Journal of Outdoor Recreation and Tourism xxx (xxxx) xxx

Contents lists available at ScienceDirect

Journal of Outdoor Recreation and Tourism

journal homepage: www.elsevier.com/locate/jort

Thinking like a system in the turbulent world of outdoor recreation management

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ARTICLE INFO

Keywords:
Systems thinking
Mental models
Emergent properties

ABSTRACT

The world is turbulent, everchanging, non-linear and uncertain. COVID-19 demonstrated this uncertainty at all social scales. A consequence of this situation is that surprises are a universal occurence. Systems thinking is a way of thinking about the wholes and making sense of what appears to be chaos. Systems thinking is oriented toward developing understanding how the parts of a system, which outdoor recreation and tourism form, relate to the system as a whole. But systems thinking is not enough to create action in this situation. We need to do three things: Dive deeper to better understand the mental models at play; Think differently to develop resolutions to challenges based on new mental models; and Act Holistically to ensure that new ideas and all voices are included and respected.

Management implications

This paper encourages managers to rethink existing, conventional planning methods in order to meet challenges by increasing complexity, rapidly changing conditions, new risks and uncertainty. In order to achieve a more holistic system-oriented acting planning processes should be characterized by a holistic thinking from the beginning, the analysis of essential influencing factors and the development of a vision.

It not what you look at that matters, its what you see—Henry David Thoreau

1. Introduction *It not what you look at that matters, its what you see*—Henry David Thoreau

How can outdoor recreation management be more effective, equitable and sustainable? This question underlies many of the planning and management programs that are the basis for the controversy over management of public lands in today's world of turbulence, change, and surprise. It seems that every day brings new challenges, shifting goals, strategic shocks, and innovative alliances. COVID-19 and resulting restrictions on travel is an outstanding example of how an unexpected event and national and international priorities and actions suddenly changed, leading to enormous and wide-ranging effects at all levels and functions of society including parks and outdoor recreation (e.g., Hocking et al., 2020; Spenceley et al., 2021). Other related events come with consequences that were not necessarily observed at the time but were delayed sometime after and impacted other places. For example, visitation to some national parks in the US increased after the onset of COVID, despite a complete absence of international visitors, closure of parks, and prohibitions on travel. In some US parks, increased visitation carried with it more vandalism and littering than before (see Diaz, 2021 for a popular literature report).

These events demonstrate that we live in a connected and complex world, and one filled with surprises, despite our proclivity for the conventional rational-comprehensive planning that underpins modern societies (Freidman 1973; Hudson et al., 1979; Kohl & McCool, 2016, p. 320). To function productively in this turbulent world, we need to better understand it, but traditional paradigms of conventional planning may advance our knowledge but not understanding (see Ackoff, 1989 for an excellent statement about the difference) that underlies management. Better understanding requires a shift, a new paradigm that transforms how we think about the organization and functioning of an apparently complex and chaotic world. This will bring new insights and actions that lead to more useful paradigms of research and management (e.g., Blahna et al., 2020; Cerveny et al., 2020). Focusing on understanding complex systems has other benefits; Gharajedaghi (2011, p. 351) argued that understanding complex systems helps with simplifying what may be an apparently overwhelmingly chaotic situation:

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https://doi.org/10.1016/j.jort.2021.100484
Received 21 December 2021; Accepted 26 December 2021
2213-0780/© 2021 Published by Elsevier Ltd.

> "We see the world as increasingly more complex and chaotic because we use inadequate concepts to explain it. When we understand something, we no longer see it as chaotic …"

But developing and implementing new paradigms of planning, management and research requires us to couple our (the community of recreation researchers, managers, planners and activists) *thinking* about the complexities and uncertainty of the world with *acting* based on understanding this complexity. One way of understanding this world is to view it as a series of nested, adapting social-ecological systems (as noted by Morse (2020) and apply systems thinking to potential actions and strategies. As Gharajedaghi argues, system thinking helps us "see through the chaos". Systems thinking is thinking that looks at the "wholes" first, and then the parts and relationships that the wholes are comprised of second (see Senge—1990–for a lengthier definition). This paradigm helps managers address meaningful leverage points in the systems affecting their world. It suggests to academics what strategies of research might be helpful. And it identifies to NGOs what investments in programs might be effective in making outdoor recreation more beneficial to their clienteles.

For example, recent research points out the fundamental benefits of nature and parks to human health (Derrien and Miller 2019; (Hendricks et al., 2019)). This research suggests a new way of looking at the relationship between people and outdoor recreation participation. Benefits based management, a long held, but not frequently used paradigm of nature-based recreation management, suggests we examine the ecosystem services provided by parks and recreation areas (Brown, 2019).

As argued in several recent publications ((Morse, 2020, Selin et al., 2020 and Cerveny et al., 2020), we need to think of outdoor recreation and tourism, in contrast to conventional rational-comprehensive planning, as an adapting social-ecological system and apply systems thinking to them to resolve those demands and challenges (Moscardo, 2021, applied this approach to aspects of tourism hospitality research). These include connecting citizens equitably with the recreation supply, investing in facilities and programs, enhancing our knowledge of the health effects of recreation participation, reducing ecological effects of recreation use and developing capacity among scientists and managers to think and act differently about the systems we manage. It may also mean broader adaptions to surprises, as Zoom, search for a vaccine, masks and social distancing demonstrated.

Our first step when faced with a complex, uncertain situation is to make sense of a situation (McCool et al., 2013; Weick, 1995) to develop a sort of "situational awareness" (Endsley, 2000). We ask questions like: What is the system, what function does it perform and how is it organized geographically, spatially, temporally, and socially. We ask what the parts of the system are, their relationships and delays between actions and consequences. We become particularly diligent in this thinking about actions that shift the burden to others, problem displacement, equity, and surprises that may occur when proposing responses to these questions. By asking these questions, we raise our awareness of the systems that enmesh recreation and tourism systems and the relationships that connect their parts.

By using systems thinking we can consider these questions and challenges in different ways than we do with conventional planning and research paradigms. These challenges can be considered as wicked problems, thinking at geographical and social scales too small for the underlying problem, framing the challenge in such a way as it cannot be effectively addressed, uncertainty and lack of vision. Therefore, the principal objective of this essay is to outline how systems thinking can be helpful in addressing these challenges and how it leads to some practical ways of understanding challenges, thinking differently about them and acting more holistically in planning and management. This paper is about how doing these three things will help us better respond to and anticipate the outdoor recreation and tourism management challenges of the 21st century.

Doing these three things is a real challenge in a world that is not linear and contains many surprises, like the COVID-19 pandemic, government budgets for tourism and recreation, and decreasing management capacity in light of increasing demand. For example, recreation managers may be surprised that a use limit implemented in a nearby area may result in increased use someplace else as displaced visitors seek a similar experience elsewhere. Managers may be surprised that establishing a so-called "carrying capacity" exacerbates management challenges instead of solving them (e,g., on what basis do we ration recreation opportunities made scarce by imposition of a use limit—need, satisfaction, equality, etc.?). And we may be surprised by the importance of outdoor recreation and tourism to human health (Hendricks et al., 2021).

To achieve the goal of the essay, I briefly review first why we have this problem because how we frame the problem determines what responses we arrive at. This is an important first step for scientists, managers and planners (and those who wish to be in the profession). I then turn to systems thinking as a particularly relevant response (and one that is key to newer approaches to outdoor recreation and tourism research). In this section, I review some elements of systems thinking that are relevant to outdoor recreation research and management. Finally, I describe in more detail the three ways to become more effective researchers and managers. Along the way, I present some examples where new ways of thinking and acting can be more effective.

2. The problem: Conventional planning in a turbulent world

The basic purpose of planning is to change the future. This is achieved by planners performing three distinctive tasks: (1) frame the problem or issue with which they are confronted; (2) develop and assess responses to these problems; and (3) implement actions. Along the way, planners interact with a lot of policy makers, managers, scientists and citizens, acting as a mid-scale agent in transforming policy into action (Nkhata & McCool, 2012). Conventional planning is simply no longer adequate for these three tasks. In terms of framing problems, conventional planning often views problems and issues as isolated events (as in seeing the tips of icebergs in a roiling sea), when in actuality they derive from deep down, the underlying trends, structures, or even paradigms or worldviews (that occur at the base of the iceberg deep under the sea surface Senge et al. (2008) for a more detailed description of the iceberg analogy) that influence how we go about addressing these three tasks (Kohl and McCool detail the paradigmatic challenges in using a rational-comprehensive planning paradigm in developing plans that can be implemented).

In terms of developing and assessing responses to contemporary challenges, we often find that conventional planning processes assume there is scientific agreement on relationships between causes and effects and believe society agrees on goals. If such assumptions are true, then problems are "tame". Unfortunately, as described above, the world is complex, dynamic, contentious and changing; science often harbors disagreements about the relationships between causes and effects, and often implicitly assumes that society has identified goals and agrees on them. These conditions lead to "wicked" problems (Allen & Gould, 1986; Rittel & Webber, 1973). Planning processes appropriate for tame problems do not work well for wicked ones (DeFries & Nagendra, 2017; Jentoft & Chuenpagdee, 2009).

Finally, conventional planning views building plans and implementing them as distinctly separate activities performed by different actors: planning is conducted by planners, technocrats who have training in rational-comprehensive planning; decisions are made by elected or appointed individuals separate from planning processes. Essentially, conventional planning has disconnected thinking and action, knowledge from deeds, and assessment from performance. Compartmentalization works poorly in this new world where we recognize universal connections.

3. More holistic views of the world are needed in the 21st century

Kohl and McCool (2016), in their proposal for holistic planning, suggest that this problem is brought about by a world view that makes four assumptions: the world is predictable, it is linear, it is understandable, and it is stable (they call the resulting worldview the PLUS world.) But the world of the 21st century, they argue, is not described well by these assumptions because they result in actions, such as conventional rational-comprehensive planning, that are not well suited for situations where problems are wicked rather than tame. In outdoor recreation and tourism, for example, the PLUS worldview results in attempts at establishing carrying capacities and defining high levels of tourist congestion and inappropriate behaviors as "overtourism."

Following an extensive review of advances in a number of fields, including protected area planning, they argue that world is actually DICE: the world is dynamic, it is impossible to completely understand, it is complex, and it is ever-changing. As a result, they argue that a new more holistic planning is required to result in effective change. This means that high levels of use, congestion and inappropriate behavior might be better served if we abandoned our search for simplistic solutions such as carrying capacity and asked a more useful question such as "what conditions are appropriate/acceptable for whom and how do we manage for those?"—a question that Stankey et al. (1985) attempted to develop a process for understanding through the Limits of Acceptable Change technique. It is important to note that in this process, which contains nine steps, it is the *thinking* behind it that is as important as the specific steps.

One aspect of thinking and acting more holistically is transforming our paradigm of outdoor recreation research, a need that is argued by Blahna et al 2020a, Blahna et al 2020b. This paradigm requires us to see the world differently by changing how we construct it through our thinking and actions. And this world is not just complicated—having a lot of parts, but complex—having uncertain outcomes, delays between causes and effects and non-linear relationships. To describe it, we face the following tasks defined by Reed (2006):

> **"Identify a System.** After all, not all things are systems. Some systems are simple and predictable, while others are complex and dynamic. Most human social systems are the latter.
>
> **Explain the Behavior or Properties of the Whole System.** This focus on the whole is the process of synthesis. Ackoff (1989) says that analysis looks into things while synthesis looks out of things.
>
> **Explain the Behavior or Properties** of the thing to be explained in terms of the role(s) or function(s) of the whole."

By completing these tasks, we learn about outdoor recreation and tourism systems, which are dynamic with lots of moving parts, contain many interests, which are partly overlapping and partly unique, involve relationships between these causes and involve delays which are primarily loosely, not tightly, coupled. We learn that these whole systems have varying emergent properties and thus produce different benefits. We begin to understand that characterizing one part through research does not necessarily lead to more efficient or effective systems. We may learn that the paradigm upon which our research is based overlooks or discounts many important variables in explaining the behavior of the particular system we are investigating. We may find that we are simply asking the wrong, for the situation, question.

Reed's process also helps us think in nonlinear ways, which is different from the linear thinking of rational-comprehensive thinking. Linear thinking is "one-way thinking". We start with a cause and through a chain of events we end up with a consequence. However, our complex and everchanging world works differently. Causes do lead to consequences, but often not in a linear fashion and often not quickly; and perhaps multiple causes lead to the same effect, so it is difficult to determine what is responsible for the effect. Sometimes an action does not lead to the desired effect; sometimes a cause may lead to a desired effect, but also results in "surprises", undesirable effects, and some of them not even predictable because we do not understand the system. The relationship between causes and consequences may be non-linear and complex (small causes can lead to major consequences, as a small leak in an oil drilling rig in the Caribbean in 2010 led to a major ecological disaster), and sometimes the relationship between cause and effects is loosely coupled and filled with lengthy delays (such as fuel accumulation during decades of wildland fire suppression leading eventually to extreme fire behavior), thus making our understanding of how a system may work difficult. So, in a complex system the relationships between cause and consequences can be quite difficult to understand and result in a kind of "policy resistance" in policy and management noted by Sterman (2002).

Consequences often feedback to causes, changing the relationship between cause and consequence. This circular relationship leads to other consequences that are not often displayed or studied, such as shifting the burden of the consequence to other groups involved in a system or all too often a "fix that fails" (Senge, 1990). "Fixes that fail" solutions are very common in business and government. One that nearly all of us experience is this one: A commuter highway maybe highly congested during the morning and afternoon hours as people go to and return from work. Highway engineers may define this situation as the highway has inadequate capacity for traffic, and thus widen the highway to extra lanes. After construction, the highway becomes just as congested as it was before. The fix—extra lanes—has failed to solve the problem.

Fig. 1 displays a causal loop diagram of how in one wildland situation, closing campsites in a high mountain basin, led to more impact rather than less. The "solution" has actually failed. The fix failed because Reed's recommendation on describing the system did not occur nor was the behavior of all parts of the system and their relationships, including humans, was not understood.

Another often used "fix", limiting use, may shift the burden to other groups, groups who for one reason or another, have difficulty accessing the place or program. Access has been a large issue in the COVID

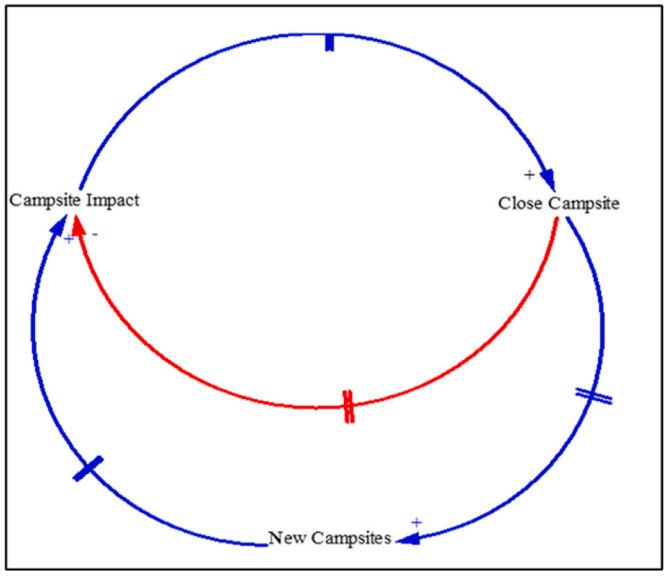

Fig. 1. A simple depiction of a "fixes that fail" system resulting from imposition of an imposition of an action to close campsite which had heavy impacts in a subalpine lake basin. This loop shows how closing campsites in a subalpine environment can lead to greater overall impact. Visitors create new campsites in light of the closure, which causes additional impact. Such impacts are quick to occur while recovery of closed campsites takes a long time, thus leading to a total impact that is larger than the initial impact. The diagram demonstrates the power of systems thinking in a complex system.

pandemic, both in terms of health care but also in access to national parks and other protected areas. Limiting use may also lead to displacing problems to another recreation area or different agency, as when one area's managers limit use, and another area's managers then report an increase in use and impact. To make matters worse, the second area may not have the managerial capacity to address the problem the first area has, thus exacerbating the problem. The problem has not been solved only displaced elsewhere often as a surprise to those managers.

Part of the reason for the linear approach is that we conflate knowledge with understanding (Ackoff, 1989) a conflation mentioned earlier but necessary to address here. According to Ackoff, knowledge concerns instructions and answers to how-to questions, but "*Understanding* is conveyed by explanations, answers to why questions" (emphasis in original). And in this conflation, our research has been oriented toward increasing the knowledge about the parts of this system but not understanding the system as a whole in producing emergent properties This is understanding what a system is about, what it does, and how individual parts "fit together" to make what the system is created for.

A large part of our research in outdoor recreation management has been to increase our knowledge of the parts—visitors, visitor expectations, willingness to pay, resources, resource impacts, policy, so on. Research in general has not been built around understanding how the various parts function in relation to what the recreation management system produces. In fact, we may not even be able to describe the system or what even the emergent property is. This lack of understanding and heightened uncertainty about effects is exemplified by reactions to the COVID-19 crisis, which in general was to close many outdoor recreation resources. While we were operating in a situation of lack of knowledge about the virus itself and how it is transmitted, knowledge about the health effects, mental as well as physical, (see for example Derrien 2019; Hendricks et al., 2021; Parks Victoria, 2015), of outdoor recreation had been increasing for several years. The importance of recreation sites during the pandemic to people was made clear by the high levels of visitation they experienced; yet many sites remained inaccessible to them. This situation exemplifies the need to increase understanding about emergent properties of outdoor recreation and tourism systems.

Thus, we need more research at the system level to enhance understanding of how the parts fit together and determine emergent properties. This suggestion has been made several times in the recreation research literature. McCool and a few others raised the proposal of looking at park, tourism and recreation settings from a systems perspective in a series of publications in the 2000s (e.g., Lachapelle, McCool and Peterson 2003; Stricklund-Monroe and Moore 2010; Farrell & Twining-Ward, 2004.) More calls for examining protected area recreation from a systems perspective were made by McCool et al. (2013), in fact in the very first issue of JORT). More recently, additional calls were made in the set in several papers in a volume edited by Selin et al. (2020) and a research strategy proposed by Cerveny et al. (2020).

This way of thinking leads us to see outdoor recreation as part of a nested, adapting, social ecological system (Morse, 2020) that is composed of parts, relationships and functions with the relationships characterized by delays of differing lengths. The system has a particular function (as in the function of an automobile is to provide transportation, or the function of an outdoor recreation system may be, for example, to provide learning opportunities about the natural environment) and leads to emergent properties.

4. What can we do?

As outdoor recreation scientists, managers and scientists, what can we do to improve our understanding of the system, its emergent properties and act to conserve it? There are three major activities that build on each other which not only build our understanding but will enhance our decisions.

4.1. Dive deeper

We fail more often because we solve the wrong problem than because we get the wrong solution to the right problem – Russell Ackoff.

We see challenges as events, but underlying those events are patterns that lead to those events, but as we dive deeper, we see those patterns as being underlain by certain structures; and as we dive deeper still, we see those structures as a function of paradigms or worldviews. Thus, we often see visitation to parks as causing problems, such as congestion, but that congestion is a result of certain patterns, such as the inadequate supply of urban park areas, perception of parks as relief from disease, or park managers educated that they solve problems but do not provide opportunities. Those are underlain by structures such as approaching patterns or events as having singular causes. Those structures are themselves underlain by assumptions about the world, such as PLUS as noted earlier. Those assumptions may be termed "mental models" or paradigms (see Senge, 1990 or Kohl & McCool, 2016, p. 320 for detailed explanations) and Kuhn (1970) demonstrated their significance in hindering or revolutionizing scientific progress.

This iceberg analogy is an informative way of seeing the problems often hidden by the surface. We see events, like the tip of an iceberg, but below the surface often lurks danger. We see congestion for example and react by calling for a "carrying capacity" study, implicitly hoping that a magic number will come to the surface. The magic number almost never breaks the surface because it is not possible given the mis-match between the system and research paradigms.

By diving deeper alongside the iceberg in our thinking about challenges, we gain leverage when we address more innate but profound insights into the nature of those challenges. For example, when we see events such as littering, we may want to levy a fine on the visitor. If we dive deeper, we may see people who want to enjoy nature but are accustomed to urban environments where litter and trash are relatively common features of the environment. Deeper still we may see that users are not concerned about littering apparently someone else's property. Thus, levying fines may bring in revenue but we ask if the fines really resolved the problem. But the greatest leverage may be by diving deeper still, building a new mental model that emphasizes parks as public property and thus creating a sense of ownership in an area among visitors.

Our study of the carrying capacity of an area leads us to limit use, but because we subscribe to one paradigm over another, we seek the maximum number that we can "fit" into a park. We fail to ask the question of what are the "appropriate/acceptable conditions for the experience desired or of the objectives of the site". We end up with a "carrying capacity" that is built upon existing infrastructure, for example. We never ask the question of what would happen if we enhanced the infrastructure. If one looks at the literature, this type of thinking at the surface still dominates the outdoor recreation and tourism literature.

Thus, to "solve" these problems we need to dive deeper, down to the bottom of the iceberg. There we will find a different paradigm that is a useful way of examining the world of outdoor recreation and tourism challenges. Diving deeper involves not just more in-depth discussion, but also a close examination of alternative mental models and emergent properties. For example, we might start by asking questions like, "What is driving the interest in recreation and tourism at this destination?"; progress to "what structures in the system facilitate or hinder participation?"; moving on to "What are we really managing tourism for?" 0 (McCool, 2020). He notes that it *could be* that recreation planning is not about recreation planning, but something else. We can explore what leverage points make for the greatest change in the output of the system. We can ask about what would make the system more resilient in the face of uncertainty. And we can ask about what emerges from this system when all the parts are functioning. And we can ask "Is this something we desire?" We can ask "What should tourism sustain?"

Health might be one of those emergent properties of outdoor

recreation. Thus, closing an area to potential recreationists—an act at a particularly important leverage point in the recreation system—may have nonlinear effects elsewhere and on a variety of goals, such as equity. Because closing a site may be oriented toward events and often implemented by a state or federal agency legally and politically distant from visitors, it may actually lead to more litter and vandalism as potential visitors and users respond to the closure through anger and frustration.

4.2. Thinking differently

> *"Systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static snapshots"* – Peter Senge

By diving deeper and understanding that apparently isolated events are linked by patterns and structures, we come to realize that these events, including the way we do planning, are part of an adapting, dynamic social ecological system. This system at times changes slowly, and at other times changes rather fast. Each time it changes, changes occur throughout the system that may be noticeable but may not be immediately measurable. This perspective allows us to not only see the "whole" but we also gain new insight about our world. Thus, closures of units of the US National Park System in April 2020, almost overnight, resulted in collapse of the nature-based tourism industry, loss of jobs, increase of unemployment benefits, each more distant in systems terms from the original closure.

Second, we think differently when we think in systems terms. By thinking differently—about the whole—we see the function of a system and the emergent property that comes when the system is operating. Emergent properties are those that result from the system as a whole and not from individual parts such as the old saying "we cannot see the forest for the trees". Thus, a forest is more than the sum of the individual trees, it has properties, e.g., habitat for wildlife or the source for shelter for local people. Another example might be the transportation provided by a railroad; transportation is not a property of the individual parts, such as rails, passenger cars, stations and so on. An emergent property of tourism is the transformative experience that people may undergo and not of individual parts, such as transportation, guides, lodges or food, although those may be very important to an experience. Little of tourism research, particularly about nature-based and community-based tourism, identifies the emergent property of tourism. Emergent properties are important, but difficult to reveal, as Buckminster Fuller noted *"There is nothing in a caterpillar that tells you it's going to be a butterfly."*

The emergent property of a system is almost the same as its function. In an adapting social ecological system, the system is constantly reacting to forces and events. This adapting is ever occurring, a reaction to forces and events occurring at larger and smaller scales. The system adapts so the function can survive, whether that be responding to episodic events such as wildland fire in western forests or rapid increases in recreational use. If the system is not changing in response to these other forces and events, it will eventually die or it will be transformed into system which has another function. Thus, systems are always in a state of change, whether we can measure that change or not.

Understanding what this whole is in a particular situation allows planners to find leverage points in a system that can be manipulated to result in major change. So, recreation planners may ask, how do we make this transformative experience more, well, transformative. That means we ask this question not just of guides, naturalists, and visitor management specialists, but of maintenance people, law enforcement rangers, natural resource scientists, wildlife managers. Each may have an important role in implementing leverage in improving visitor experiences.

In thinking how we structure a planning process itself to be more holistic. we need to think differently when working with recreation management challenges. There is this complexity, but there is also connectivity. Specifically, we need to think in systems terms; describing what the system is, what are its parts, the relationship between parts, the delays in the system and the function of the system. Instead of asking how do we provide opportunities for sustainable tourism, we might ask what should tourism sustain. The latter question is essentially relational in character that forces us to think about the emergent property of a system.

A third way of thinking differently is to use causal-loop diagrams to show relationships among causes and effects (such as in Fig. 1). Conventional thinking is generally represented using one-way flow of cause-and-effect relationships (although they often display some kind of simple feedback). When we use causal loop diagrams to show the system to ourselves, and to others, we think differently, recognizing that systems are complex, and that simplistic solutions often make things worse or shift the problem to somebody else.

Finally, as we see the benefits of thinking differently, we see that diving deeper results in useful insights about the problem and therefore helps us achieve higher levels of understanding. For example, closing campsites, if not accompanied by other actions, such as monitoring and enforcement, can lead to more impact, not less, or simply displacing the problem elsewhere but not really solving it. In fact, thinking differently results in the understanding that much of the time, problems are shifted elsewhere as when we barge a city's garbage to be dumped in the ocean rather than treat it where it is generated (*"out of sight, out of mind"*), or we use electric vehicles in cities to reduce pollution but construct new power plants in rural areas to provide electricity to charge those vehicles. And we come to an understanding that in complex systems we often do not solve problems (find an answer) but rather we just resolve them (come to a mutual agreement about how we deal with them) principally because in complex systems (1) wicked problems only have more or less useful resolutions and (2) larger systems or the context is always changing, so what once worked may no longer work (Bardwell, 1991; Interaction Associates, 1986, p. 35; Rittel & Webber, 1973).

4.3. Acting holistically

> *"Leverage points are points of power."* – Donella Meadows.

In thinking about our challenges with providing recreation opportunities, we are often consumed by increasing or decreasing rates of participation and not so much about what happens to participants. We tend to neglect, or forget, the primary reason for providing those opportunities and why as a society we spend billions of dollars annually on recreating in the outdoors. That primary reason may be the resiliency of our nation, our health, our national well-being. In short, we often lose focus on the very things that makes participation such a powerful shaping component of our culture. Focus on individual goals or rates is important, but when we think more holistically, about the purpose of the whole system, frankly, that purpose trumps these individual goals. And as we move up in thinking about goals, each level has more power to change the system but simultaneously becomes more costly and difficult to change through planning.

This idea was formalized by Donella Meadows in what has become a classic paper in systems thinking, *Leverage Points: Places to Intervene in a* System (Meadows, 1999). In one sense, Meadows argued that we don't really manage systems but their leverage points. Meadows ranked system leverage points from low to high with respect to their effect on the system, with indicators the lowest and the ability to *transcend* paradigms of systems the highest (see Table 1 for her list.). She noted, however, the list is temporary, reflecting on her own experience and admitting that different situations may have a different priority. Nevertheless, the list is a starting point. To make significant change, we need to go farther down her list.

Outdoor recreation management is at a point where it needs to transform what is its paradigm currently, the study of parts. In a complex everchanging system, we need to think more holistically. We need to change paradigms, which is admittedly costly and difficult to do,

Table 1
Meadows' listing of leverage points in a system (Source: Meadows, 1999, p. 19) Listed in increasing order of effectiveness.

- Constants, parameters, numbers (such as subsidies, taxes, standards).
- The sizes of buffers and other stabilizing stocks, relative to their flows.
- The structure of material stocks and flows (such as transport networks, population age structures).
- The lengths of delays, relative to the rate of system change.
- The strength of negative feedback loops, relative to the impacts they are trying to correct against.
- The gain around driving positive feedback loops.
- The structure of information flows (who does and does not have access to information).
- The rules of the system (such as incentives, punishments, constraints).
- The power to add, change, evolve, or self-organize system structure.
- The goals of the system.
- The mindset or paradigm out of which the system — its goals, structure, rules, delays, parameters — arises.
- The power to transcend paradigms.

something that Thomas Kuhn (1970) noted in his classic *"The Structure of Scientific Revolution"*. But keeping a paradigm that has lost its utility is far more costly in terms of research funding spent or staff hours devoted to solving the wrong problem.

Thus, if we suggest changing outdoor participation rates, a leverage point, that would likely have far less effect than changing our model or vision of the role of outdoor recreation in society, according to Meadows (1999, p. 19). If we saw, for example, the park-recreation system as holding health as an emergent property, (in addition to fun, adventure, and appreciation of nature) we would be using a different paradigm of it and allocate resources differently. So, the purpose of understanding system leverage points is to know where we can intervene in a system most effectively and equitably, that is making change with a good benefit to cost ratio. But because conventionally we don't think and act more holistically and thus intervene at fundamental points rather than points at or close to the surface, we cannot make bigger changes in the sustainability and resiliency of the system.

The same is true about acting on that system, i.e., planning and research. There are a variety of methods of acting more holistically, based on diving deeper and thinking differently about the outdoor recreation system and thus transcending paradigms that influence how we conduct research on and plan for the provision of recreation opportunities. First, we can adopt a series of principles as suggested by Kohl and McCool (2016, p. 320), who, after a review of park planning failures (due primarily to thinking more narrowly and only at the tip of Senge's iceberg) suggested several principles to help act more holistically. Those are shown in Table 2. These principles help planners identify and act on significant leverage points. For example, planners can adopt a strategy of having heritage managers conduct planning processes rather than outside consultants (which Kohl and McCool criticize a lot). This strategy builds capacity and ownership in the plan which is an important leverage point in understanding and implementing plans. Actually, planning may be viewed as a capacity building process. However, as Kohl and McCool note, these principles must be followed with integrity,

Table 2
Principles for planning more holistically (Source: Kohl & McCool, 2016, p. 320).

Ensure Constituent Community Readiness
Create balanced relationships of power and heartfelt needs
Build ConsensusIntegrate Multiple Forms of Knowledge
Facilitate Community-Based Heritage Interpretation
Design planning to manage technical problems as well as build social capital
Facilitate Development of Others but Do Not Do Their Work for Them
Build Holistic Planning Teams
Plan and Implement Continuously
Carryout Every Planning Moment Holistically
Learn to Learn
Plan and Implement Continuously
Meet People Where They Are

require diving deeper and thinking differently if they are going to be applied with enthusiasm.

Another way to help us act more holistically is to develop a "vision" of what we work toward in our agency and for outdoor recreation. A vision is what we "create together", it is an emergent property of a system that does not currently exist in our minds. In essence we build a vision of what an outdoor recreation system will be like in the future (McCool et al.,) or even what function it will serve in society. A vision is created by and shared with the people affected (Senge, 1990). By sharing a vision (and its construction), we develop a sense of ownership and trust in those that manage the values in which we believe. As Senge eloquently argues, there is nothing more powerful to an organization as a shared vision:

> Few, if any, forces in human affairs are as powerful as a shared vision. A shared vision is not an idea. It is not even an important idea. It is palpable. People see it as if it exists as an actual entity, as if it is something alive.

Visions that are useful are difficult to shape; they take time and a lot of work, wordsmithing and negotiation. They involve different kinds of people: planners, scientists, advocates, non-government organizations, visitors and so on, but the result is a future that all believe in and have ownership in. They may be short, such as Ducks Unlimited vision of "skies filled with wings" or longer. All depends on the situation.

We need a longer term, more spatially enlarged view of the systems we manage, such as thinking across boundaries. For example, we tend to think about managing a park for its recreation opportunities but managing within those boundaries may result in surprises outside. We may, for example, restrict horse use inside one park, that leads to increased horse use in a unit nearby, and that unit may not have the same capacity (such as management, trails, legal authority) as the first unit. We thus may have resolved a problem in one place, and then are surprised by the problem popping up somewhere else. This is what I term "whack a mole" planning, after the popular arcade game in the U.S. A plan is created one place, then the same problem pops up in another, which we quickly respond to, only to pop up some place else, all because we do not understand the system with which we are dealing.

In summary, we need to know the system's function and its emergent property. And we need a view of where we are headed for in managing this system. We need to act on the more significant leverage points first while considering what the system function is.

5. Some concluding remarks

If you don't know where you are headed, then any road will take you there –Lewis Carroll.

Changing paradigms to think like a system will not be easy. It becomes only a reality when the overwhelming weight of evidence points to the lack of progress in the current paradigm that we must change (Kuhn, 1970). Not all researchers or planners will want to change, a sort of paradigm resistance sets in as I have seen in some reactions to presentations and papers. For me, the need to change paradigms began a quarter century ago when I saw plans failing everywhere I looked, a finding that was confirmed by interaction with close colleagues (around the question of "if plans are failing so frequently, why do we continue to use the same model", e.g., rational-comprehensive planning), searching and some reading (e.g., Friedmann, 1973). If the conventional paradigm does not work, then I will try something else. There were some fellow travelers in this, particularly in the public engagement component of planning.

Research on outdoor recreation needs a new paradigm, a new way of looking at the world. It needs a new paradigm because the world has become so complex, subject to rapid changes, and so uncertain, that old paradigms of outdoor recreation research and planning are inadequate to provide the understandings we need. Thinking like a system, where

the focus is on the whole and understanding how parts relate to that whole will advance our understanding of the importance of doing research on leverage points. Along the way, we need to develop a vision of where we want to be headed, which will lead to what we do "on the ground" that is useful to providing high quality recreation opportunities. These opportunities and what they do to participants will help us provide more benefits.

Changing paradigms means diving deeper to find the mental models causing problems and then designing alternatives. It requires thinking differently, "out-of-the box" as often proposed but at the deepest level we can get to. And we will need to translate that thinking into more holistic, system oriented acting.

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