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# Linking Human and Natural Systems in the Planning Process

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**Abstract**

Planning links human and natural systems in the urban–rural interface by engaging people in consideration of the future of natural resources. We review evolving ideas about what planning entails, who it involves, and what its outcomes should be. Sense of place, collaboration, emergent planning, and other new developments in planning are discussed. Smaller plans, shorter time horizons, and broader, more local involvement in planning processes are trends in resource management planning with potential for the dynamic landscapes of the urban–rural interface.

## Resource Management Planning in the Urban–Rural Interface

Urbanization is widely seen as a threat to ecosystem health and sustainability, and the urban–rural interface is often at the leading edge of urban growth, in an area that was rural in the preceding decades and will be urban within coming decades. Hence, it is a good area in which to learn more about the consequences of urban growth. Throughout this book the focus on the urban–rural interface has served to highlight issues, problems, and future expectations around this expanding zone of overlap between people and nature. Here we discuss planning in the urban–rural interface, an especially significant activity when residential growth is rapidly changing the ecosystem because the plans developed, whether specifically for resource management or for other activities that affect resources, are intended to shape the course of growth and to set goals for its ultimate outcomes.

Ideas are changing about how planning can and should be done and what its processes and outcomes should be, and these new ideas have repercussions for planning in dynamic landscapes like the urban–rural interface. We review changing ideas about planning and how they influence planning practices, especially for plans that affect natural resources. We begin with a discussion of both narrow and broad interpretations of planning, what planning entails, and who is involved. Then we consider how the postmodern turn has affected planning within and beyond resource management and discuss two new developments in planning that are especially prevalent in resource management planning—sense of place and collaboration in the planning process. To conclude we discuss how the social context for planning shapes the mix of traditional and newer planning ideas brought to bear on the planning process.

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The urban–rural interface is an ideal setting in which to examine resource management planning because planning is a social activity reflecting social issues, and the urban–rural interface is undeniably influenced by social dynamics (Hull and Stewart, 2002). The significance of human activity in the urban–rural interface is obvious even to those who prefer to keep resource management deliberations focused on biological or physical states and processes. The social component of the urban ecosystem is one of its defining characteristics, and in the theories and models specific to urban ecology, social structure and function are not treated as separable dimensions or optional considerations. Urban ecology provides support for a resource management planning process in the urban–rural interface that considers social and ecological issues on equal terms.

## The Traditional Approach to Planning

Planning is that set of activities where people interact and deliberate on what actions to take regarding management of natural resources. It can be seen as adaptation in action; an assessment of what has occurred, what the outcomes of previous plans have been, and what could and should happen next. Adaptation, or change that occurs in response to new stressors, is given particular emphasis in urban social–ecological theory because of the major role people play in urban systems (Pickett et al., 2004). People continually interrupt and redirect ecosystem processes to reshape the environment, effecting faster and more significant adaptation—or in some instances, preventing adaptation—than in a less human-dominated ecosystem. Planning is the social process that gives shape and intentionality to adaptation and other human interaction with ecosystems.

In the context of natural resource management, planning in its narrow, traditional meaning refers to a process wholly managed by and for a specific institution, such as a government agency, a nongovernmental organization (NGO), or a private landowner. Typically it entails pursuing development of and consensus around a set of long-term goals and the actions to be taken to reach those goals. While "planning" can describe any number of operational or short-run exercises, in the context of resource management, it typically refers to a comprehensive planning process covering a larger system of resources (e.g., the system of parks within a county, the many resources and sites within a national forest, the diverse species and habitats in a game reserve). Scientists, lawyers, and other experts are central to the planning process and provide much of the basis from which decisions are made. Comprehensive planning may be mandated under law (for a governmental body) or required by donors or a governing board (for an NGO or business). Land and Resource Management Plans (LRMPs), required under law for National Forests and Grasslands, are an example. Land and Resource Management Plans deal with issues that apply across the spatial extent of the forest such as maintenance of early successional habitat for various game species or forest-wide travel management. Similarly, states, counties, and NGOs that manage large areas of diverse resources for multiple uses undertake comprehensive planning.

The logic of this traditional approach to planning is appealing. An organization need only assemble experts who offer advice on how best to achieve future goals, and often this advice extends to evaluating a range of options and indicating which is the best option. Similar to solving an engineering problem, the traditional planning process entails finding the single or few viable solutions given a set of assumptions and a planning horizon. The many complexities of natural systems are seen as challenges to be overcome. The long string of analytical tools developed by the Forest Service to analyze and project forest resource availability, in particular its linear optimization tool for planning (FORPLAN) (U.S. Congress Office of Technology Assessment, 1992; Schroeder, 1996) testify to the efforts put toward that end.

## Postmodern (Re)Conceptualizations: Sense of Place and Collaborative Planning

Because of its broad scope and almost exclusive reliance on scientific and technocratic expertise, comprehensive planning has also been characterized as an outdated exercise and a vestige of high modernity (Scott, 1998). After what some have called "the postmodern turn"—an evolution in thought that (among many changes) questions authority and challenges science or any other basis for claiming exclusive knowledge (Rosenau, 1992)—planning has taken on a different character (Allmendinger, 2001). A legacy of unintended consequences, outcomes not anticipated, benefits and costs observed (and felt) beyond those formally counted, and the postmodern skepticism around institutional authority have brought many challenges to the traditional (modern) style of planning (Scott, 1998; Lawrence, 2000). These changes influence

the planning process generally, regardless of the context or application of the plan.

In resource planning and management, there are two developments associated with the postmodern turn that have been especially influential. The first of these is sense of place, or treating each place as particular and unique rather than abstracted space with generic and interchangeable attributes (Stewart et al., 2012). The ideas behind place-based planning resonate with scientists, managers, and visitors alike, perhaps because they capture how people actually experience and remember places (Schroeder, 1996; Williams and Stewart, 1998). They have dramatically reshaped resource management and planning (Williams, 2008).

Second, resource management planning embodies the trend toward collaborative planning. The prevalence of public lands in major resource management planning efforts gives credence to arguments for broadly inclusive efforts as "the people" step forward to set the future path for the lands they own. Planning after the postmodern turn still brings together experts and managers, but is better described as a collaborative process, and many other participants are present as well—typically self-identified, self-invited, and qualified on the basis of their interest and willingness to engage (Williams and Metheny, 1995). In their review of more than 200 collaborative efforts in resource management and planning undertaken in widely varied settings, Wondolleck and Yaffee (2000) found that collaborative efforts have been successful both in terms of achieving ecological results and in improving communication and cooperation between managers and community members who participate.

The legal structures around planning have also changed with society's ideas regarding who has a legitimate reason or right to influence planning (Hoberg, 2004). Across all levels of government, "sunshine" laws that require transparency and access to official government activities support public participation and preclude the practice of making decisions in private regarding the management and use of public resources. Under state laws regarding open meetings, most dating from the 1970s and present in various forms in all states, the public and the press have the right to know about government meetings, including those surrounding land management and planning. Through these laws, public access to government documents and involvement in public decision-making has become a more formal and intentional part of government operations in the United States. Government entities hosting a planning process have little ability to exclude anyone from it entirely. In addition to legislation, litigation has been widely used to slow or stop traditional planning practices. Environmental activists have had success by producing contradictory expert findings and opinions, beating the technocrats at their own game.

In a trend that reflects both the return to local, place-specific planning and an open, collaborative process, locally focused and led planning efforts are becoming more common. The postmodern turn supports the notion that resource management decisions can have great significance for local communities. The economic prospects and quality of life in a small town are directly affected by decisions made in the forest planning process (Steelman, 2001). In some places, local groups have sought to separate their forest from its national structure or system and plan for it independently under a legal structure set up specifically and only for that purpose (Nie and Feibig, 2010). In three western communities, ad hoc local groups were successful in establishing a separate, local planning process for their national forest (Hibbard and Madsen, 2003). While these also fall under the broader heading of "collaborative efforts" as Yaffee and Wondolleck (2003) used the term, the three cases highlight another consequence of the evolution of planning, which is its potential effect on environmental advocates. Hibbard and Madsen (2003) illustrated that when the planning process is shifted to the local level, environmental groups whose members and activists were largely urban-based had difficulty attending meetings in rural communities and expressed concern that rural residents and extractive industries could effectively veto the nation's majority opinions to undermine environmental governance regarding management of federal lands, a resource owned by all.

Considering only the Hibbard and Madsen (2003) case studies, it appears that the success environmentalists enjoyed under the centralized planning system will not survive the change to a more collaborative planning process. However, these cases were all in rural communities, not urban, suburban, or urban–rural interface communities, and all involved planning for national forests, not locally owned resources. Within the broad and varied urban–rural interface, it is less clear that the move away from traditional and centralized planning would consistently advantage industry, environmental, or any other group.

The urban–rural interface is as likely to be home to people with mostly rural backgrounds as to people with mostly urban backgrounds, and not as likely to be distant from urban centers, ameliorating one set of concerns raised by environmentalists about local, place-based planning processes. Nor are those extractive industries still operating in the urban–rural interface in a position strong enough to dominate a urban–rural interface planning process as they might a rural process, simply because urban–rural interface development often threatens their ability to continue operating profitably (Hull and Stewart, 2002). Extractive industries have, by virtue of the urban–rural interface developing in their locale, already been assailed by market forces as land rents rise and by regulatory changes reflecting efforts to limit noise, odor, dust, aerosol drift, and other externalities associated with their operations. Their bargaining power in an urban–rural interface setting is unlikely to be as robust as in a rural community. Therefore, the concerns raised about local, collaborative planning may be more a function of the places and targets of such efforts to date—federally owned natural resources in rural communities—than of the collaborative planning process itself.

The overall effect of changes in natural resource planning over the past 30 years has been to make planning a more bottom-up, rather than top-down process, with more emphasis on local than organization-wide priorities. Currently, it would be exceptional and noteworthy for a government agency or even a large NGO to initiate a planning process based only on national direction and priorities or to initiate a planning process and include just in-house planners, scientists, and managers. Public expectation is that any planning process will involve a very broad array of people to serve in an equally wide range of roles and to focus on local as well as regional and national issues. While this style of bottom-up planning answers many critiques of postmodernism, it also trades away the benefits of top-down planning, which are coordination, consistency, and information sharing. Institutional resources cannot be distributed across a large system according to a shared plan if only bottom-up planning is used. Feedback and learning that occurs in one local process may not benefit anyone outside that process. People, industries, interest groups, and communities will not necessarily be treated comparably across the system. Coordination across an entire national system of public resources requires that some entity with a broader view compensates and balances resources across the system and shares information. While this coordination role is not necessarily incompatible with either principles or practices of collaborative planning, it may be underemphasized, particularly at a time when any effort to balance or align local with national interests can be interpreted as pursuing a partisan agenda.

## Relating Changes in Resource Management Planning to Planning Theory and Application

The postmodern turn sketches a general backdrop for changes in the way society thinks about and practices planning and is a useful starting point to understand broad changes. In a summary and review aimed at organizing the many specific changes in planning, Lawrence (2000) discussed five major schools of thought, or general approaches to planning. He posited *rationalism* as the original basis for planning and traces the critiques and departures from it. Briefly, *pragmatism* moves toward using experience to guide planning, and negotiation to find common ground among competing interests. *Socioecological realism* emphasizes improving society and nature, through planning and design. *Political and economic mobilization* takes activism a step further to include goals like social and environmental justice. *Communications and collaboration* puts the planning process in the foreground (rather than the plan, or place being planned for) and strives for process outcomes such as inclusion, consensus building, and conflict resolution. This progression of planning ideas is replicated in resource management planning; each of these schools of thought, has influenced resource management planning processes. All are evident in practices past and present.

As Lawrence (2000) suggested, planning practices are not as distinct as his grouping of planning theories, and in practice, planning rarely leaves an entire approach behind. Instead, current practices reflect some aspects of each different approach. Pragmatism gives us the mandate to base plans on best available science, a hallmark of federal resource management planning even through the ebb and flow of political objections to science (Lambright, 2008). Within pragmatism, incrementalism advocates for adjusting plans repeatedly to maintain political agreement, harmony with knowledge-based experience, and advances in science (i.e., from outside the planning process) or to reflect other changes in group consensus on how best to achieve the plan's goals. Socioecological idealism and political–economic mobilization both

describe more humanistic approaches and open the door for pursuing environmental justice, another important consideration in federal planning. Although the executive order directing federal agencies to account for environmental justice dates from 1994, it was re-emphasized in 2011 when the heads of several executive agencies signed a memorandum of understanding, committing their agencies to renewed efforts at making progress toward greater environmental justice. Recognizing the significance of sense of place is congruent with both of these approaches as well, in that sense of place rejects the notion that spaces can be understood without reference to the meaning they have for people. Sense of place encompasses the integrated social and ecological realities of places.

In what Lawrence (2000) described as the communication and collaboration approach, planning theory comes full circle, imposing a more rigorous science-based structure on the components of the planning process, but with an eye toward better achieving planning *process* goals. Where traditional planning assumed that planners stood entirely outside the system and directed its workings, the communication and collaboration approach treats the planners as the objects of research. The scientific knowledge it draws on directs the work of the planners, shaping the ways in which planners engage participants, communicate with them, and employ science and other forms of input to guide the group to a decision. Communication and collaboration shifts from treating planners as exogenous, independent agents in charge of the process to endogenous functionaries within a planning system.

## Broadening the Scope: Emergent Planning

In its current form, natural resource management planning can be and often is broadly inclusive of people and ideas, in pursuit of serving resource management goals. Resource management planning has become a way to involve people in intentional and deliberate action in service of ecosystem sustainability. But, an additional and very broad category of planning is arguably of equal or greater significance for the urban–rural interface: those plans for activities not intended to address ecosystem management goals but that generate impacts felt in ecosystems. In some sense this style of planning is another example of socioecological idealism, but here that idealism is inserted into a planning process outside the resource management realm. We term this *emergent planning*, in that resource management goals emerge from discussion of other possible actions. It can encompass any primary focus, such as residential, commercial, or industrial development or decommissioning plans; highway, public transit, wastewater treatment, power generation and other infrastructure plans; or any other planned activity that affects natural resources but is not primarily focused on resource management. In such planning processes, the consequences for natural resources are discovered or contested through the planning process, and participants use the process to force consideration of an additional set of issues, namely, the fate of natural resources.

Emergent planning is on the margins of many ecological discussions about land use change, often mentioned (in all but name) as a strategy for improving future outcomes. A common example is exhorting foresters or wildlife biologists to involve themselves in city planning and zoning efforts so they can bring expertise about land use change effects into the planning or zoning discussion—a discussion not primarily focused on ecosystem sustainability. Ecologists have actively supported this style of involvement through publications such as the Ecological Society of America's Ecological Principles for Managing Land Use (Ecological Society of America's Committee on Land Use, 2000) and Conservation Thresholds for Land Use Planners from the Environmental Law Institute (2003), to name two among many similar publications. The urban–rural interface with its boundary-spanning identity is an ideal setting for emergent planning in that resource managers and specialists will often neighbor land owners who are not focused on resource management goals. Johnson and Klemens (2005) discussed a wide range of ecological outcomes stemming from residential growth and how those outcomes could be improved through changes in urban planning.

The threat of negative externalities also gives rise to emergent planning. Externalities occur when pollution is generated but left "external to" what the market requires its producer to pay and can arise from almost any human activity, such as road construction, waste disposal, manufacturing, neighborhood revitalization, and so on, to impact people or resources in ways not intended, often not acknowledged—and usually not welcome. Given awareness of what is happening and the power to voice objections, people will respond to negative externalities, and any planning process can become a useful venue for that response and objection. Planning

that involves people in shaping future ecosystems spans beyond the formal processes we call "resource management planning," and in its emergent forms may be even more significant in the ongoing urban ecosystem adaptive process.

Emergent planning strongly links people with nature. When we hear, "linking people with nature" we may envision a park bench to view the sunset or hiking through a field of wildflowers, but those kinds of opportunities and the nature experiences that they facilitate are merely the culmination of many different kinds of planning, like community master planning that creates parks, planning for transportation that includes bike paths, or planning for subdivisions that maintains open space. Nature experiences give people much needed opportunities to restore physical and mental well-being and seldom require anything from them in return. This is appropriate in that public goods by definition are worth providing to all because they generate wide-ranging benefits for society as well as for individuals. However, research has begun to show that volunteer involvement, taking an active role in maintaining those opportunities, generates additional benefits (Westphal, 2003). Volunteerism has become an intentional part of urban greening and restoration efforts because it builds social capital and empowers individuals (Westphal, 2003). Most volunteers studied to date have worked planting trees and gardens, physically interacting with nature. Whether working as an advocate or local representative in an emergent planning process is equally beneficial for the individual, we do not yet know.

Emergent planning and volunteerism broaden our perspective on what it means to engage in planning in the urban–rural interface. Compared with planning and its outcomes from a traditional perspective, both treat a larger set of behaviors and concerns as relevant and significant in resource management, and both draw from a wider range of theoretical and methodological tools to understand how people interact with their environment.

## Incremental and Experimental Plans

The changes in planning are not all matters of philosophy, theory, and subtle distinction. Among the simple and obvious is that resource management planning has moved away from comprehensive scales and scopes, to include plans for smaller areas and more particular changes. Less-than-comprehensive planning goes by many names, such as project planning, preserve planning, or the proper name of the place being planned for, like the Black River opportunity area (Schroeder, 1996). Many organizations, governmental entities, and communities tackle small changes or specific issues, either between comprehensive planning cycles or outside/beyond/in spite of the planning process and department. Like emergent plans, these smaller-scale plans may not be recognized as part of the planning realm, particularly if they sit outside the usual legal structures that apply to "planning" by that name. But, also like emergent planning, they are significant in their potential for connecting people and nature through a collaborative, future-oriented decision-making process that affects natural resources and their management.

Specific projects on a national forest ranger district, for a single nature preserve, or regarding configuration of one subdivision are examples of where smaller plans are particularly valuable. Daniel Burhnam's directive to "make no little plans" aside, little plans can serve a useful function, even if they are not awe-inspiring. In a rapidly growing urban–rural interface where many settings and problems are novel, there is a premium on learning before committing to large-scale change. Small plans may be (or become) part of an incremental planning process. While traditional planning from a rational perspective assumes it is possible to consider every alternative and choose the best option, a more pragmatic approach looks at experience and sees that this is not always possible because the environment is not predictable and stable or within the planner's control. Nor is reaching consensus on which alternative is "best" a reasonable expectation for all planning processes (Lawrence, 2000). In addition, managing urban ecosystems for sustainability is still a new goal, and small plans can provide information needed to refine and improve management practices. The community or neighborhood may be a perfect scale for trying out ideas and evaluating how well they work.

The vagaries and uncertainties of both physical and social worlds suggest that making large-scale, long-term plans will require accepting a high degree of uncertainty, whereas a shorter planning horizon and an iterative approach carries less uncertainty and thus fewer risks. Taking action for the purpose of finding out what will result has an obvious appeal to scientists, too, in that incremental plans bear a strong resemblance to experiments. The National Science Foundation's urban sites for Long Term Ecological Research are generating extensive empirical information about the urban ecosystem. Their research methods range widely

but in many instances use incremental planning, in pursuit of social and ecological change as well as scientific progress (see Chapter 14, Pickett et al., 2012, this volume).

### Case Study: Standards for Bird-Safe Windows—An Example of Dispersed and Incremental and Experimental Planning

Over the past three decades, environmental studies have repeatedly documented the high numbers of bird mortalities caused by collisions with buildings (Klem et al., 2009). Current efforts to address the bird collisions through bird-safe building standards and materials, for new and existing buildings, have gradually emerged over time through an incremental and experimental approach.

The issue of bird collisions with buildings emerged as a conservation issue only in the mid 20th century when steel and glass buildings became common, a design that has remained popular among planners and residents. Using volunteers to monitor specific sites, researchers have identified the building and landscape features most likely to lead to mortalities. For example, the more window glass a building has, the higher the rate of collisions. Buildings with windows that directly face into a park or vegetation are more likely to lead to bird mortalities (Klem et al., 2009). By conducting site-specific monitoring, conservationists are able to suggest site-specific changes in building material and structure. For example, after New York City Audubon volunteers monitored high-profile, distinctive buildings in Manhattan, the NGO engaged directly with individual properties to implement low-cost changes that reduced bird mortality (Foderaro, 2011). Existing buildings can often be inexpensively made safer for birds, including by means of seasonally specific modifications, such as using nets during migration season on lower building floors.

As a result of this effort in New York and similar monitoring studies in different cities, a number of different certification and building regulation efforts have emerged, at both local and national scales. In San Francisco, a code for bird-safe buildings was adopted in fall 2011 by the city Board of Supervisors. This code requires bird-safe features in areas that are essential for birds with substantial risk of building collisions (San Francisco Planning Department 2011 SF guidelines). For other areas of the city, the code presents a number of voluntary measures. At the national scale, the U.S. Green Building Council's newest version of the LEED system for sustainability for the commercial, residential, and institutional building industries included provisions related to bird safety (U.S. Green Building Council v3, 2009). In the 2011–2012 Congress, Representative Quigley from Chicago introduced legislation that would require federal buildings to incorporate bird-safe features (H.R.1643–Federal Bird-Safe Buildings Act of 2011).

This change in building design demonstrates an incremental and experimental approach to changing one feature of building design and highlights many of the hallmarks of the post-comprehensive planning period. Careful study and monitoring, conducted along with community members, allowed researchers and planners to test different building designs and mitigation techniques. This change in building design is unfolding incrementally over in multiple sites, drawing together a wide range of people in the conservation, planning, and design communities. Ultimately, they found multiple ways of inexpensively changing building form and materials, for both existing and future buildings, to reduce the risk of bird collisions.

## Integrating the Scientific Basis for Resource Management Planning

One of the best arguments for rethinking planning practices is growing recognition that few problems are simple or simply solved, and this is nowhere more true than in a setting such as the urban–rural interface, where social systems (notorious for their complexity) intersect with ecosystems (equally notorious for their complexity). Although the intersection of the social and ecological realms occurs across the landscape, the juxtaposition of the two is obvious in an expanding urban–rural interface, with larger areas of wildland vegetation still nearby, land cover still undergoing changes, and the human presence relatively new or newly intense. In this overlay zone of two complex systems, science plays a valuable role in the planning process, even without its traditional stature as the unquestioned source of solutions. Yet, it is the natural sciences that have traditionally supported planning for resource management, and despite the significance of social issues, the extent to which social sciences are being utilized is still limited.

Disciplinary integration runs counter to long tradition. Specialization is an essential characteristic of the sciences, and separation between scientific disciplines is pursued and maintained in service of specialization. The rationale for disciplinary divides is that without the ability to leave most studies behind, a scholar cannot develop the expertise necessary to advance a

focused area of research. For scientists and practitioners, expertise tends to be based within a single discipline; education enforces and career paths reinforce specialization. Beyond specialization, both old and new beliefs about the role of people in ecosystems limit enthusiasm for integrating the social sciences. Natural resource management was strongly shaped by scientific forestry, a school of thought associated with the modern ideals of human progress and dominance over nature where human influence is both assumed and encouraged, and society pursues the goals that improve the quality of life for human society. In this worldview there is no "social" dimension to any management or planning issue because people are exogenous to and in control of the resources; hence, there is little need to integrate social sciences.

This perspective was challenged in the 1970s by the rise of conservation biology, the scientific study of the nature and status of biodiversity, with the explicit aim of protecting species, their habitats, and ecosystems from extinction. It is an interdisciplinary field that draws on all the sciences—including social sciences—to achieve its goal of biodiversity conservation. The Society for Conservation Biology states that it, "envisions a world where people understand, value, and conserve the diversity of life on Earth" (http://www.conbio.org/AboutUs/). Conservation biology does not emphasize a "social dimension" either because of its strongly ecocentric stance in which social goals are often considered only under the aim of obtaining a predefined ecological goal. Hence, even in this newer conception of the right relations between social and natural realms, practitioners often do not attempt to fully integrate the social and natural sciences. These conflicting perspectives, sketched here in simple terms, each influences natural resource management planning and research. Both are built on ideas about the relationships between nature and society, although in both views, society's side of the argument is underdeveloped and based primarily on philosophical positions. So although conservation biology introduced a radically different notion of human society—rather than being the source of solutions, society becomes the source of problems—the shift did not fundamentally change the stature of the social sciences among foresters, ecologists, and related specialists.

## Integration in Planning Practice

As a professional practice, planning has always crossed the disciplinary boundaries of many areas of specialization. Planning requires a breadth of knowledge, and as a participatory process, it must make sense of wide-ranging inputs and perspectives. But even in the field, removed from academic rivalries and disputes, integrating social science and natural science has not been common. Traditionally, resource management planning was dominated by professionals educated in forestry or other biological (botany, silviculture) or physical sciences (soils, hydrology). The need to work within regulations governing ecological systems (e.g., the Endangered Species Act) and physical systems (e.g., the Clean Water Act) reinforce the tendency to staff planning teams with specialists from biological and physical sciences, but legal or regulatory issues rarely create a need for social scientists. Consideration of cultural resources is the rare exception, and "cultural" is used in a narrow sense to mean resources with historic or Tribal significance. For these reasons, integrating planning teams is still something that is discussed and considered rather than assumed as a matter of course.

Integrating the sciences such that researchers from different disciplines work together through the whole research process may or may not become the norm for future research (Fox et al., 2006). More commonly a planning team will draw together a group of specialists, such as geologists, anthropologists, wildlife biologists, and so on to form a cross-disciplinary team, bringing together the sciences at the time of application and delivery rather than during scientific discovery. This allows the planning team flexibility to add or drop specialists as the planning questions take shape. Conflicts among the specialists on the planning team are not uncommon (Stewart et al., 1998). For instance, a wildlife biologist might argue that negative perception of snakes can be overcome by providing more information about the snake's role in the ecosystem, while a social scientist might counter that providing more information will not, by itself, overcome the cultural and psychological factors reinforcing negative perception.

Alternatively, confrontations between scientists may stem from different starting assumptions, rarely stated but always present in the scientist's perception of a planning issue. If an ecologist assumes people are a negative external influence that threatens the ecosystem, her recommendations for managing human access to a riparian area will be different from those of a social scientist who assumes that human access to the riparian area will improve a community's connection with the river, reinforcing its identity as a settlement built around natural resources.

Arguments such as these are all too familiar to anyone who has endured a planning process that involved scientists. And yet, although they seem sometime petty and repetitive, disagreements can uncover assumptions, clarify the basis for conclusions, and highlight the degree of uncertainty and potential for error or contradiction.

Opening the door wider to social science involvement holds much promise for planning. Fire managers have come to learn that acceptance of new initiatives (e.g., restoring native plants in a neighborhood park) and unfamiliar practices (e.g., burning to maintain native prairie plants) is more likely, and can be improved to an extent, if they work with social scientists to understand the attitudes and perceptions of forest neighbors and homeowners (McCaffrey, 2009; McCaffrey and Winter, 2011). Building support for any proposed change is more effective if communication science, with it specific direction on message content, timing, medium, audience segments, context and overall process, is applied (Jacobson, 2009). A science-based approach to communicating about resource management contrasts in process and outcome with what resource managers often refer to as "educating the public," whereby they convey their best arguments, in their own words, for the course of action they favor. Educating the public is well meaning but seldom useful and sometimes harmful, especially in its insistence on a one-way style of communication at a time when two-way communication, with neither party presuming to be the expert, is more consistent with social norms.

The values people hold for natural resources can also be clarified through use of the social sciences. Economics and psychology can both structure and quantify the arguments in favor of retaining "nature"—or in more precise terms, for maintaining the flow of ecosystem services that society enjoys. Research has documented beneficial effects of human contact with nature (Campbell and Wiesen, 2009; Kaplan, 1995; Maller et al., 2006; Ulrich, 1984). These and many other studies have demonstrated that humans and by extension the social systems they create are healthier when the natural environment is also healthy and functional (Luck et al., 2011), and evident in their surroundings. Such findings align with what resource managers believe, but the added empirical evidence, sometimes even expressed in dollars, makes for a more persuasive argument, for example, for more urban greenspace or improved outdoor recreation facilities. A wide array of environmental services have been evaluated and valued in monetary terms, providing specific evidence about the claims made for them (Costanza et al., 1987; Farber et al., 2002). This kind of evidence is especially needed in settings like growing urban–rural interface communities, where existing resources are under development pressure and decisions must be made to retain or transform vegetation and landforms (e.g., stream beds, wetlands). For example, costs of new residential construction could be increased by requirements to retain existing tree cover, but evidence regarding the premium a homeowner will pay to live in a wooded setting can change how the cost of retaining those trees is judged by the community.

Information about the range of social costs and benefits associated with natural resources is especially applicable in a collaborative planning process intended to consider the interests of all parties affected by a proposed change. For many years, traditional planning processes relied on cost–benefit analyses (CBA), a relatively transparent method of comparing costs and benefits of proposed alternatives, but one that proved to be very sensitive to the choices made by analysts regarding which costs and benefits to include (Schmid, 1989). For instance, if harvesting a forest stand was an alternative, the value of lumber might be weighed against the cost of constructing a road to access that stand. The values of nonmarketed goods and services like scenic vistas and clean air are less easily captured, so these values of leaving the forest intact were often not counted (Peterson and Randall, 1984). Improvements in valuation methods and a move away from heavy reliance on CBA have changed the balance of evidence supporting the claims of different parties to the planning process.

## Planning in an Urban System

Urban ecology has taken a leading role in promoting the idea that social and ecological goals are equally relevant when managing resources. It stands mostly clear of the disputes between the sciences, perhaps because its origins coincide with (rather than pre-date) the appreciation for science integration. Urban systems challenge ecologists to revisit ecological theory and at the same time, confront social scientists with an intense and dynamic social setting (Cadenasso et al., 2006, Pickett et al., 2004). Metropolitan areas, including the urban–rural interface, are places where the world has always been (in fact, if not in theory) integrated across social and natural realms. Environmental historians like John McPhee and William Cronon tell compelling stories about the interconnections and unexpected causal

relationships between social and natural worlds across the landscape, encompassing urban and rural places. The success these two writers and others like them have found is a testament to the broader resonance of the notion that natural environments, even those that may appear pristine, have been under human influence for a long time. Ultimately, integrating the sciences at some stage of the research or planning process would better capture this collective understanding about natural resources in our society and would support efforts to balance social and ecological outcomes in urban–rural interface planning.

New ways of managing resources have developed in urban settings. As ecologists recognize the widespread alteration of natural ecosystems and the limited ability to preserve undeveloped areas from direct use or other negative effects of human use and settlement, they have increasingly turned to ecological restoration, the practice of restoring, repairing, or reinventing natural ecosystems (Seabrook et al., 2011). Ecological restoration is intended to ameliorate the widespread negative impacts of land use and land cover change, while also maintaining important social and economic benefits. For those participating in planning along the urban–rural interface, social–ecological restoration is of interest because of the emphasis on both social and ecological aspects of ecosystems and because restoration acknowledges the changing nature of the urban–rural interface. We often think of land as converting from rural to urban status, and then remaining fixed as urban, but a closer examination of the United States shows that urban areas can experience changes in land cover, land use, and habitat that reduce the intensity of land use and habitat change.

### Case Study 2. Social–Ecological Restoration: Restoring and Re-naturing Urban Landscapes to Balance the Social and the Ecological

In Seattle, local government decided to focus on residential design and landscaping in areas close to streams as a way to enhance ecological function, as there were limited opportunities to preserve high-quality undeveloped habitat (Karvonen, 2010). After a demonstration project, local government worked with a developer to design and implement water quality management in a New Urbanist development built on previously industrial land. Because each design decision had implications for both social and ecological goals, the project led to unprecedented collaboration between different city agencies and is still considered a benchmark example of combining ecological and social sustainability in an urban context (Karvonen, 2010, and references within). Although planning and constructing a new development involve substantial governmental input, habitat management and actions by residents will also play a role in continued water quality maintenance.

Buildings in many cities now have green roofs and even walls, where space and support for soils is added and plants are established. These serve a variety of ecosystem functions and services, including providing a home for birds and invertebrates, reducing heat transfer through roofs, reducing rainwater run-off and increase biodiversity in urban areas (Baumann, 2006; Francis and Lorimer, 2011; Kadas, 2006; Mentens et al., 2006). Urban roofs and walls are different from many urban restoration projects in that they can be created at the initiative of local residents and property owners (Francis and Lorimer, 2011). While governmental and institutional support will help promote green roof and wall establishment, these discrete projects do not require 'top-down' or large-scale cooperation between planners and environmentalists.

In some cases, urban restoration or reclamation is catalyzed by broader socioeconomic conditions. For example, the rust belt cities of Cleveland and Detroit currently have tens of thousands of vacant and abandoned lots, caused by urban abandonment and de-population. At city scales, these abandoned lots are being used as experimental study sites to better understand urban restoration and ecosystem functioning: "One abandoned yard is a mess; 20,000 abandoned yards is an ecosystem" (Tortorello, 2011). The sheer number of abandoned lots now dotting these cities highlights the need for planners to be flexible and adaptive, to capitalize on unexpected opportunities for both restoration and knowledge-building. It also represents an interesting twist on another trend in urban ecology, which is to think of lawns as pieces that together make up an ecosystem, one which could be made more functional with small changes in how properties are configured and managed (Goddard et al., 2010).

Working in another post-industrial U.S. Midwest landscape, Westphal et al. (2010) refined the terminology to clarify purpose and outcomes. They termed their work in the Calumet region of Chicago *re-naturing*, to focus attention on what changes can be expected in this heavily industrialized area where Superfund waste sites are intermixed with prairie and wetland remnant. Re-naturing does not set expectations of a return

to a particular time period or ecosystem condition, or even the same legacy landscape across the region, but rather, gradual increases in the extent of vegetation, wildlife, and ecosystem services. Social–ecological restoration can emerge at small sites (individual properties, managed by hundreds of different residents), but in combination can allow for substantial environmental benefits and research. Ultimately, such restoration contributes to an ever-changing urban–rural interface, by re-introducing and enhancing natural ecosystems in urban areas.

## Summary

The urban–rural interface has the potential to remain a residential setting with great appeal to Americans, owing to its mix of social amenities and natural resources. Many aspire to the lifestyle and prestige associated with the single-family home on a large lot in the urban–rural interface. Yet human pressure degrades the ecosystem, often in ways that are apparent to those responsible for creating the pressure and degrading the resource—in other words, the developers, homeowners, and entrepreneurs themselves and the civic officials and land managers who serve them. In this context, a conversation about planning for a sustainable future can find an audience.

Conversation is now a central metaphor in resource management planning. Planning processes are no longer expert-dominated, closed sessions with predetermined outcomes. Following from the new ideas associated with the postmodern turn, more people, more interests, and more ways of knowing are accommodated when plans are being developed. Nor is planning a once-per-decade, all-encompassing effort to address only the issues with widest applicability. Smaller plans for shorter time spans are finding wider application in resource management. Small plans fit well with other trends in resource management planning such as emphasis on sense of place and local determination of outcomes.

Planning itself cannot guarantee anything, not about fairness and inclusiveness of process, nor sustainability of or even agreement on an outcome. But, it can provide an opportunity to connect with nature and to pursue ideals, whatever those might be. Where resource management planning once served the purposes of the agency or institution with direct responsibility for a resource, it now includes participants and even goals and aspirations from a much wider group of people. Even planning processes not intended to address resource use and management can be influenced by any interested party who sees the potential for whatever is being planned—a new high school or a solid-waste landfill—to affect ecosystem health and sustainability. The current openness of governance at all levels and most venues in the United States lends itself to considerable chaos and messiness, but also gives anyone with a passion and commitment to advocating for nature a powerful venue for effective involvement.

Including a larger number of scientific disciplines in resource management planning is not yet common enough outside the world of research to warrant being identified as a growing trend, although it is something scientists increasingly push managers and planners toward. Research about social–ecological processes, particularly from the new field of urban ecology, continues to increase support for the idea that the two realms are inextricably linked and should not be treated separately. Instead, managing the two systems simultaneously is the key to sustainability.

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