data according to a protocol described within a traditional scientist-driven project), collaborative (perhaps also helping design data collection methods or conducting data analysis) or co-creative (also helping define the research question, interpret data and draw conclusions).

Examples have been reported in which citizen science initiatives resulted in increased civic awareness, greater involvement in local resource issues, the creation of scientific data sets and roles in shaping environmental policy.

Though data collection projects can create in citizen science volunteers increased and lasting understanding of content and awareness of issues, and participants often report a greater appreciation of science, general instruction does not generally change how participants view the practice of science or their ability to reason scientifically about problems.

Because it is not clear what content knowledge is necessary for participants to understand scientific procedure and exercise broader scientific reasoning, questions remain about whether educational goals should be part of volunteer data collection efforts. Additionally, there are questions about whether participation in citizen science engenders in volunteers a perception that they can effect environmental change. New awareness of the severity of environmental problems may overwhelm participants, or if the problem exists at a sufficiently large scale, participants may feel they have little control over outcomes. Engaging participants up front through collaboration or co-creation and participation in sustained initiatives increases the likelihood of changes in personal action, policy and management.

Data validity is a major concern for resource professionals and scientists. Not all projects are suitable for engaging volunteers. Accuracy of volunteer participants has been tested in a number of studies, and results are mixed. Generally, the degree of accuracy is a function of the amount of training volunteers receive, the type of sampling being done and how long volunteers are engaged (i.e., their experience).

Financial resources, especially for grant-funded activities, are often most available at the beginning of a project when the greatest amounts of time and financial resources are necessary. Continuing a program over the long term requires a lead organization or person to serve as a point of contact and to manage training and data collection. Numerous online tools have enabled greater automation of training and data validation. Partnerships between government agencies and nongovernmental organizations and environmental hobby clubs have often helped to establish a small but very motivated group of volunteers to serve as citizen science leaders. Often, these are the individuals who help sustain projects.

Key Points and Compelling Questions

Access, standing and influence

- If environmental or natural resource conflicts end up in the courts, how will data collected by nonscientist volunteers be weighed?

Goals

- How are thresholds or reference conditions selected? How good is good enough?
- Decisions made by individuals about actions that have environmental or natural resource impacts will be based on what individuals value and what they perceive their impacts to be. How does scientific literacy affect this?
- Recognition among stakeholders and management agencies that they share common interests and have common goals will help build trust.

Agency

- Engagement and collaboration require attention to ways that citizens view problems and whether they believe that they can effect behavioral changes for themselves and others.
- How does citizen science gain legitimacy within environmental and natural resource governance?

- What motivates volunteers? Experience suggests that motivation is highly individualistic. Maybe a few select leaders can motivate groups.
- If citizen volunteers are to be engaged in assessment and monitoring, who is responsible for doing training to prepare them?
- If volunteers become disillusioned or overwhelmed when their monitoring reveals environmental damages, how will that affect their behaviors?

Context

- Some members of the public may hold that change is inevitable; it's not that degradation is good, but nature is dynamic, violent and messy.

The question of legitimacy arose repeatedly during fellows' discussions. Who validates the involvement of volunteers or stakeholders? Having legitimacy is about having **agency**: desiring outcomes, forming intentions and acting creatively. Agents are empowered by structures to coordinate actions with and against others, to form collective projects, to persuade, to coerce, and to monitor the simultaneous effects of their own and others' activities (Sewell, 1992).

- How does scientific literacy affect the way that monitoring results are received and interpreted by the public? Would greater scientific literacy reduce negative pressures on agencies responsible for monitoring?
- Trust is important.

Stream fishing in fall, Michigan; Michigan Travel Bureau

Workshop #6: Alternative Models of Governance

The goal for session 6 was to explore alternative models of governance that have evolved in other locations. What has worked well? What has not?

The Governance We Deserve: Creating an Ecosystem for Innovative Solutions

Synopsis of presentation by Wendy Willis, interim director, Policy Consensus Initiative/National Policy Consensus Center

A host of problems have led to calls for changes in how governance is done. Among these are siloed decision making across and within organizations; large institutions that are slow to respond to problems; litigious problem solving; a dissatisfied public and an endless loop of negative feedback; and stunted creativity. These are problems of institutions, a function of the way the system is built and the legal structure that supports it, not of personalities. As such, they require institutional solutions. As alternative governance models are sought, evidence indicates that the days of single investment opportunities are over – collaborations are necessary. Environmental and natural resource governance is the furthest along and offers the most innovative examples of collaborations among industry, nongovernmental organizations and government.

Collaborative governance came out of labor dispute resolution and techniques used to build consensus. The language of dispute resolution is becoming dated, but key principles of transparency, inclusiveness and shared decision making remain important. The process of collaborative governance is about making space for changes, and it can be disorderly and messy. Generally, the necessary change is highly experimental and nascent and requires problem solving, innovation and adaptability. Experimentation by government and allowing others to experiment are necessary.

A spectrum of collaborative governance models exists. In the civic engagement model, members of the general public are represented at the table when there is a decision to be made that will have broad public impacts. In the policy development/dispute resolution model, the goal is agreement about a particular issue or problem among people with disparate interests. The intergovernmental collaboration model is growing in importance, often involving working to get ahead of problems or sharing scientists across agencies and organizations.

A collaborative process is likely to be appropriate when:

1. The issues are of high priority, there is an opportunity for action, and a solution is needed.
2. Many levels of government, along with other sectors of society, need to be involved. Parties recognize that they need one another's agreement and buy-in for action to be taken.
3. A fragmentation of responsibilities and authorities among government agencies and other organizations stands in the way of solutions. Policies, programs and resources must be integrated to address the problem or issue.
4. A sponsoring agency has the authority, but not the power, to make and implement a decision.
5. The resources exist to support a collaborative process. The sponsor can afford the staff time and/or the cost of hiring a facilitator and technical experts, if needed.
6. Political leadership supports the process, and the timing is favorable.

Source: Policy Consensus Initiative (2007).

With the collaborative implementation model, the goal is not necessarily about reaching agreement; generally there is already a rough agreement, and the question is how to get the resources together for implementation or how to speed up the process. Finally, the collaborative systems model is useful when new ways of working together are needed. Collaborations can span several projects over a long time frame; partners are committed to working through all the aspects of a project.

When considering how to create the conditions for effective collaboration, four levels of screening are necessary. First, not all decision making or problem solving will benefit from collaboration. Second, is there a fatal flaw, such as a critical player or resource that is unavailable, a critical agency or actor unwilling to implement a solution, an emergency that requires immediate action, an issue framed as a legal or moral right, a polarized stakeholder, a key party has better options or inadequate resources to complete the process? Third, which collaborative model is most appropriate? The answer depends on the core issue, the timeline, the presence of conflict and the role of the public. The final level of screening evaluates who should be involved and how. Conducting a formal assessment before beginning a collaboration can reduce potential trip-ups in the process. Bad processes make people less likely to engage again.

Examples from across the spectrum of collaborative governance models can be reviewed at: http://policyconsensus.org/casestudies/index.html.

Key Points and Compelling Questions

Access, standing and influence

- The institution is created in response to the problem, not the reverse.

Agency

- How does a state agency become willing to give over some authority and control over the process?
- Collaborations require an institutional response; for example, a representative from a state agency stops being an advocate for the agency and starts being an advocate for the collaborative process.
- How can creativity and innovation be fostered?
- How is legitimacy for collaborative processes and stakeholder engagement achieved?

Context

- Context matters.

Process

- Consensus building is not always a pleasant process; participants must have a tolerance for failure.

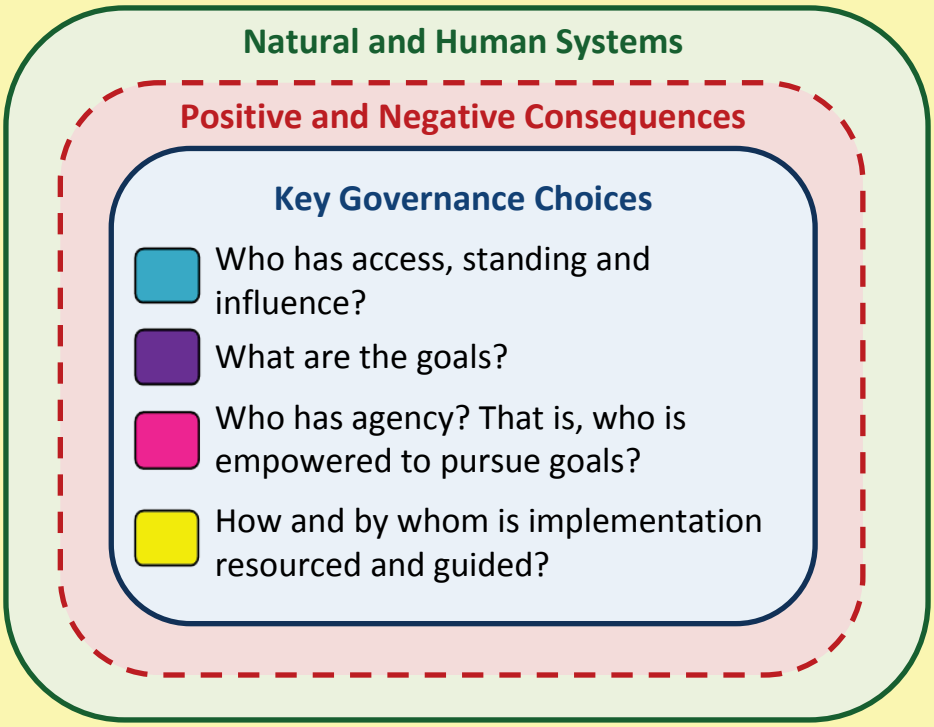
Framework for Conversations about Governance

The seventh workshop focused on the emerging framework for conversations about governance. In particular, a principal goal for the session was to evaluate and refine the framework by applying it to a series of individual case studies.

The framework developed over the course of the first six workshops is reproduced below. The language used to capture the key choices in the framework came from fellows, from presenters and from literature. The framework incorporates:

- The key choices.
- The understanding that these choices are made within the context of natural and human systems.
- The understanding that decisions and actions driven by these choices will produce a myriad of consequences for natural and human systems.

The blue text boxes in the previous pages highlight points of discussion, observations and questions that provided the building blocks for this framework to guide conversations about governance.



Framework for Conversations about Governance

Applying the Framework

The framework that evolved over the course of the workshop series was refined using conclusions drawn by fellows as they used it to answer specific questions about a set of case studies. The six case studies represented, generally, three different governance models. Each case study was written by a fellow and described activities with which he or she has been involved.

The first two case studies are examples of citizen groups initiating stakeholder involvement in governance questions related to specific community issues. In these two cases, an unpopular public decision appeared imminent, and in each case stakeholders sought and received opportunities to broaden and lengthen debate around the decisions.

The second two case studies describe efforts to develop programs within the context of existing formal government structures. In these two cases, change was desired, but stakeholders did not perceive an imminent crisis. Instead, in these cases stakeholders sought different ways of achieving desired outcomes.

The last two case studies describe examples of networking as a governance model. In each case, networks were formed in response to concerns that were not being adequately addressed by formal government structures. The networks cross formal government jurisdictions to address problems not confined by political boundaries.

Discussions of the case studies were connected to earlier workshop topics through deliberations around five questions:

1. What were the context and perceived problem in the case?
2. Was there an initiator, champion or catalyst in the case? Who or what?
3. Does the case represent a tame or a wicked problem? What makes it tame or wicked?
4. What were challenges of accessing and/or using science? How did or might science inform or make a difference in the situation or choices made?
5. What ethical challenges exist(ed) related to determining and achieving desired outcomes? How were ethics explicitly a part of the discourse, or were they not?

The framework was evaluated and tested within the context of the case studies through responses to these additional questions:

1. How was voice (access, standing and influence) given? How was voice exercised?
2. How was the goal(s) established? By whom?
3. Who was given agency? That is, who was empowered to act in response to any performance standards, incentives or disincentives that were established?
4. What resources were provided (financial or other types) and by whom to support both governance and implementation?
5. How did context matter in this case?
6. Does the approach described in the case represent a viable example of environmental and natural resource governance? Why or why not?
7. Does discussion of this case suggest that any key choices are absent from the framework developed so far? If yes, what are they?

Though fellows' applications of the framework focused largely on the four principal types of choices that surfaced during earlier workshops, their work in this session also confirmed that many additional considerations will be part of governance discussions and will affect the four key choices. By and large, these considerations address the context within which governance is being discussed and the processes agreed upon for the discussion as well as for implementation once decisions are made.

Observations about context include:

- Most governance choices are not made with a blank slate. How the four questions are answered inevitably will be influenced

by structures already in place, even if those structures are changed when new choices are made.

- Resource constraints are real, and how burdens are distributed will influence key choices.
- The social capital that accounts for critical aspects of trust, transparency and accountability both affects and is affected by governance choices.

Observations about process include:

- Governance entails not only what choices are made but also the process by which they are made.
- Governance is dynamic and organic. The framework does not imply that things are settled once the choices are made. These are questions that will resurface regularly as successes and failures are evaluated.
- Governance processes and outcomes will benefit if an initial assessment of the status of natural and human systems also recognizes uncertainty and dynamics that may be outside the control of the governance system.
- Multilateral communication is an important part of the process.

Case Study #1: Richland Township Proposed Gravel Mine

A group of community residents was alerted that the township was considering approving a special use permit for an 850-acre gravel mining operation in an area of prime farmland. A few residents attended a Richland Township Planning Commission meeting, where it appeared that the township supervisor, his staff, and the planning commission felt they had very little say in the matter and that the application was, essentially, a "done deal". A small group of concerned citizens organized quickly to identify pertinent issues, stakeholders and expertise needed to explore the identified issues. A series of well-attended community information sessions was held to inform the citizenry about the gravel pit proposal, the various issues with the proposal and the process the township was going to follow to approve the special use permit. What followed was over a year of planning commission meetings, each attended by hundreds of concerned citizens, where the various stakeholders presented their concerns about the proposal. Each meeting had a theme: safety and traffic; environmental impacts, including air, surface water, groundwater, wetlands and potential conservation areas; gravel mining and the economy; and economic impact of a gravel mine on a community. Experts were hired to elaborate further on various issues, including hydrogeological considerations, traffic safety and economic impacts. After almost a year of meetings and deliberations by the Richland Township Planning Commission, the gravel company applicant withdrew its application for the special exception use. This action was taken soon after the W.E. Upjohn Institute issued a report on the negative impact a gravel mining operation would have on local property values for years to come. However, the company maintained that it withdrew because of market conditions for gravel.

Applying the framework: what we learned

- **Resources. Replication of this model is dependent on citizen investment of significant time and money.**
- **Voice. Creating or providing voice through access, standing and influence is difficult; having a neutral forum is important for sharing information and discussing its implications.**

Case Study #2: Redridge Dams Study Group

Stanton Township, in the western U.P., owns the Redridge Dams, which impound the (Little) Salmon Trout River. These dams hold historical engineering significance and represent copper stamp mill community heritage, and the impoundment has provided quiet-water recreation for generations. Around 2000, the safety of these dams came into question, posing complex decision-making challenges to one of Michigan's least densely populated and poorest rural townships. By 2006, a swirl of controversy affected the township board as it neared the decision to remove and sell the steel dam. After hearing from two consultants with ties to the community who offered private, non-profit assistance for dam stewardship, the Stanton Township Board of Supervisors gave six months for a "preliminary feasibility assessment and recommendations" for the dams and impoundment. These consultants informally engaged history and engineering faculty members at Michigan Technological University, seasonal residents, a land trust, another consulting company and the Township Recreation Committee, and connected with the diverse state and federal agencies involved in dam management, ecosystem services and history for technical information. The group quickly conducted technical and historical research, an inter-agency meeting with state agencies, site visits with stakeholders, and an assessment of residents' and recreationists' perceptions and uses of the area. The group also worked with pro bono consultants to prepare the preliminary feasibility assessment. At its August 2007 meeting, the township board accepted the conclusion that the steel dam has significant historical, cultural and aesthetic value, and that the township properties deserve further study. The board authorized the Redridge Dams Study Group to collect data and propose a preferred alternative for managing the dams and associated properties. After a year of considerable public involvement in a series of events, the study group recommended the concept of a community heritage park, and the new five-year recreation plan for Stanton Township incorporated this and other findings. The study group continues to link the township to expertise to inform decision making, but how the state's dam safety program will respond remains an open question.

Applying the framework: what we learned

- **Role of science. Issues about the adequacy of science in the decision process may be as much about a lack of translation and explanation of its use as about whether it is used.**
- **Voice. Even with extensive citizen involvement and work by volunteers, including work that the state had insufficient resources to undertake, uncertainty about whether state agencies will choose to recognize and benefit from citizen efforts makes viability of this approach unclear.**

Case Study #3: Michigan Agriculture Environmental Assurance Program

Regulatory focus on agriculture's contributions to water quality impairment increased in the late 1990s. The U.S. Environmental Protection Agency (USEPA) was working with the U.S. Department of Agriculture (USDA) on a new strategy for regulating concentrated animal feeding operations (CAFOs). Agriculture organizations, academia and government agencies were increasing communication with farmers about environmental management on farms, each commonly providing a different message and different requirements. In 1997, directors of the Michigan Department of Agriculture (MDA) and Department of Environmental Quality (DEQ) signed the Pollution Prevention Strategy for Michigan Agriculture, which called for the development of a proactive environmental assurance program for farmers. In 1998, the state departments, in partnership with agricultural organizations, convened the beginnings of a partnership called the Michigan Agriculture Environmental Assurance Program (MAEAP). Groups involved included farmers, agricultural groups, Michigan State University (MSU), MDA, DEQ, USDA Natural Resources Conservation Service and conservation groups. The group created a mission statement, bylaws and a set of goals. The program was chaired by representatives of Michigan Farm Bureau and MSU. Farmer focus groups were convened in 1999 to establish farmer direction of the program. The MAEAP partnership was formalized on December 8, 2000, with leaders of the partnering organizations signing a partnership agreement. The partnership created the nation's first state-developed comprehensive nutrient management plan outline for use on livestock farms and later used a systems approach to address all agriculture environmental risks. Beginning with an education requirement, farmers were acquainted with risk management tools. After assessing on-farm risks, farmers could voluntarily ask that MDA perform an audit of the managed on-farm environmental risks; that was called verification. As of 2011, there have been over 850 on-farm verifications for which farmers proudly exhibit verification signs. Gov. Snyder signed P.A. 1 and 2 of 2011 to codify MAEAP with formalized standards, regulatory incentives and direction to MDA to establish a water quality monitoring program to assess the benefits of MAEAP to water quality.

Applying the framework: what we learned

- **Science. Science cannot answer the question "How good is good enough?" The answer will reflect value judgments about desired outcomes.**
- **Goals. Having a clear statement of goals and agreement on the goals contributed to a successful outcome.**
- **Timing. This case did not reflect a perceived crisis, so considerable time was spent on the details. When a crisis emerges, limited time exists for conversations about the key choices.**

Case Study #4: Green Infrastructure Planning

In 2004, a citizen volunteer undertook the task of developing a green infrastructure plan for his township. Oakland County Planning assisted in developing the process, and the volunteer prepared to lead the initiative. The green infrastructure initiative was intended to protect wildlife habitats in the community and map out the areas of concern to prevent fragmentation of habitat as development occurs. The process was started with a short series of planning charrettes with representatives of as many community groups as possible. The group completed a map showing the prime areas to be protected and the important connecting links between them. Three conservancy members verified the map by exploring every road in the township. The final phase of the initiative was to include the map in the planning process. A planned complete rewrite of the zoning ordinance was undertaken, and the shared vision of the planning commissions and the initiative volunteers was to incorporate the green infrastructure map into the new ordinance with requirements and as a supporting document. During the lengthy ordinance re-writing process (several years), economic conditions in the township deteriorated. Also, membership on the planning commission changed, and as the composition of the group changed, it started to favor removing restrictions as though they were responsible for the township's economic plight. When the ordinance rewrite was complete, the green infrastructure map was relegated to a role as a supporting document with no planning requirements stipulated.

Applying the framework: what we learned

- **Agency. Absent an explicit agreement about empowerment, agency was lost when context changed.**
- **Goals and implementation. Without a clear statement of agreed-upon goals, implementation was not fostered when context changed mid-course. Context evolved, but agreement on goals did not.**

Case Study #5: Stewardship Network

Natural communities across our country are deteriorating. This deterioration threatens the ecological, economic, cultural and recreational support that these systems provide for our lives. Stewardship, the careful and responsible management of natural resources entrusted to our care, can protect and restore natural communities and their core ecological and economic functions. A decade of budget constraints and the recession have not only deprived government agencies and private landowners of the capacity to adequately protect and restore the land in their control but have inhibited their ability to innovate or explore new approaches. The Stewardship Network was created to increase the capacity of organizations and individuals to protect, restore and manage our natural lands and waters. As a 501(c) (3) nonprofit organization, the network facilitates collaboration of public and private property owners who together preserve hundreds of millions of acres of natural lands and waters. The network's approach and services are unique – providing science-based training to small-scale, geographically based "clusters" made up of private and public landowners working to improve the stewardship of the natural communities in their care. The network tailors training, technical and contract/project management services to each cluster's needs, increasing clusters' capacity for effective conservation programs. By encouraging networking, information sharing and collaboration, the network creates efficiencies and economies of scale among the partner organizations. The net result is better stewardship across regions throughout eco-systems, with tangible on-the-ground results. The efforts of the network over the past five years have resulted in the creation of eight clusters across the southern half of the Lower Peninsula, with expansion of additional collaborative stewardship underway into the Upper Peninsula and northern Lower Peninsula and across state boundaries to northwestern Ohio and northeastern Indiana. Among the more recent accomplishments, in 2010, more than 10,000 participants from the network's 150+ active partner organizations contributed over $2,250,000 in volunteer stewardship work.

Applying the framework: what we learned

- **Goals. The network has an overarching goal, but specific implementation choices are made in local contexts.**
- **Agency. In this network, local groups assume agency, and it is legitimized through successes.**

Case Study #6: RE-AMP Network to Reduce Greenhouse Gases

The Midwest is responsible for one fourth of all greenhouse gas emissions in the United States. Its high emissions make it an obvious target for greenhouse gas reduction, and its large manufacturing infrastructure uniquely situates the region to become the builder of the new energy economy. Work by foundations and nonprofits in the Midwest to encourage energy efficiency and renewable energy was disparate and uncoordinated. Systems mapping was begun by an initial group of people to work toward a new structure and a common goal: reduction of greenhouse gas emissions. Next, the levers needed to change the current system were identified, and working groups were created to work on specific target areas such as energy efficiency. This step was completed through group assessments of work being done at various levels in the Midwest and surveys identifying the most effective courses of action. A network called RE-AMP was formed, comprising nonprofits and funders who agreed on the commonly shared overall goal and who work in at least one of the working group subject areas. Network participants may not all share the same low- or mid-level goals across work groups, but they have all committed to the overall goal of greenhouse gas reduction. This commitment helped to avoid future conflict over tactics and opinions at the ground level; consensus is needed for group action but not necessarily for individual action. The nonprofits and funders work with one another through the working groups and also broadened the network by including "caucuses" of stakeholders to maintain communication with major interested parties. A policy of honest and open yet always civil discussion was adopted. The network has shared many accomplishments toward the overall goal: knowledge and resources have been shared across the Midwest, coordinated efforts have become increasingly effective, and energy efficiency portfolio standards have been adopted in six Midwestern states.

Applying the framework: what we learned

- **Goals. The network is successful because, even though member organizations have individual values and goals, they all agree explicitly to contribute toward meeting the network goal.**
- **Role of communication. The framework does not explicitly account for the importance of open, multi-lateral communication channels. However, constant communication, sharing of information and feedback, even in the face of value differences, legitimizes members' participation and builds relationships.**

Key Points

The case study discussions highlighted a number of ways in which the viability of governance models depends on the extent to which the four central questions are explicitly considered and how both context and process are formalized in the conversation.

Access, standing and influence

- Access, standing and influence are not equally distributed across concerned citizens. Successful models will include a formal process and leadership for ensuring access, standing and influence.
- If access depends on knowledge levels of stakeholders, stakeholders will be starting at different points. Leadership in governance discussions and processes will involve making information and education available.
- Network models make access, standing and influence explicit through network membership. Yet, at some point, decisions must be made about who will and who will not be included in the network.

Goals

- A clear process for setting goals and the rules for changing those goals need to be understood.
- Success of network models requires agreement on overarching goals.

Agency

- The question of who has agency is critical. Whether individuals or groups are able or willing to participate in governance discussions depends on whether they are able to insert themselves into the process legitimately or whether they are given agency (authorized to participate). Agency, or legitimacy, can come from statute, or it can come from evidence of successful participatory processes.
- Sometimes successful governance requires a government agency to give up some control or authority. Often issues of control exist between and among state agencies, as well as between agencies and other parties. Trust will be key to resolving control issues.
- Agency exists at many levels. Those empowered by governance choices may find that their work benefits from empowering others.

Implementation resources and guidance

- The availability, source and allocation of financial resources for governance and for implementation will be subjects of conversation. More participatory governance will require more resources. However, where the resources come from will matter, especially to how that affects trust among participants. Decisions about how to allocate scarce resources are an important part of governance; allocations reflect the values of those involved, and conflicting values may make allocation decisions difficult.
- Within a model of networked organizations, partner organizations can learn from one another and use lessons to enhance participation in other circumstances. However, in a network model, partners are forced to consider issues but are not required to take responsibility for outcomes.
- Successful governance requires legitimate and sustainable monitoring and assessment of implementation and outcomes.
- Scientific knowledge can help to frame a problem and can clarify trade-offs, but the availability of that knowledge alone will not solve a problem.

Context

- An approach to governance that works in a particular instance may not be generally applicable. Similarly, if context changes, then previous decisions may no longer be appropriate or may be unacceptable.
- The framework for governance discussions assumes there is no crisis; a crisis allows little time for such discussions.
- The scope of the issue and the homogeneity of stakeholders will influence whether a problem is tame or wicked and what governance approach is acceptable.

Process

- Governance processes will be subject to the insertion of self-interests by the participants. Early decisions about process will require attention to how such complications will be managed.
- Building trust among participants is important and will take time.
- Governance choices require explicit attention to the process by which transition from the current governance model to the new model will occur.

Family canoeing, Grand Traverse, MI; Traverse City CVB

VI. Engaging in Critical Conversations about Environmental and Natural Resource Governance

The fellows program sought to begin the governance conversation among a group of leaders from around the state and to arm those individuals to convene and lead subsequent conversations in their communities. This section reviews the structure of the fellows program and provides a general overview of how the program was designed to model a few select engagement approaches. This information may be useful to fellows as they initiate similar conversations in their communities.

The Fellows Program

Each workshop during the Environmental and Natural Resource Governance Fellows Program followed a basic format:

- **Opening questions:** At the first workshop, objective questions elicited information about fellows' knowledge of, assumptions about and expectations for the topic of governance and the fellows program. At subsequent workshops, reflective questions continued to reveal assumptions and to connect content among previous sessions to the topic of governance and to fellows' experiences.
- **Exploration of a topic and its connection to environmental and natural resource governance:** Presentations offered a particular perspective on a topic, often related to the experiences or expertise of the speakers. Fellows were provided in advance with a written document foundational to the presentation and, in some cases, additional resource material.
- **Interaction with speakers:** Fellows probed more deeply into the topic of the day and explored the presenters' perspectives on a number of issues during a question-and-answer period. Speakers also participated with fellows in subsequent small- and large-group discussions.
- **Closing questions:** Each session ended with discussion around a series of reflective and interpretive questions structured to connect the topic of the day to previous topics and to explore implications for understanding environmental and natural resource governance.

This program structure modeled a merging of *dialogue and deliberation* (especially the larger program schedule) and *focused conversation* (what questions were asked and when). Summaries of these two ways of facilitating conversations follow, along with specific examples from each of the workshops.

Dialogue and Deliberation

Dialogue and deliberation are two processes that, in combination, create group engagements that strengthen relationships, bridge gaps, generate innovative insight into problems and inspire collaborative action. Dialogue allows people to share their perspectives and experiences about difficult issues. The focus is on **learning and understanding,** not on judging, weighing or making decisions. Deliberation is a related process that promotes the use of **critical reasoning and logical argument in group decision making**. Instead of decision making by power, coercion or hierarchy, deliberate decision making emphasizes the importance of examining all sides of an issue fairly, collecting and considering the relevant facts, and carefully weighing the trade-offs associated with various options.

Elements of dialogue and deliberation that were used to frame and guide the fellows sessions are:

- **Prep work**. Fellows were provided background materials with diverse content and viewpoints as well as details on the group work process.

- **Introductions**. During workshop 1, participants had the opportunity to meet and briefly interview several other fellows as part of the orientation. Throughout each session, work group participation was randomized to create greater opportunity for fellows to meet and work with everyone in the group.
- **Establish/present ground rules***.* During workshop 2, a short set of ground rules was offered to make explicit the intention to promote inclusivity (i.e. seek to understand rather than persuade) and to foster civility, honesty and respect rather than back-and-forth adversarial discussion.
- **Share personal stories and perspectives**. Multiple opportunities for inquiry and conversation were provided during each workshop. Fellows were encouraged to share and examine their experiences and perspectives on issues related to environmental policy, practice and governance.
- **Explore a range of views***.* To explicate a range of views and perspectives, each of the workshops had a different topical focus with different presenters and/or a different group exercise. Use of facilitated open discussion and inquiry following each presentation further encouraged and supported the sharing of multiple and differing perspectives.
- **Analysis and reasoned argument.** As the sequence of workshops progressed, fellows were challenged to consider the costs and consequences of various governance options and to work through what were to become the critical elements of the conversation framework that emerged from the group deliberations.
- **Decide on action steps or recommendations**. The framework for discussions about governance that is being recommended was determined in entirety by the content and ideas that emerged during the workshop sessions.

Guidelines Offered for Working Together

1. Participate in the spirit of practical consensus:
   - Give everyone a chance to speak.
   - Consider supporting idea(s) that may differ from your own but serve the interest of the group.

2. When making choices:
   - To end discussion, give everyone one more chance to speak, then close.
   - To finalize choice:
     → Check for consensus.
     → If not in consensus, note the group's predominant choice; then document the preferred alternative(s).

Focused Conversation

Focused conversation is a technique for having conversations that support learning and understanding and the use of critical reasoning. This technique was applied throughout the fellows sessions to engage the group in moving from the surface of a topic to its deeper implications (adapted from Stanfield, 2000).

1. **Objective.** Begin by asking questions about specific facts and external reality; this ensures that everyone in the conversation deals with the same body of data. These questions are worded to elicit an open-ended response, not a "yes" or "no" answer.

<u>Examples from fellows sessions:</u>

- What does the term "governance" mean to you?
- What changes or transitions in governance related to environment and natural resources have you observed or experienced during your lifetime?
- What did you hear or talk about over the past week that informs you about held assumptions related to governance or government?

- What did you hear last time that informed your thinking about opportunities for changes in governance?
- What questions were raised in your mind as you were reading the provided papers?

> Checking Assumptions
>
> What information am I generating or do I hold that may or may not be true?
>
> - About people and their thinking?
> - About others' expectations?
> - About context – Michigan's environment and natural resources?
> - About what's important?
> - About what's possible?
> - About other things?

2. **Reflective**. Move into questions that call forth personal response(s) to external facts and data by addressing feelings, moods, memories, associations, values. These questions help to make explicit the often implicit concerns and interests that people carry about the subject being considered.

Examples from fellows sessions:

- What are the most provocative things you heard?
- How did the exercise go?
- What was challenging about the exercise? What makes this a challenging topic?
- How are your assumptions similar to or different from those of other fellows?

3. **Interpretive.** These questions get at "so what" – that is, they identify implications and meaning of the topic under consideration.

Examples from fellows sessions:

- What does this tell us about underlying values that have informed our governance choices, and do you think they are changing again?
- What questions does today's presentation raise about the current approach to informing and creating norms (standards) for environmental governance?
- What have we learned that differently informs our thinking about governance?
- What issues did this exercise raise for you about the implications of wicked problems for environmental governance and policy?
- What could we be doing differently?
- How might we explicitly bring ethics into the environmental governance process?
- What are the questions about what and why and about who and how that need to be part of a broader, deeper conversation?

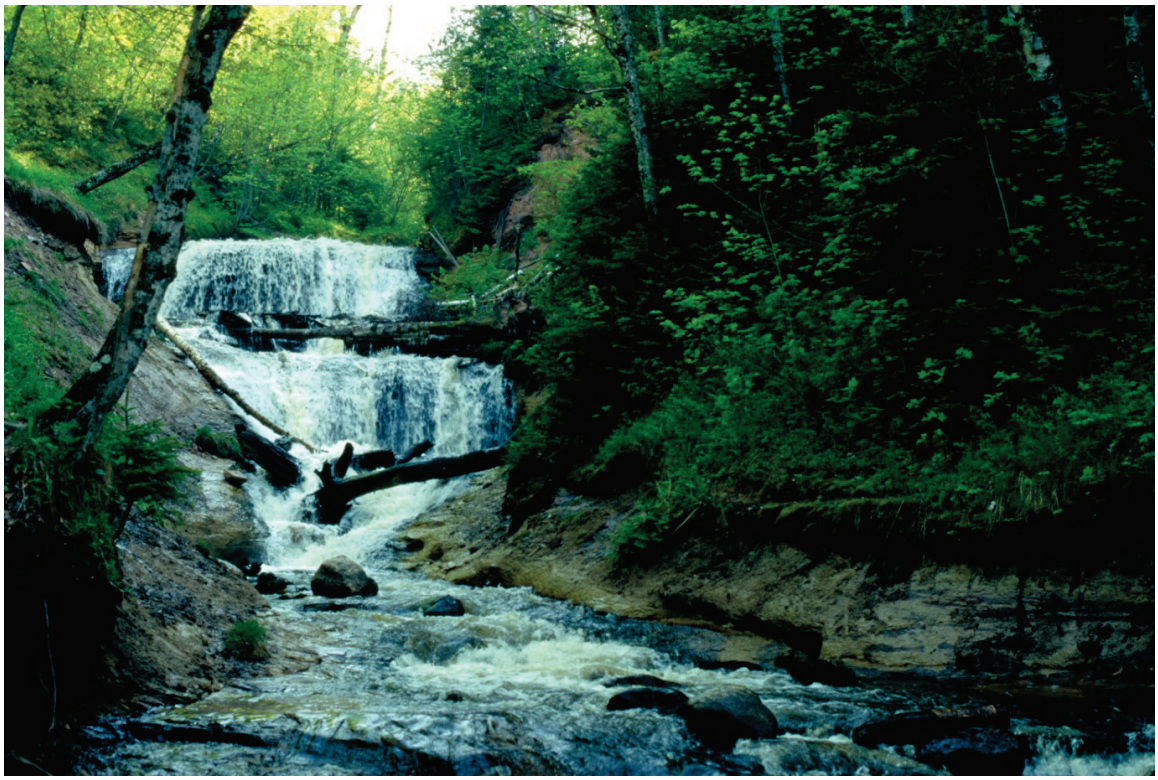
4. **Decisional.** The final questions elicit resolution and closure and set the stage for moving into the future.

Examples from fellows sessions:

- What could we be doing differently?
- How might we explicitly bring ethics into the environmental governance process?
- How does using/applying this (governance) model aid our understanding of the current state of environmental and natural resource governance in Michigan?
- What does this say about broadening the conversations about governance?

The following focused conversation flow was used during the session 7 case study exercise.

- What were the context and perceived problem(s) in this case?
- Our speaker suggested that successful innovations in governance require a willing initiator, champion or catalyst. Was there one in this case? Who or what?
- Does this case represent a tame or a wicked problem? What makes it tame or wicked?
- What ethical challenges exist(ed) related to determining and achieving desired outcomes? How were ethics explicitly a part of the discourse, or were they not?
- How did or might science inform or make a difference in the situation or choices made?
- Did you identify any evidence that science either informed and facilitated the governance process or, alternatively, caused conflict?
- How does this governance model aid our understanding of the current state of environmental and natural resource governance in Michigan?
- We asked you to give some thought to where you would first go in your efforts to broaden the discussion of environmental and natural resource governance. Where can you make the greatest contribution? Where do you think you will go first?
- Are there any places not to go? Anywhere that you think is not ready for this discussion?



Sable Falls, Grand Marais, MI; B. Fisher, U.S. Fish and Wildlife Service

VII. Conclusions

Throughout the deliberations of the environmental and natural resource governance fellows, key points and compelling questions pointed to four types of fundamental choices that are part of deciding on an appropriate governance model:

- Who has access, standing and influence?
- What are the goals?
- Who has agency? That is, who is empowered to pursue goals?
- How and by whom is implementation resourced and guided?

Information provided by subject matter experts and the experience brought by fellows to the conversation suggest five principal conclusions:

1. To be effective, a new environmental and natural resource governance model will need to reflect broad public views of resources to be protected, problems to be addressed and management outcomes to be pursued.
2. A clear process for setting goals is necessary, and the rules for changing goals need to be understood and agreed upon.
3. A new model may well require that individuals and groups beyond traditional state government structures play important roles in implementing management initiatives and monitoring outcomes.
4. Decisions about how to allocate scarce resources are an important part of governance and reflect the values of those involved; conflicting values may make allocation decisions difficult.
5. Most governance choices are not made with a blank slate. Key choices will be influenced by structures already in place, even if those structures are changed when new choices are made.

Lake Michigan beach, Elberta, MI; Michigan Travel Bureau

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Trout fishing, Newton Creek, Harrison, MI; Michigan Travel Bureau

The Guyer-Seevers Program in Natural Resource Conservation vision of effective natural resource conservation involves scientists, resource managers and resource users who understand the complexities that define both human and natural systems. The mission of the Guyer-Seevers Program, built around the Gordon and Norma Guyer and Gary L. Seevers Endowed Chair in Natural Resource Conservation, is to connect and create programs that build this understanding and provide the tools required for informed natural resource policy and management decisions. The Guyer-Seevers Program strives to honor the commitment of Drs. Guyer and Seevers to careful natural resource management and conservation and informed, effective natural resource policy through its collaborative research and education activities. For more information: http://nrconservation.msu.edu

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