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Water and People: Challenges at the Interface of Symbolic and Utilitarian Values

Editors

Stephen F. McCool was a professor (now retired) of Wildland Recreation Management, College of Forestry, University of Montana, Missoula, MT 59812. **Roger N. Clark** and **George H. Stankey** were social scientists (now retired), U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Clark was at the Pacific Wildland Fire Sciences Laboratory, 400 N 34th St., Suite 201, Seattle, WA 98103, and Stankey was at the Forestry Sciences Laboratory, 3200 SW Jefferson Way, Corvallis, OR 97331.

Cover Photo

Kootenai Creek, Selway-Bitterroot Wilderness

Kootenai Creek is representative of the changing values and uses of water in contemporary American society. The creek flows out of the Wilderness to the Bitterroot Valley in Montana, where its water is extensively used for irrigation of farmlands. And yet, water from the creek maintains a certain symbolism not associated with its more instrumental values. Water in the streambed contains an aesthetic valued in situ and not for other uses. Water here is used by fish and other animals, by artists, by recreationists, not only for drinking, but for appreciation as well. These symbolic values, unfortunately are rarely considered in allocation strategies and processes. Managers of wildlands then become the stewards to ensure that such values are protected and accounted for in decisionmaking. Photo by Stephen McCool.

Abstract

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The demand for water is rapidly increasing, but the uses to which that water is put and the values society places on water are changing dramatically. Water is the source of life, the sustenance for living, the resource needed for manufacturing, mining, agriculture; the element required to grow our lawns, to water our landscaping, to shower us with refreshment; it is the place where we play; it provides the snow for our winter recreation, and it provides the habitat for much of our wildlife. Water in contemporary American society is more than a simple physical entity, its symbolic values, and noninstrumental uses are growing in significance. As with many Native American cultures, water is as much a symbol as it is something to extract and use in the production of commercial products. This book is about the issues associated with these symbolic values and uses of water: the challenges they present—in our language, in our allocation mechanisms, in our communication—the conflicts raised; and the potential for resolving the difficult, contentious and complex issues concerning the use of water for various purposes. It is as much about framing the questions about symbolic values of water as it is anything else.

Keywords: Water, recreation, symbolism, uses and value.

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Chapter 1: Water, Recreation, and Society: Shifting Demands, Rising Concerns, Growing Complexity

Stephen F. McCool, Roger N. Clark, George H. Stankey, and Rhonda Mazza[1]

Introduction

The presence or absence of water has long shaped human society. Early civilization was nurtured in the fertile flood plains of the Tigris and Euphrates Rivers. Later, in the same region, drought led to societal collapse (Diamond 2004, Weiss and Bradley 2001). As the foundation of civilizations has shifted from hunting-gathering, to agriculture, to urban-industrial, people manipulated the supply of fresh water with ditches, levees, reservoirs, and aqueducts. Revered for its life-giving properties, water also holds sacred significance for many cultures, from the ancient Nile River god, Sobek, to the Hopi snake (rain) dance, to Christian baptisms. The history of water has long been typified by a dual role; a physical necessity for life **and** a symbol for power and purpose beyond simple human survival.

As global populations have increased, so has demand for water to serve a host of utilitarian uses, including irrigation for crops, use for industrial production, and consumption for domestic purposes. During the 19th and 20th centuries, institutions were developed in the United States for managing water in ways that reflected scarcity and emphasized its use for industrial and agricultural purposes to further economic progress. Yet, even during this period, water's value for a variety of nonutilitarian purposes—recreation, amenities, subsistence, spiritual—remained important.

For these values, which are more symbolic than utilitarian, water is not consumed, transformed, or polluted; rather water in its in situ form is valued as it exists and for the connections it represents. And that very character leads to issues that challenge the current ways in which water is considered in contemporary land management. The goal of this volume is to frame the dimensions of symbolic uses

[1] Stephen McCool was a professor (now retired) of Wildland Recreation Management, College of Forestry, University of Montana, Missoula, MT 59812. Roger Clark and George Stankey were social scientists (now retired), U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Clark was at the Pacific Wildland Fire Sciences Laboratory, 400 N 34th St., Suite 201, Seattle, WA 98103, and Stankey was at the Forestry Sciences Laboratory, 3200 SW Jefferson Way, Corvallis, OR 97331. Rhonda Mazza is a science writer/editor, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, P.O. Box 3890, Portland, OR 97208.

of water to promote dialogue about how these values can be more completely understood and considered in management. To do this, we focus on recreational values because they are representative of the changing symbolic character of water in land management.

Symbols involve meanings. A red, eight-sided sign is the international symbol for "stop"; a skull and crossbones is the symbol for poison. In this sense, they are denotative in character; i.e., there is an agreed-upon definition—a dictionary definition, if you like. However, symbols also involve interpretations, which are subjective assessments about meaning. When Norman Maclean wrote "*A River Runs Through It*" in 1976, he was talking about more than the hydrologic characteristics of Montana's Blackfoot River. The river became a symbol for life and death, for continuity, for connections among people and between people and nature.

Symbols and symbolic images and values are real, and they have direct impacts on our lives.

It may be tempting to treat symbols and symbolic images as nothing but interesting notions or as having little significance for operating "in the real world." After all, many symbols appear to have little direct practical application for economic progress. The practical value of the symbolism involved in a view of the Blackfoot River that thousands of people experience annually does not easily translate into economic impacts, highway design, or silvicultural approaches to the surrounding mountainsides. Our position is to the contrary; symbols and symbolic images and values are real, and they have direct impacts on our lives. In the case of natural resource management, it is the symbolic dimensions of forests, mountains, wildlife, wilderness—and water—that lie at the root of much of the public debate and controversy today. Ignoring these dimensions or discounting their significance in day-to-day management only places today's natural resource manager at peril in a political system driven as much by abstract philosophies as by pragmatic accomplishments.

Having said that, we must also acknowledge that symbolic uses and values are often, but not always, difficult to define and measure: they frequently lack agreed-upon meaning, and they are subject to multiple interpretations, which can change over space and time. This is further complicated by the simultaneous utilitarian and symbolic values given to water and because many of our utilitarian uses (such as water for irrigating a hay field on a western ranch) have become symbolic themselves. To a rancher, water is more than sustenance for crops and livestock; without it, hayfields could not be irrigated and stock could not survive. As such, this use of water has come to mean a livelihood, a way of life, and the survival of a culture.

These complications leave us in the apparent dilemma of arguing that (1) symbolic uses and values must be given greater attention in natural resource

management, but (2) we are not able to tell you what those symbolic uses and values are or what they mean. Working through this dilemma not only requires patience, but tolerance, as many people may view such discussions as threatening.

This opening chapter is intended to engage this dilemma and to offer the reader the means to understand why the issue of symbolic uses and values is crucial to fashioning more effective resource management strategies. We discuss the limits of language regarding changing water uses and values and existing management paradigms to conceptualize and manage for them. We propose outdoor recreation as a proxy for a wide variety of symbolic uses of water. A central contention is that much of the debate and conflict surrounding the management of water and the integration of traditional, economic uses with emerging symbolic values derive from inadequate attention to problem framing; therefore, we offer some specific comments for better addressing this issue. This seems especially critical as future demands for water—both traditional and symbolic—will continue to increase and diversify, as will the potential for conflict over allocation and management. This inevitably will require a critical examination of how contemporary institutional barriers make it difficult to efficiently, effectively, and equitably allocate water for diverse values. We close with an overview of the remaining chapters.

Society Affects, and Is Affected By, Water

Throughout history, natural changes in water regimes have shaped social patterns of values, occupancy, and use; conversely, changes in social and economic conditions have altered water regimes. For example, human exploration and development of much of the Western United States was influenced by the pattern of water availability; it affected the location and size of settlements and the character of economic development activities. Its presence or scarcity ultimately played a major role in shaping the cultural landscape of the region.

Since John Wesley Powell's initial navigation of the Colorado River through the Grand Canyon in 1869, the scarcity of water for utilitarian uses, particularly in the West, has been addressed in a number of social and cultural responses—from legalized water adjudication processes, to state constitutional statements on what beneficial values of water are viewed as legitimate, to the construction of water storage and distribution infrastructure. All these actions represent significant components of Western American society today. Because water is more abundant in the East, society there has dealt with it differently, and consequently, the relationships between water and society may differ from one society to another, but they are still significant. Moreover, the nature of the water regime—where water is

found, its quantity and quality, its dependability, and its timing—shapes the development and exercise of a host of formalized rules and regulations that ensure its availability for particular demands.

The study of water and its uses provides insight to the social foundations of natural resources and their management. It is generally accepted that resources are culturally defined because the resource holds value and utility for people. This is an admittedly anthropocentric conception. For much of contemporary history, resources have been defined within a commodity framework wherein their value was revealed through the economic marketplace and expressed in monetary terms. However, the cultural foundation from which natural resources gain definition also implies these meanings can change over space and time, reflecting changing cultural orientations. And often, such changing cultural orientations are reflected in the marketplace, such as the rapidly growing demand for kayaks and rafts used to navigate particularly challenging stretches of rivers. The stock, distribution, and character of resources, as well as the metric through which they are valued, can differ in response to new technologies, new knowledge, and changing social values.

The history of water resources in the United States and elsewhere reveals a continuous evolution in the meanings and importance assigned them by society.

The history of water resources in the United States and elsewhere reveals a continuous evolution in the meanings and importance assigned them by society. Historically, water has been valued as an engine of economic development and as the source of commodity and utilitarian values. For example, water fostered the Nation's agricultural development, and the hydropower it generated drove much of the country's urbanization and industrialization. Paris Gibson, the founder of the city of Great Falls, Montana, envisioned harnessing the falls along the Missouri River to fuel industrial development in a brand new community. And for a century, the electricity produced by several dams in the city (nicknamed the Electric City) were used by smelters, refineries, and other manufacturing plants that served as its economic foundation. Few such plants remain, but the river has become a central focus for recreation and aesthetics.

Industrial values and uses of water remain important today, and contemporary management paradigms remain dominated by them. At the same time, however, the definition of what constitutes the useful and beneficial uses of water is expanding. In recent years, federal legislation such as the Clean Water Act, the Endangered Species Act, and the Wild and Scenic Rivers Act have provided a legal justification that utilitarian, consumptive uses by humans are not necessarily the "best" uses for water. Such laws begin to legitimize the utility of other values and uses related to amenity, outdoor recreation, scientific, aesthetic, and spiritual purposes. These uses enhance the quality of our lives, providing opportunities to "connect" with

nature and improve our understanding of the natural processes upon which society depends.

It is relatively easy to talk about the value of water in traditional terms. Well-defined metrics in economics enable ready calculation of the monetary value in irrigating crops or providing a municipal water supply. It is more difficult to talk about the value of water for uses that do not have a market price. For instance, how does one calculate the aesthetic value of a waterfall or the tranquility of a lake shore and incorporate it into a traditional management plan? Even the lack of an adequate vocabulary to describe these uses and values makes it difficult to incorporate them into a management plan. As a result, such values or uses often are ignored or discounted in formal evaluation processes. And even if they are considered, the tendency is to redefine abstract, symbolic values of water and measure them in highly reductionist ways. Attempts have been made to place monetary units on these uses by using techniques such as contingent valuation—for example, a survey might ask respondents to state how much they would pay to preserve a certain wetland—or a travel cost method that determines the value people place on a scenic river by calculating how much they paid to get there. These techniques attempt to translate one type of value in terms of another; but in doing so, there is a risk that important dimensions and values may be lost in the translation.

Although these uses and values such as amenity, subsistence, spiritual, and aesthetic are sometimes characterized as new, in reality, they have long been with us. And at times, we have formally recognized them. For example, in 1962, the Outdoor Recreation Resources Review Commission noted that water and the interface between water and land was the focus of much outdoor recreation activity; this interface continues today. Moreover, contemporary scientific studies have expanded understanding of the key role of water regimes in ecosystem functioning and in maintaining and sustaining key ecological processes. As a result, the competition and conflict between recreation (such as camping in riparian areas) and such ecological services has become increasingly recognized and a challenge to effective and equitable resolution. And water serves as the medium that represents the connection between human life and the world around it, a key element of Native American and other belief systems.

Our capacity to depict accurately the nature and character of these uses and values—new vs. old, traditional vs. contemporary, symbolic vs. nonsymbolic, consumptive vs. nonconsumptive—is limited.

It seems obvious that managing to satisfy these various values and uses of water is challenging. Yet, our capacity to depict accurately the nature and character of these uses and values—new vs. old, traditional vs. contemporary, symbolic vs. nonsymbolic, consumptive vs. nonconsumptive—is limited. And, as we argue here, our aptitude to do something about it, even if we could depict these values, seems

even more limited. Our vocabulary reflects the paradigms of management that long have dominated social discourse, and as new paradigms evolve, the language of the old seldom is adequate in describing the new (Kuhn 1962). Terms such as those above fall short of representing the rich and complex connections, meanings, and relations that exist between uses; moreover, they convey a sense of either-or that constrains the search for compatibilities and opportunities for integrated, mutually beneficial decisions.

Language, with its imprecision and shifting meanings, troubles all fields where precise words are imposed on imprecise concepts. Philosophers note that when talking about an abstraction, we also must be able to talk about its opposite. For instance, the concept of wilderness only holds meaning when taken as the opposite of civilization (Nash 2001). Many of the values for water that fall outside traditional utilitarian definitions are abstract, often personal, and not necessarily shared. In this publication, we contend that the term "symbolic" best describes these values. Although linguistically "symbolic" and "utilitarian" are not natural opposites, we believe the concept of symbolic embodies the broad, diverse collection of uses and values—spiritual, amenity, aesthetic, historical, cultural—that have come to hold increasing importance for many people but lie outside of formalized institutional processes of water management. It is also a gesture in favor of moving beyond traditional language, a necessity, we feel, in moving beyond the conventions of the past 100 years of natural resource management that now constrain, rather than nourish, society (Wilkinson 1992).

The emerging importance of symbolic uses and values of water raises a variety of challenging questions. How does the spatial distribution of water supply and demand affect these changes? What mechanisms are best suited for allocating water to them? How are they impacted by more traditional uses? What are the compatibilities, conflicts between them and other, again perhaps traditional, values and uses? What are the drivers of such changes? Such technical questions trigger others regarding how resulting conflicts are addressed and resolved, the processes agencies use to identify various water-dependent values, and how those values are identified, displayed, and weighed. More challenges arise when we consider the adequacy of existing institutions' processes and capacity in making decisions about the inevitable tradeoffs that occur. To what extent are contemporary institutions suited for management of these emerging uses and values of water? What is the capacity of society to frame and resolve issues of water management today? How do existing power structures influence these questions, and what do we do about them?

As society's needs, desires, and practices evolve, so must the institutions—the rules and mechanisms that guide us—created by society to address the new challenges, conflicts, and issues that arise (see box 1). New paradigms revolutionize how people see the world and approach the challenges, conflicts, and issues previously unrecognized, ignored, or discounted by former paradigms. The broadening definitions of the value of water—typified not only in increasing concerns about quality, access, and attachment, but also in links to other components of human-natural systems—presage a new paradigm in social definitions and management of water.

Water and Recreation: Changing Conceptions

Just as water influences decisions regarding where people live, it also explains much about when, how, and where they recreate. Water provides access to some recreational settings, such as whitewater rafting; it is required for some activities, such as water skiing and fishing; and it serves as a backdrop for many others, such as picnicking, camping, and relaxing. Although these activities take different forms, they all lead to meanings, experiences, and benefits highly dependent on the presence of water.

Symbolic values of water recreation can be best understood along three dimensions: (1) the meanings individuals and societies attach to it at different places, (2) the strength of these attachments, and (3) the dependency on specific water environments for these meanings. Williams and Patterson (1999) provided a useful classification system for understanding the meanings people attach to places: (1) aesthetic meanings (this place is beautiful, or ugly), (2) instrumental meanings (this is a good place for water skiing), (3) cultural/symbolic meanings (this lake held important spiritual significance for Native Americans), and (4) individual/expressive meanings (this is the lake where I got married). Although recreational meanings are often primarily instrumental, uses of lakes and other water surfaces can foster other types of meanings; a campground located beside a lake might take on individual/expressive meanings because of a family tradition of camping in that specific place. A stream may have been the place where an individual caught his or her first fish as a child. Or, a set of rapids in a river running through a community may become symbolically important to the whole community.

Generally, the stronger the meaning, the more likely a person is to respond to proposed changes in the conditions that foster those meanings.

People value these meanings differently. Generally, the stronger the meaning, the more likely a person is to respond to proposed changes in the conditions that foster those meanings. A person who considers a lake a good place to go water

Box 1. Conflict over water allocation in Owens Valley and Klamath Basin

When the rules and mechanisms society establishes to guide its actions fail to evolve at a pace similar to society's needs and desires, conflicts often arise. This disjunction between institution and need is apparent in many water conflicts today. Originally, America's water management institutions were established to facilitate the Nation's economic growth, primarily through agricultural, industrial, and urban development. However, as we have prospered and the population has grown and diversified, other uses and values for water—amenity and aesthetic, scientific, spiritual—have grown in importance and the traditional institutions of water resource management have struggled to accommodate these values such as instream water rights to preserve fish habitat. When these institutions fail, U.S. society resorts to litigation and more legislation. As the institutional landscape becomes more complex, conflict can be built into the system; innovation is needed to craft institutions flexible enough to manage natural resources effectively. Two examples in the Western United States illustrate this point.

The saga unfolding in Owens Valley, California, has been well documented in literature and film, such as in Roman Polanski's *Chinatown*. To those eager to sensationalize the conflict, it has lent itself well to deft depictions of good and evil: hardworking farmers cheated out of land and water by slick-talking businessmen from Los Angeles; a rural community sacrificed to quench the thirst of a growing metropolis. At the heart of the story, though, is the shift in water use and management paradigms. When White pioneers settled Owens Valley in the 1850s, they displaced Paiute Indians and converted the watered meadows of native grains to irrigated fields of domesticated crops. At the turn of the century, Los Angeles was growing, and foresightful developers, keen to cash in on such growth, realized more water would be needed. The Los Angeles Department of Water and Power (LADWP) began buying land and associated water rights in Owens Valley in 1905 and, by 1928, owned about 90 percent of the water-bearing land in the valley. The Los Angeles Aqueduct transported water from the valley to the city 240 miles to the West. This diversion, accompanied by drought in the 1920s triggered protests and destruction of LADWP property in Owens Valley, but ultimately most farmers left by the 1930s. As the farms dried up, so did the rest of the valley. The water diversions to Los Angeles drained Owens Lake and about 50 miles of Owens River—wetland habitat for resident and migratory water fowl. This management scenario is summed up in President Theodore Roosevelt's justification for enabling the Los Angeles water diversion; the water was

Box 1. Conflict over water allocation in Owens Valley and Klamath Basin (continued)

better used facilitating development of a growing port city on the West Coast than supporting a small, isolated farming community (Walton 1992). The institutions in place supported this paradigm.

The environmental movement in the 1960s and 1970s represented a shift in society's valuation of natural resources. The Endangered Species Act, Clean Air Act, and Clean Water Act added another component to natural resource management. People fighting the dewatering of Owens Valley suddenly had another tool at their disposal. As Walton (1992: 6) put it, "Battles lost during the 1920s in the name of community were pursued and finally won in the 1970s under the auspices of environmentalism." This has not been a decisive shift in the way natural resources are managed or allocated, however. Litigation between the LADWP and interest groups such as the Owens Valley Committee and Sierra Club continues over the environmental degradation occurring in the valley. As the institutional landscape becomes more complex, rigid institutions can stymie efforts to achieve emerging uses and values, resulting in gridlock and further litigation.

The Klamath Basin along the southern Oregon and northern California border is also home to conflicts that illustrate the need for institutional innovation. The Klamath Basin and Owens Valley are geographically similar and both were considered prospective sites for Bureau of Reclamation Projects in the early 1900s. Whereas in Owens Valley, the Reclamation project was rejected in favor of the Los Angeles aqueduct, the project went ahead in the Klamath Basin. Dams and canals were built to supply basin farms with a reliable source of irrigation. The drama of the 1920s in Owens Valley was played out in the Klamath Basin during summer 2001. A sustained period of drought, coupled with new environmental regulations that increased the required minimum water level in Upper Klamath Lake to protect endangered fish, meant farmers below the lake did not get needed irrigation that summer. As in Owens Valley during the 1920s, the headgate of a main irrigation canal became the focus of local protest and civil disobedience; it was forced open at one point to allow water to flow into the canal; farmers and supporters from outside the region gathered to show solidarity, and both events captured the attention of the national media. As in Owens Valley, the root of the conflict over water use was fueled by different institutional paradigms working in opposition to one another—leaving key stakeholders convinced the resource was inequitably distributed and inefficiently allocated.

skiing might not evince much concern about changes in access or water quality if that lake is one of several choices for skiing. On the other hand, a proposal to cover a reservoir in a city park might elicit sharp response by regular park users because of the meanings (e.g., it is an essential part of the neighborhood) attributed to it. Such meanings extend beyond traditional values, such as the impact the lake has on property values.

We contend that many conflicts arise because some of the different meanings attached to a specific water surface—particularly those symbolic in nature—are not adequately defined, expressed, or evaluated in utilitarian-oriented planning frameworks.

Water requires certain physical characteristics to be appropriate for certain uses. Whitewater rafting, for instance, requires a certain range of water levels and gradient. As long as these characteristics are present, floating any river is acceptable to some whitewater rafters. Others, however, might have much more specific requirements that can only be satisfied in a very few places; for example, perhaps only the Middle Fork of the Salmon River in Idaho has the qualities of challenge and remoteness consistent with the experiences they seek. That setting has come to symbolize something more than what is offered by basic physical characteristics needed for the activity.

These aspects of place, then, provide a framework within which to consider evolving constructs of water and recreation. Once understood, they identify potential conflicts, clarify why conflicts occur, and might reveal ways to resolve them. We contend that many conflicts arise because some of the different meanings attached to a specific water surface—particularly those symbolic in nature—are not adequately defined, expressed, or evaluated in utilitarian-oriented planning frameworks.

The appeal of water for recreation or as a backdrop for communities likely will continue, and interest in water-related recreational activities likely will grow and diversify, with new meanings and dependencies fostering not only emergent relationships but competition and conflict as well. For example, we know that motorized uses of waters often conflict with nonmotorized uses. This often plays out in spectacular settings such as the Colorado River in the Grand Canyon, where for decades, both motorized and nonmotorized rafters have battled for preference in river recreation management. We also know that management actions can impact the quality of water-based recreation opportunities. For example, changes in flow regimes as a result of shifts in the operations of dams can affect the size, complexity, and difficulty of rapids, important features to kayakers and rafters. Similarly, strategies to protect riparian habitat (such as closures to human activity) have displaced recreationists from their favorite fishing or camping places. Even though such changes might have only relatively minor impacts on the physical characteristics of the setting, they nonetheless can significantly impact place meanings and

dependencies. In short, they change the kind of place it is and its appeal to users. Such impacts can lead to significant conflict because of the strength of those attachments or nature of the dependencies involved.

In many ways, water-related recreation reflects larger social issues and changes in society's relationship with water. These interactions are particularly significant in the Western United States but occur in the East, and indeed, globally as well. First, water surfaces in the West are relatively rare and highly concentrated in space. They are often over-allocated to a wide range of conventional uses. Meanings have evolved for these water surfaces that are often not compatible with these conventional, commodity-based uses. This means water is a focal point for multiple uses, meanings, and values, many of which conflict with one another.

Second, in the Western United States, many of the lakes, streams, wetlands, and rivers that people seek are on public land, or their waters originate on such lands. These public lands often provide multiple uses and values. However, they are governed by resource management institutions developed primarily to address utilitarian meanings of land and water. Measuring and evaluating these meanings, uses, and values occurs in a complicated, often poorly understood federal decision-making milieu that interfaces with often equally obfuscating state adjudication procedures. Institutions developed for water management have strict, generally inflexible, ways of defining socially acceptable uses of water. They have created rules and procedures for allocating water among competing uses. In addition, such institutions have developed mechanisms for valuing water that give preference to utilitarian values in management and allocation. Such institutions not only affect how we manage water, but eventually changing values of water will affect institutional design. Institutions are more than agencies and laws, and go to the very heart of our society, how it achieves its goals, and what it is (see box 2).

Third, population growth and shifting demographics (e.g., ethnicity, age, education) in the West have led not only to higher demand for scarce water supplies, but also to a more diverse set of demands and meanings, reflecting differing social preferences. Many of the demands do not fall under the traditional definition of utilitarian. For example, water as an aesthetic backdrop for homes, businesses, and communities; water as representative of pristine ecosystems; water for recreation; and so on.

Finally, these changes occur at different spatial and temporal scales with different rates of change. Water allocation institutions, for example, have proven slow to respond to the rise of instream water use values (such as for fisheries preservation), whereas population growth in many rural areas of the West has been

Box 2. Institutions—What are they?

The literature discussing natural resource management in a contemporary world often cites the inability of current institutions to deal with the emerging challenges facing the field. Consequently, calls for new institutions of management and planning are common. But just exactly what are institutions?

The question is more complex than it appears. Even among scholars, there is much debate about the nature of institutions. Some argue that institutions include the various rules by which society agrees to operate, others define them as standards of behavior, and still others, as political structures. The lack of agreement means it is difficult to study or evaluate institutions, yet there **is** agreement that institution—however defined—somehow is the key to more effective management. Given this importance, what can we say about institutions?

At the broadest level, institutions embrace the steps that society takes to get along. An array of formal and informal examples can be found. For many, a handshake or one's word is a binding arrangement that commits one to some action or behavior. In other cases, our beliefs and attitudes about the world become a part of the institutional fabric—we believe humans can improve upon nature (or they can't), that scientific knowledge is essential to effective management (or that many forms of knowing are important), that humans and nature are separate (or not), and so on. Collectively, these dispositions come to influence and shape our behavior with regard to the world around us.

A more familiar notion of institutions embraces the formal structures and processes that surround us. For instance, we generally agree that our society is founded on the rule of law and laws are examples of formal, codified types of institutions. So are organizations such as the USDA Forest Service or state water agencies. Professional organizations, certification standards, agency policies, and educational curricula are also examples of formal institutions.

Formal and informal institutions can affect one another. For example, if our belief system is grounded on the idea that humans and ecosystems are separate systems, formal institutions, such as management agencies, likely will be organized along similar lines, treating people as external to ecosystems and natural resource problems. Conversely, if belief systems promote the idea that human and resource systems are connected and interrelated, this can produce support for integrative institutions or decision processes that require integrative approaches.

Institutions reflect both internal and external influences. In part, this reflects the kinds of interactions between formal and informal types of institutions discussed above. However, institutions also can take on a life of their own;

Box 2. Institutions—What are they? (continued)

laws such as the 1872 Mining Act have been described as "lords of yesterday"; that is, rules formulated under conditions that no longer prevail, but which persist because they serve certain powerful interests (Wilkinson 1992). Current interest in fostering collaborative approaches to resource management similarly face major barriers within resource management organizations, where beliefs as to the ascendancy of technical, scientific, and rational thinking still prevail.

Institutions influence how we frame problems and how we seek solutions to those problems. For example, if we believe that natural resource management problems occur mainly because of a lack of knowledge, efforts to solve them will focus on increasing the stock of knowledge. On the other hand, if we believe such problems are an inevitable result of the underlying socioeconomic and political system, then an entirely different scope of locating effective, appropriate institutional arrangements must be undertaken. However, the latter situation can be a formidable, even frightening prospect, and the tendency is to redefine the problem so as to make it amenable to current institutions. In short, radical or transformative institutional reform is difficult to achieve.

relatively rapid. Reliance on the allocation mechanism of first-come, first-served has created an inertia, making quick accommodation of these emerging uses and values difficult. The consequence of disconnects between institutional processes and changing public interests and values brings numerous questions to the fore: How much water should be allocated to what values? How should these decisions be made, and what criteria should guide these decisions? Who gets to make them? What type of knowledge is appropriate to make such decisions?

Several ramifications stem from these four factors. First, allocation and management for water-based recreation is complicated because demands for some values (such as fishing) can be identified, defined, and valued from a traditional economic or utilitarian perspective, but others (such as the sense of tranquility experienced during a walk along a lake shore) cannot. Because of this disparity, decisionmakers typically are aware of the consequences of proposed actions for some values but not others. Or they might be aware of say, cultural/expressive meanings, but lack metrics that quantify their magnitude, distribution, and importance. Second, the presence of symbolic water recreation values shifts the character of water management decisions away from a

purely technical question (e.g., how much water for what) to one of values, preferences, and meanings. This shift challenges the appropriateness and capacity of conventional technical-rational planning models. Third, increased understanding of these nonutilitarian values of water will require integrating different forms and sources of knowledge because the positivist traditions underlying contemporary land use planning are not well equipped to deal with them. These ramifications also emerge in a host of other natural-resource-related issues (e.g., forestry, wildlife). As noted earlier, our discussion of the recreational use of water is grounded in the assumption that it bears upon the larger societal issue of symbolic meanings of resources and how those meanings can be effectively, efficiently, and equitably managed.

Framing the Challenge of Water in a Changing Society: A Problem in Itself

At present, natural resource decisionmaking is driven by two principal imperatives: **rational, scientific planning**, which emphasizes objective, measurable, and systematic approaches, and **political processes**, which reflect power relations in decisions. Under current conditions, rational-scientific processes dominate agency planning efforts, but growing public dissatisfaction with results increasingly has led to agency decisions being superceded in the political arena. Complicating this has been the rise of prescriptive agency legislation. However, in either case, outcomes tend to be dominated by a single interest or resource focus that fosters either-or answers, ignores the potential for adverse interactions among resource systems, and often fails to capitalize on opportunities for diverse positive outcomes.

When a problem is framed adequately, it is understood by diverse interests.

A central contention of this publication is that the situation above derives from the way problems of water management are framed; that is, the parameters admitted to and used in discussions about an issue. When a problem is framed adequately, it is understood by diverse interests, it is stated in a way that allows for a solution, and via the process of discussion, we avoid solving the wrong problem (see box 3).

Problems tend to be framed in a manner consistent with the dominant paradigm. For example, if one views a decision regarding water allocation and management as simply involving a choice among competing uses that are easily measured and valued in an agreed-upon fashion, then problem-framing is relatively easy: that is, what is the most socially efficient allocation? Although this approach proved adequate when utilitarian values dominated and the metric for comparing them

Box 3. Framing the problem is a critically important step in developing solutions.

…an adequate problem definition is a critical first step to effectively solving complex problems. The process of reframing or redefining a problem enhances one's understanding of the problem… Being able to problem-frame, to adopt different perspectives on a problem, makes people better able and more willing to think about and creatively address it. (Bardwell 1991: 606)

applied to all values, it has proven less useful in resolving issues involving diverse, nonutilitarian demands because it leads to neither understanding of the fundamental underlying issue nor agreement on how the issue should be defined.

We are not arguing that technical analysis is inappropriate or invalid, but that such analyses are inadequate when used in isolation and are particularly limited when it comes to dealing with issues/conflicts fundamentally grounded in value conflicts. As society increasingly values water for its nonutilitarian uses, meanings, and merits, we would expect the limitations of technical analysis, used alone, to become more evident, and that the sole use of technical analysis be more subject to public scrutiny, academic debate, and political controversy. It is our position, though, that analyses can be undertaken that inform and reveal symbolic values.

Goal and Purpose of This Publication

Gaps in our knowledge about water and societal uses and appreciation for it are a function of limited disciplined inquiry in these areas, new knowledge that has not been presented or synthesized in an easily retrievable manner, and fundamental societal changes. Although the following chapters focus primarily on the United States, the problems, challenges, and remedies they describe are global in character. With an expanding world population, water management issues will become more pressing as demands increase and diversify.

This publication attempts to narrow the gap of understanding about the symbolic values and uses of water. A central premise of our discussion is that although technical knowledge about water resources is a critical, necessary component of informed decisionmaking, it is not sufficient for ensuring better management. Rather, increased attention must be given to describing and understanding the social and institutional context within which water management occurs, including the dynamic nature of changes in cultural uses, demands, and values for water. To give

A central premise of our discussion is that although technical knowledge about water resources is a critical, necessary component of informed decisionmaking, it is not sufficient for ensuring better management.

our discussion more specificity, we have chosen to focus on recreational uses of water, treating this issue as an exemplar of a broader societal interest in a host of symbolic uses and values of natural resources. It is our contention that we can learn much about the management of these uses and values through a focused discussion of water recreation, the dynamic changes in its character, the links between it and other resource uses and values, and the institutional structures and processes that facilitate effective management.

Organization of This Publication

The following chapters cover a range of topics regarding the social values and uses of water, with an emphasis on recreation. Patricia Stokowski begins this discussion in chapter 2 by providing an historical overview of the symbolic role of water in society. Understanding this history and the significance of water and how natural resource agencies currently view it helps us appreciate how and why many of the emotions associated with water are not well-served by decisions affecting its management. In the third chapter, Christina Kakoyannis and George Stankey provide a review of the relations between water and recreation. They describe how recreationists perceive water and its relations to recreational engagements. They also review the literature describing the impacts of recreational activity on water quality.

Jeff Kline and others provide a detailed examination of the demand for water-based recreation in chapter 4 and review various conventional and emerging mechanisms for assigning value to water-based recreation. This information is helpful in understanding how time is taken into account in various planning processes. Western institutions and approaches have often marginalized values and meanings of indigenous cultures. A specific illustration of the symbolic character of relationships between water and recreationists is provided by Kelly Bricker and Debra Kerstetter in chapter 4. The meanings that recreational river floaters attach to specific segments of California's American River are identified.

In chapter 6, Elizabeth Woody shares her perspective as a Native American on the relationship her people hold with the water and the beings dependent on it. As she eloquently writes, "Today, the vanishing of our Native/traditional salmon runs parallel the disappearance of our Native languages and presence along the shores of the rivers and streams." Sarah Bates van de Wetering examines the institutional processes and mechanisms for managing water, particularly their applicability to

recreation in chapter 7. Water law is complex and controversial; this chapter provides an overview not only of traditional institutional approaches but newer experiments as well. In the final chapter, McCool and others discuss future directions for research on water in contemporary American life, and share some observations about the adequacy of current institutions to deal with symbolic aspects of water and move forward.

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Chapter 2: Symbolic Aspects of Water

Patricia Stokowski[1]

Introduction

Water is the original symbol of life, and as such, it represents creation, absolution, and physical and spiritual renewal. Across all time, people of all cultures have attributed to water a beauty, mysticism, and power beyond compare. Of the four basic elements, water has the appearance of being the most human-like, the most alive. Earth is massive and solid. Air has motion, but is generally invisible. Fire is useful, though often unpredictable. But water is animated, full of motion. It skips, falls, and jumps in and out of streams and over and around boulders; it absolves, cleans, and renews; it changes moods over time; it murmurs, sings, and caresses, or it thunders and roars in downpours, floods, and storms. Visible falling as rain, flowing in streams, bubbling in mudpots, sprouting in geysers, and cascading in waterfalls, water appears "as a complete being, with body, soul, and voice," wrote the French philosopher Bachelard (1983: 15). The Greek poet Pindar agreed, beginning his Olympian One Ode (Instone 1996: 41) with the claim, "Water is best" among the elements.

Although many people in Western society take water for granted, the magic of water is apparent to those who are attentive. Writing about the effects of war in Croatia and her sense of loss upon departing her ocean-side homeland, Ugresic (1996: 217) explained her new-found attachment to another form of water:

> No one is the same anymore….I, uprooted daughter of the Adriatic Sea, have developed a passion for snow. When it snows, I go outside and gaze enchanted at the sky. I seem to attract snowflakes like a magnet, I drink in the snowy moisture like merciful oblivion. I feel my body…becoming lighter. And, suddenly, I wave my arms energetically and see the glass dome above me misting over…. Feathers fall over me, a white feathery snowstorm enfolds me, envelops me….

Loren Eiseley (1957: 18) wrote of water's mystery, "I examine one intricate (snowflake) crystal on my sleeve before it melts. No utilitarian philosophy explains a snow crystal, no doctrine of use or disuse. Water has merely leapt out of vapor

[1] Patricia Stokowski is an associate professor, Rubenstein School of Environment and Natural Resources, University of Vermont, 305 Aiken Center, Burlington, VT 05405.

and thin nothingness in the night sky to arrange itself in form….it is an apparition from that mysterious shadow world beyond nature….”

Water may be lyrical and artistic, an evocative metaphor for life’s joyous and meaningful experiences, but it also signifies danger, and gives rise to mourning:

> …All love goes by as water to the sea
> All love goes by
> How slow life seems to me
> How violent the hope of love can be…
> *Apollinaire* [1990: 102]

Thus, Wendt (1969: 8) urged caution in considering water. He wrote, “There is a long thread linking Thales of Miletus [a Greek pre-Socratic philosopher who developed a theory of water as the source of all life] and Edward Teller, the primordial element of water and the H-bomb.”

Because its cultural and symbolic values are often neglected and poorly understood, contemporary approaches to understanding water tend to focus primarily on its functional, utilitarian purposes.

Because its cultural and symbolic values are often neglected and poorly understood, contemporary approaches to understanding water tend to focus primarily on its functional, utilitarian purposes. Worster (1994: 31) wrote, “Today water refers mainly to a commodity providing material comfort and prosperity….We expect it to be as clear, colorless, and odorless as we can get it, and then we dismiss it from consciousness. With hardly any effort on our part, it comes gushing from a tap….” That clean, plentiful water is necessary for life cannot be ignored. The human body is about 65 percent water, and about 71 percent of the Earth’s surface is covered by water (Miller 1998), although much of the Earth’s water is too salty for human consumption or for industrial and agricultural use. Water resources are in short supply in some of the major population zones of the world, and water stress on humans, plants, and animals is becoming more common in some parts of the globe. Even when water is plentiful, it is sometimes polluted, unavailable because of diversions, or unpredictable in flow (e.g., places are subject to flooding, or fluctuating levels of rainfall or snowpack). Water is thus political: those who control waterflow and access have power, a point vividly realized by those living downstream from water sources and water managers.

Miller (1998: 7) defined a **resource** as “anything we get from the environment (the Earth’s life-support systems) to meet human needs and desires.” The conception of water as a resource can be traced throughout all historical periods, but is illustrated most vividly by the Romans, whose methods of aquatic engineering were highly advanced and served public well-being; architectural remains of their aqueducts, reservoirs, and several hundred public baths still exist today. Contemporary natural resource managers tend to objectify water, focusing primarily on its

tangible, measurable aspects—its basic forms as lakes or rivers or icefields; its presence or absence in a setting; its descriptive qualities (size, depth, breadth, speed of flow, turbidity, accessibility); and its quantifiable uses (navigation, irrigation, border control, and so on) or aesthetic values (scenic qualities, recreational values). The consequence is to treat water as a commodity whose economic values can be estimated objectively for purposes of buying, selling, and trading. Little attention is given to the symbolic aspects of water, or to the ways in which historic precedents and cultural orientations toward water might lead to new understandings of the roles and meanings of water for personal recreation experience and public lands management.

The utilitarian view of water resources is the heritage of scientific rationalism and materialism derived from world views that emerged and took root during the 18th-century Enlightenment period in Europe. Although they stimulated notable scientific and technological achievements, these perspectives replaced and concealed earlier philosophies that had more vividly elaborated the symbolic aspects of water. To better understand contemporary functions, uses, and symbols of water, this paper examines earlier ages when humans and nature-spirits were more closely linked. The purpose of the historical review is to rediscover, describe, and analyze the symbolic, noninstrumental values of water—an effort that should facilitate a broader appreciation of this vital fluid and its roles in modern history. Following this exploration, some new approaches to thinking about water in contemporary recreation resource management are discussed. Considering water as an objective resource is but one way of encountering that element. What other ways of seeing can be derived from earlier mythological accounts? Can these other views offer new ways of conceptualizing recreation experience? Finally, alternative approaches to research and management are presented and discussed. The intent of the historical and cultural review of water symbolism is to suggest new policy agendas for agencies charged with protecting and wisely using the Nation's public lands and resources.

Beyond their personal uses of water at home and work, the varied settings of leisure and recreation provide most people with their primary encounters with water.

Traditional Approaches to Water in Recreation Resource Management

Beyond their personal uses of water at home and work, the varied settings of leisure and recreation provide most people with their primary encounters with water. Water recreation settings have always been highly valued by recreationists (Kakoyannis and Stankey, this volume; Kline, this volume), and in their leisure and travel, people apprehend water in all its varied forms. Water features are often the

Regardless of water form or activity pursuit, much recreation research tends to refer to water as a tangible object, as a resource available for human use and subject to agency or community management and control.

basic components of natural and built landscapes—landscapes that are both gazed upon in passive sightseeing, or actively used in outdoor recreation activity. These landscapes include pools, rivers, lakes, reservoirs, or ocean settings, places used for fishing, boating, diving, swimming, and other water play. They also include places where water transforms itself into frozen sheets and fluffy groundcover that allow skating, skiing, and sledding. Water creates a multisensory experience: people can hear water, smell it, touch it, taste it—and can imagine and remember it. Its value is obvious: ranchers in the Western United States refer to the precious fluid as "liquid gold"; ski resort managers have their own term for snow, "white gold."

Regardless of water form or activity pursuit, much recreation research tends to refer to water as a tangible object, as a resource available for human use and subject to agency or community management and control. Traditional recreation research centers primarily around quantifiable topics that attempt to establish scientific principles supporting human recreation choices, benefits, and consequences. These include (1) economic aspects of water, including the market and nonmarket values associated with water recreation and water-related aesthetic decisions, such as second home purchases; (2) physical and physiological benefits of water-related recreation activities; (3) psychological values, motives, and perceived benefits related to water recreation participation; (4) social aspects of water use, including onsite visitor activity patterns at specific water features; and (5) aesthetic or scenic values of water in the landscape.

Representative examples abound; a few will suffice. Contributing to the extensive literature about user norms and crowding behavior at recreation places (see Manning 1999, Shelby and Heberlein 1986) are quantitative analyses of norms expressed by boaters of all types, including whitewater river rafters (Roggenbuck et al. 1991). Basic research about recreation demand for alternative boating locations and activities (Siderelis et al. 1995) and studies of recreation participation (Bixler and Morris 2000) and recreation specialization in river settings (Kuentzel and McDonald 1992) also compose a large portion of available research literature. Economic analyses of water use have received increasing attention over the last two decades, and include examples such as Connelly and Brown's (1992) study of anglers' expenditures, and analysis of visitor's willingness to pay for river recreation access and experience (Loomis and Gonzalez-Caban 1997). Smith et al. (1995) studied visual aesthetics associated with water clarity and color.

Despite the varied topics, most of these articles assume a relationship between the water feature and the recreationists under study: water is essentially a backdrop

to the social and individual experience of recreation. Symbolic aspects of recreation experience are typically ignored. Additionally, the recreation experience is defined by objective qualities related to the water features (water levels, pollution levels, availability of facilities, travel distance to the site, numbers of other visitors, and so on)—not by particular relationships or symbolic meanings held by individuals or groups toward the water feature.

One study that does address issues of symbolism, however, is Vining and Fishwick's (1991) analysis of recreation site selection. The authors studied the "thinking-aloud" decisionmaking processes used by a sample of college students asked to describe their preferences for outdoor recreation sites in Illinois state parks. Although many objective characteristics of the sites (such as natural features, facilities, activity opportunities) were mentioned as contributing to personal decisions to visit or not visit a site, subjects also seemed to make inferences about the "atmosphere" of a site based on symbolic interpretations of natural features. As described by the authors, "Underlying values and beliefs were often revealed in subjects' discussions of symbolic variables. Water, often viewed as simply a medium for preferred activities, also represented qualities such as serenity and the opportunity to escape" (Vining and Fishwick 1991: 122). The authors suggested that understanding how symbolic aspects of water factor into personal decisionmaking processes might help reveal fundamental values that support and encourage leisure participation.

Other examples illustrating nonutilitarian views of natural resource management are offered in *Nature and the Human Spirit* (Driver et al. 1996), an edited collection of reflective chapters about spiritual aspects of nature and the role of spiritual meanings in public lands management. This collaborative effort, produced by land management professionals (primarily associated with the U.S. Forest Service) and filled with essays from resource managers, academics, private consultants, artists, and members of interest organizations, defines spiritual meanings as "the broad range of hard-to-define and hard-to-measure values and benefits that relate to the deep psychological or higher order human needs that (are) derived in part from humankind's relationship with the natural world" (Driver et al. 1996: 3). Driver et al.'s book is a notable departure from more utilitarian approaches to recreation and natural resource management.

Although the publication *Nature and the Human Spirit* does not directly set out to discuss nature symbolism, some of the authors suggest that spiritual meanings emerge from symbolic aspects of nature experience. For example, the artist Susan Driver begins her essay with a discussion of nature symbols and patterns; she

observed (p. 186), "Nature is a source of symbols that represent beliefs about life. These beliefs govern personal conduct, rituals, and group interrelations, and form the framework for a persona—a spiritual orientation to life." Likewise, Finnish researcher Aarne Reunala (1996: 228) identified certain archetypal symbols (a World Tree, for example) and myths that underlay ritual ceremonies and emotions (spiritual feelings) about nature in Scandinavian countries. Schroeder (1996: 85) also discussed psychological perspectives about the genesis of archetypal symbols in dreams and mythology.

Few of the authors specifically discussed water features in the landscape, but two chapters stand out. Bob Budd, a Wyoming cowboy, explained, "The power of water is never lost on the cowboy. Slow, soaking rains bring joy and contentment. A good snowpack tempers the difficulty of deep powder and ice on the meadows.… Cowboys think of water always" (Budd 1996: 172). Magary wrote, "Every kind of water…has been used as a metaphor for some kind of spiritual realization. The advent of rain, thunderstorms, mist, and fog require a slowing down as well as a loss of control over our rationally planned experiences" (Magary 1996: 298). He argued (p. 299) that land managers should design landscapes to foster spiritual opportunities: "Restraint exercised by public agencies toward spiritual things, the willingness to provide a space—but not fill it—is analogous to the silences that are essential in music."

Little attention has been devoted to studying symbolic meanings of water-related recreation experiences and encounters (such as those related to emotion, artistry, spirituality, and place-based sentiment) or considering symbolic issues related to water in management decisions.

Despite these efforts, traditional recreation research and management approaches tend to objectify water. Water is defined as a resource and is characterized by observable features and qualities. Little attention has been devoted to studying symbolic meanings of water-related recreation experiences and encounters (such as those related to emotion, artistry, spirituality, and place-based sentiment) or considering symbolic issues related to water in management decisions. Both researchers and managers tend to favor a rational, scientific model that privileges disciplinary investigations and emphasizes quantitative analyses. Qualitative analyses (specific to some schools of scientific reasoning in several social science disciplines) are slowly becoming more common, but critical analyses drawn from liberal arts and humanities (classics, religion, philosophy, history, and so on) are rarely employed in resource management analyses or decisions.

It is evident that water has functional, aesthetic, and symbolic meanings, but the symbolic characteristics are often down-played or ignored in current research. Thus, the following sections of this chapter attempt to recover some of the historical and cultural meanings associated with water symbols in order to understand what is lost when symbolic aspects of water are ignored.

Historical and Cultural Approaches: Water as Symbol

A symbol is an image that represents something else, such as an intangible or abstract idea. Symbols, Innis (1985: 2) wrote, "signify without motivation, through conventions and rules, there being no immediate or direct bond between symbols and objects…." A green traffic light means go and a red one stop; an image of a lion is used to represent bravery; Greek letters in a mathematical equation stand for operations involving the elements being measured; a four-leaf clover represents good luck; words on paper are themselves symbols. Symbols are observable indicators of meanings in human belief systems, and although some symbols may have spiritual overtones, not all symbols are religious.

The consideration of water as the preeminent symbol associated with creation, fertility, rebirth, renewal, good harvests, and so on can be traced to the mythology of ancient civilizations. Readings in classical and historical literature analyzing symbolic aspects of water are numerous, and reveal many symbolic referents. Water is the fluid powering creation mythology in all cultures. Symbolic aspects of rain and flooding are related to birth, fertility (agricultural and human), and sustaining growth. Pools, wells, springs, streams, rivers, grottos, and fountains are sites of cleansing, purity, and fulfillment, and they symbolize spiritual renewal, youth, immortality, and vigor. These water sources are sites for baptisms, places valued for their healing powers, or places to wash the body at death and prepare it for its final journey. River and sea voyages are metaphors for the conquest of lands and strangers, and harbor unknown dangers that must be overcome for success. Baths and spas provide hygienic, therapeutic, and social qualities of engagement and renewal. Water in its violent forms (storms and water monsters, for example) reflects the anger of gods and punishment for human misdeeds. Creation myths and flood myths are the foundations of more recent water symbolism and are discussed below.

Water is the fluid powering creation mythology in all cultures.

Creation Myths

At the root of all water stories are creation myths. Throughout time and across diverse cultures, water is featured in creation stories as the source of all life. The Book of Genesis, the first segment of the Old Testament, begins with the words: "In the beginning God created the heavens and the earth; the earth was waste and void; darkness covered the abyss, and the spirit of God was stirring above the waters" (St. Joseph Edition of the Holy Bible 1963: Gen. 1: 1-2). The generative

waters of creation lead directly to a maternal interpretation of water symbols. Water is female, it "swells seeds and causes springs to gush forth….The spring is an irresistible birth, a *continuous* birth" (Bachelard 1983: 14). Because many cultures believed that life began in the sea, "the word for 'sea' is feminine in many languages" (Croutier 1992: 14). Thus, in its elemental form, water symbolizes creation, growth, and life-sustaining energy.

The Nile River was the central natural feature facilitating development of agricultural communities in ancient Egypt and Arabia. Its fertile valleys and delta allowed settlements to flourish, and "each community tended to have its own set of beliefs and its own god" (Ions 1982: 8). Among the deities, the primary gods were those associated with creation, fertility, and the sun, and water played a prominent role in myths associated with these gods. According to Ions (1982: 19), the Egyptians believed that "water…was the source of fertility, and the sky was considered to be an ocean mirroring that on earth from which the Nile took its source." Gods associated with water took a variety of forms (Ions 1982, Martin 1991), including a crocodile (Sebek, a water-god from Crocodilopolis); a ram (Khnum, who raised heaven on pillars above earth, formed gods and men on a potter's wheel, and directed the waters of the Nile north and south as they arose from the Underworld ocean); a corpulent man wearing a crown of water flowers (Hapi, god of the annual Nile flooding that brought fertility to the valley); and dolphins (symbols of luck and joy that protected gods from evil during their water travels); among others.

All ancient civilizations had spiritual systems based on glorification of natural elements, and because water was so necessary to life, there were many gods with water interests.

All ancient civilizations had spiritual systems based on glorification of natural elements, and because water was so necessary to life, there were many gods with water interests. Powerful deities and lesser spirits, nymphs, dragons, and other animals and monsters, controlled the forces of nature, including water, and thus controlled human destiny. The gods who populated classical mythology diverged in name and character across different societies, but they often displayed similar powers and were symbolically equivalent (Croutier 1992, Martin 1991, Murray 1970, Schama 1995). In fact, "Much of Christian water symbolism," wrote Croutier (1992: 40), "was gleaned from the cult of Isis and Osiris, the moon deities of ancient Egypt." Osiris (likely a counterpart to the Greek god, Adonis; see Frazer 1961) was the god of heaven, and Isis—his sister and eventual widow—was god of the moon (her Greek parallel seems to be Demeter). The Osiris myth varies in its cultural presentation, but the key elements remain similar. Osiris was murdered and dismembered by his wicked brother Set (Typho, in Greek), who threw the heaven-god's body parts into the Nile. In preparation for burial, Isis was able to gather up

all the pieces of Osiris' body except the genitals. These significant parts remained in the river, restoring to the Nile River its symbolic role as a source of life and fertility.

Death, resurrection, and precious fluids that could stimulate new life were all central elements in the Osiris myth and also appear in other cultural versions of the story. As Schama (1995: 257) observed, "Death and sacrifice…are the preconditions of rebirth. Blood is miraculously transubstantiated into water (and indeed into wine…)….The connection between sacrifice, propitiation, and fluvial abundance seems to have occurred in all the great river cultures of antiquity." Blood, water, and wine also feature in later religious belief systems, such as the Roman Catholic teachings about Jesus Christ's death and resurrection, including the sacrifice of his human body that obtains salvation (rebirth) for believers.

Other classical deities also featured in the interpretation of water symbols. In ancient Greek mythology, Uranus (the god of heaven) and his mother/wife Gaea (the god of Earth) were the parents of Oceanus, the son who was god of a great ocean river imagined to encircle the world and give life to all things. Poseidon (Greek god of the sea) succeeded Oceanus, and Poseidon and his Roman counterpart—Neptune—evolved into the most powerful of the numerous marine deities. Neptune, according to the fables, used his trident to control the natural elements, stopping storms and directing the ebb and flow of the tides. Another child of Uranus, his daughter Aphrodite, was born of sea foam (her father's semen spilled upon the ocean waves). Aphrodite is known as the goddess of love and beauty; her Roman counterpart was Venus (pictured in painter Sandro Botticelli's Early Renaissance masterpiece, "The Birth of Venus," circa 1480).

In addition to the major gods in Greek and Roman mythology, there were numerous divine spirits associated with natural settings such as rivers, springs, canyons, woods, and the sea. These nymphs, naiads, Nereids, and others often traveled in groups as consort to a more powerful god. Living on Earth so close to humans, they also offered their powers of protection, nourishment, and fulfillment in love, to the mortals. The Greek hero Achilles was said to be the son of a sea nymph and a mortal.

Whereas the Mediterranean Sea and the Nile River were the primary sources of creation myths among ancient Greeks, Romans, and near Eastern civilizations, the Yellow River is the focus of Chinese creation myths and the Ganges River in India is sacred to Hindus. These societies developed myths of creation that were similar in form to those of other ancient peoples: gods and people were born of the sea, and the world was composed of sacred water sources (Whitcombe 2001). For

example, in the Chinese worldview, woman, who illustrated "the fertile, moist, receptive principle in nature" represented the life-giving quality of water. "Women appeared in mythology and literature as visible forms of the moist soil and the watercourses that make it wet. Both were receptive to the blazing, impregnating rays of the masculine sun and the benign influence of the radiant, superincumbent sky" (Schafer 1973: 7).

The generative powers of the water cycle for agricultural production and human well-being were thus repeated in Chinese mythology in a form similar to those found in Egyptian, Greek, and Roman cultures. Rainmaking rituals, common to many agricultural societies also institutionalized the close relationships with the gods. Native American dances during drought periods, east European harvest ceremonies, and Buddhist, Indian, and African rituals, although varied in form, were all intended "to attract the attention of the deities, thank them, invite their pity, and persuade them to keep the celestial waters flowing" (Croutier 1992: 35). Thus, Servid (2000: 53) could write that a coming rainstorm "consecrated" the earth and made it holy:

> A monsoon downpour approached across the distance, ushered over the landscape by fragrantly damp air. The drumming was a faint murmur at first, then a wider hissing rustle, then a crowded clatter peppering the tiles of our roof….The shower relieved the air's tired heat. Its rhythm attuned the ear, wakened the mind's impulse to look out. This rain delicious. This rain long awaited. This rain a renewal. This rain earth's sacrament, consecrating all living things.

Water deities in Chinese mythology were often given the form of dragons because, "In China, dragon essence is woman essence" (Schafer 1973: 28). This symbolic usage contrasts with imagery in other cultures, where dragons were conceived as water monsters—malevolent male spirits that reflected the potentially angry and threatening nature of waters. Bachelard (1983: 15) observed that, in many myths, water transforms from a female-nurturing symbol to a male-violent symbol as it becomes "angry" and dangerous. Smith (1995) also described clashes between gods of the sky and the waters (visibly signified by thunderstorms) in Ojibwe mythology, where the underwater dragons fight the sky for control over the world.

A nearly universal myth, Croutier (1992: 31) explained, "involves a many-headed serpent or dragon that threatens to destroy the people of a given land unless

a human victim, usually a virgin, is delivered to him periodically. Almost always a young man of humble descent slays the monster, saves the land, marries the virgin, and inherits the kingdom." Although mythological dragons were often found to be mean-spirited in their efforts to terrorize mortals (the nine-headed monster, Hydra, that was eventually slain by Hercules, for example), more recent dragons have been imagined as shy and elusive (the Loch Ness monster fondly called, "Nessie," and the Lake Champlain, Vermont, monster, "Champ"). There exist an impressive number of myths about frightening, unexplained water creatures (Eberhart 1983), and stories of their sightings, although not common, are far from rare (if available Web sites linking believers are true).

The examples of creation myths presented here refer to water as if it were an isolated element, and as if the gods and spirits associated with water were singular entities with limited interests and narrow purposes. Although it is reasonable to initially separate the symbolic values of water from those of other elements and to document the special attentions of individual water deities, that approach is ultimately misleading. Ancient cosmologies are complex, and symbols are often interdependent. Thus, Isis and Osiris are not only water guardians, but also feature in myths as gods of agriculture because water is the essential fluid needed to fertilize the Earth to make grain grow. Likewise, in Chinese mythology, water is important in comparison to mountains, as Snyder (2000: 128-9) so clearly described:

> Mountains also have mythic associations of verticality, spirit, height, transcendence, hardness, resistance, and masculinity. For the Chinese they are exemplars of the "yang": dry, hard, male, and bright. Waters are feminine: wet, soft, dark "yin" with associations of fluid-but-strong, seeking (and carving) the lowest, soulful, life-giving, shape-shifting….Mountains and Waters are a dyad that together make wholeness possible: wisdom and compassion are the two components of realization….In common usage the compound "mountains and waters"…is the straight-forward term for landscape…."Mountains and waters" is a way to refer to the totality of the process of nature.

This view of living phenomena as interdependent is evident in other Buddhist teachings and other Eastern religions practiced across Asia and elsewhere (Kaza and Kraft 2000).

Flood and Baptism Myths

The story of a cataclysmic flood that covered the earth and left widespread destruction appears in the folklore of most cultures.

The story of a cataclysmic flood that covered the earth and left widespread destruction appears in the folklore of most cultures, leading historians to speculate that the Great Flood was not merely a mythical event. The tale of Noah and his ark is well-known, and roughly parallels the flood myth that developed in Chinese tradition: "As a result of a huge flood, the earth was made barren and sterile," but a man and a woman survived with the help of a heavenly god and lived to populate the earth (Lianfen 1993: 51). Responsibility for the flood in the Chinese version was attributed to a raging dragon, which inhabited the river; controlling the floods required many kinds of human sacrifice. Similarly, in the Ojibwe "Earth Diver" narratives about the flood story, "a creature dives to the bottom of the flood waters in order to recover the world" (Smith 1995: 158). In its basic form, the flood symbolizes the destruction of evil and allows the world to begin again; a rebirth of goodness is the result.

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> One of the reasons why the flood narrative may have diffused as widely as it undoubtedly has—even to peoples who live far inland away from natural floods—could be attributable to its symbolic content. For example, inasmuch as all human neonates are so to speak delivered from an initial flood (of amniotic fluid) when the sac breaks, it is not impossible that the creation of the world was thought to have occurred in parallel fashion.

Dundes also proposed an interpretation of the flood myth that privileges male dominion of the world, explaining that, "…most flood myths involve *male* gods destroying the world but saving a *male* survivor to repopulate the earth….Noah's wife does not even have a first name" (Dundes 1988: 170). He believes this to initiate "a patriarchal period of human history" (p. 178). But, Romanian-born philosopher Mircea Eliade offered a broader view of the symbolism of the flood that transformed the event from a "profane" to a "sacred" form. He wrote (Eliade 1959: 131), "From the point of view of structure, the flood is comparable to baptism, and the funeral libation to the lustrations of the newborn or to the spring ritual baths that procure health and fertility."

If uncontrolled, floodwaters can be marshaled, eventually and with the help of the gods, into more manageable flows, then consecrated waters can be derived from

ordinary fluids. Holy waters appear in most cosmologies in the form of rivers, streams, and springs that become sites of rituals symbolically associated with birth and death (Croutier 1992). Examples are available from most religions. The Bible states that John the Baptist anointed Jesus in the River Jordan, and Christian baptisms thus are celebrated to bless newborns and adults. Orthodox Jews take ritual baths to purify themselves before participating in sacred events. In January 2001, an estimated 25 million people journeyed to Allahabad, India, to participate in the Kumbh Mela—a spiritual event derived from Hindu mythology that draws pilgrims from around the world to bathe in the Ganges and Yamuna Rivers (www.kumbhmela.com). Other faithful make pilgrimages to shrines like the one at Lourdes, France, where miracles associated with spiritual healing waters are said to occur. Orthodox and Catholic Christians ritualize the rebirth and cleansing processes by dipping their fingers as they enter or exit churches in water that has been blessed and made holy. In all cultures, washing and cleansing the dead is a way to purify the body before it is buried, burned, or transported across a real or imagined river as the spirit makes its way into the afterworld.

Traditions associated with baptism and other purification or cleansing ceremonies present paradoxes. Birth and death, symbolized in these water rituals, are two ends of a lifeline—but they are also parts of a natural circle of life that continually progresses through seasons, celestial patterns, and repetitive natural events (like the water cycle). Eliade (1959: 130) explained the baptismal symbols in the following manner:

> The waters symbolize the universal sum of virtualities….*E*mersion repeats the cosmogenic act of formal manifestation; *im*mersion is equivalent of a dissolution of forms. This is why the symbolism of the waters implies both death and rebirth. Contact with water always brings a regeneration—on the one hand because dissolution is followed by a new birth, on the other because immersion fertilizes and multiplies the potential of life.

From Ancient to Modern Times

According to classical mythology, the cosmos was alive, and people interacted in personal ways with elements of the natural world around them. Ancient societies attributed symbolic meaning to common elements like water, and although many of those symbols have remained in cultural memory, over time their representations have taken new forms in the modern world. Fundamental symbolic practices, like

that of baptism, have been expanded to accommodate other life activities and meanings. For example, in China, "From birth to death, every important phase of life had some ceremonies related with water" (Lianfen 1993: 55), including bathing ceremonies for newborns, adolescents, and members of wedding parties, formal rites for tea drinking, and ritual cleansing and transport of bodies across rivers at death. Similar symbolic practices are replicated in many societies, although as people become more dependent on technology and less cognizant of, or attentive to, natural processes, cultural memories of the meaning of water rituals are reduced or disappear.

The history of water symbolism does not end with ancient societies.

Nevertheless, the history of water symbolism does not end with ancient societies. One visible modern representation of water symbolism can be found in the development of spas and resorts that provide opportunities for people to "take the waters" for restorative purposes. In these places, many of the classical symbols of water have been reinterpreted in terms of physical and mental rejuvenation. Water deities may not be prominent, but their healing powers remain in the elaborate physical settings of spa bathing and cleansing rituals. The history of the development of spas and seaside resorts, water performances (water ballets, ice shows, and water-based cinema performances), and more recent corporate efforts to market bottled water for health purposes, go beyond this chapter (but see Croutier 1992, Towner 1996, among others). Nevertheless, these modern developments can be seen as secularized applications of the ancient symbols, played out in new contexts and new social realities.

Throughout history, water has also been employed as a dominant feature in all forms of artistry and artistic expression. Water has been used symbolically and realistically in paintings, music, and architecture as a surface that reflects meaning back to a viewer or listener. It also is used to subtly transport the external observer more deeply into the realm of meaning. Most people are familiar with classics such as the Impressionist paintings of Claude Monet (*The River*, 1868; *Water Lilies*, 1904), or the "liquid languages" of water in classical music (Handel's *Water Music*; Debussy's *La Mer*; Wagner's *The Ring of the Nibelung*), and the use of water in literature and poetry, shown in American poet laureate Robert Penn Warren's poem, *Love Recognized* (1990: 135), excerpts of which are as follows:

> There are many things in the world and you
> Are one of them. Many things keep happening and
> You are one of them, and the happening that
> Is you keeps falling like snow

> On the landscape of not-you, hiding hideousness, until
> The streets and the world of wrath are choked with snow.

The hydrologic cycle itself has also been a topic of interest to artists because it is "a concept that has been found to be eminently serviceable in explaining the harmonies of nature and the wisdom of nature's God" (Tuan 1968: viii). Dickson explained that 17th century poets dramatized the hydrologic cycle in metaphorical and allegorical texts. He wrote (1987: 2), "The endless circulation of water usually serves as a metaphor to present the descent of grace and regeneration of the soul and the consequent ascent or reintegration of the soul with its heavenly source." Specific aspects of circulating waters are also featured in other contexts. Frank Lloyd Wright's architectural masterpiece, the *Fallingwater* home (designed in 1935 and built in a forest along a stream's waterfall in western Pennsylvania) is a famous example of sympathetic merging of landscape with human experience. Likewise, the Strauss *Blue Danube Waltz* and Smetana's *The Moldau* are more than pretty tunes about big rivers—they are the lyrical melodies and rhythms of national affiliation and shared identity coursing through the lives of citizens of their countries.

A river is one of the great metaphors in literature, art, and culture.

Finally, one should not ignore the central image of rivers in symbolic accounts. A river is one of the great metaphors in literature, art, and culture. The notable rivers of the world have many practical functions, but they also symbolize the movement of time and history, and thus serve as receptacles of cultural memory and identification. They also symbolically illustrate the central notions of journey and quest; Joseph Conrad's story, "Heart of Darkness," is a paramount illustration. Seelye (1977: 6–7) observed that rivers in the eastern seaboard of America set the stage for citizens to imagine a western frontier: "Because of the primacy of rivers in the exploration and settlement of the Atlantic seaboard, waterways in the North and South (played significant roles)….the river is a defining agent in the metamorphosis of colonies to republic, serving as entrance or border but always as a symbol of what might be obtained beyond." River waters are also metaphors for living processes, as Aldo Leopold (1966: 188) explained:

> One of the marvels of early Wisconsin was the Round River, a river that flowed into itself, and thus sped around and around in a never-ending circuit. Paul Bunyan discovered it….No one has suspected Paul of speaking in parables, yet in this instance he did. Wisconsin not only *had* a round river, Wisconsin *is* one. The current is the stream of energy which flows out of the soil into plants, thence into animals, thence back into the soil in a never ending circuit of life.

Although rivers may symbolize circularity, they are also usually linear in flow (even if they meander). Thus, as Bachelard (1983: 6) observed, "One cannot bathe twice in the same river because already, in his inmost recesses, the human being shares the destiny of flowing water. Water is truly the transitory element." The Greek philosopher, Heraclitus, wrote, "As they step into the same rivers, different and <still> different waters flow upon them" (Fragment 12; in Robinson 1987). Interpreters of classical thought believe that Heraclitus was referring to not only a physical river, but to the "river of existence" (Robinson 1987: 114). Rivers may change, but they remain unified; the same is true for people, as well as for the universe itself. Thus, the original creation, flood, and baptismal waters are symbols of a broader abstraction: "the river is a striking example of precisely that which preserves structural identity and unity while undergoing constant and predictable change of content" (Robinson 1987: 84).

Discussion

What can be learned from reading about historical and cultural approaches to water symbolism? Schama (1995) drew several conclusions in his own comprehensive cross-cultural analysis of water. The first is that ancient cosmologies used water to symbolize the circular flow of the necessary fluids of life. As Schama (1995: 258) explained,

> All these fluvial myths embodied one of the governing principles of hydraulic societies: circulation….The principle held good for the circulation of blood about the human body and for waters about the earth. So the rhythms of fluvial death and rebirth, the transmutability of water, blood, and wine, described a cycle that, provided the proper remembrances were observed, would be self-regulating.

Although symbolically circular, water may also be viewed as functionally linear.

Secondly, although symbolically circular, water may also be viewed as functionally linear. Its linear representations—the life process from birth to death, the one-way flow of water in engineering projects like the Roman aqueducts and canals that served as highways and trade routes, and the flow of history over time—should also be considered as symbolically meaningful, Schama wrote. Water that has been shaped into a straight line is subservient to the deity or secular power that channeled it; linearity facilitates flow, and flowing waters are useful waters. Straight waters can be managed and controlled, and indeed, their management signifies progress.

Further, Schama concluded that many of the creation myths seem ultimately concerned with the source of sacred waters—and thus with the genesis of the physical world, including the creation of both mortals and deities. This preoccupation was eventually represented in controlled designs of natural and built landscapes (such as parks, gardens, and royal grounds) that featured mysterious pools, gushing fountains, and other waters in motion. By the time of the Renaissance, "All the elements of a new sacred hydraulics were coming together: the Christianized memory of the Nile and its cult of vital fertility; the mystique of the Source of Creation, made visible through the miraculous mechanics of (technologies for ornamental hydraulics); the *renovatio* of the Roman tradition for flowing water" (Schama 1995: 288). Classic examples of the resulting civic/religious partnerships are evident in the exuberant Bernini fountains in Rome, created during the middle 1600s. Of Bernini's "Fountain of the Triton," Schama wrote (p. 291), "The whole celebration ecstatically extended through brilliant, pressurized jets shooting hydraulic hosannas into the Roman sky." Controlling the source of water through technical advances gave implicit support to the primacy of technological knowledge, and encouraged people to believe that questions about the source of the world and human life could be answered with science.

Finally, Schama concluded, the unity of the world in modern times is revealed in the complex merging of pagan and Christian water symbols. These images persist in our dreams and memories, in the unexplored depths of our cultural (if not genetic) heritage, and in the subtle metaphors that pervade historical consciousness. Although the nature-gods of earlier societies may have been replaced with scientific rationalism and technological progress, water symbols and their implicit meanings remain and have evolved for contemporary applications. Couched in new civic and religious forms, informed by Enlightenment rationalism and scientific analysis, these symbols still retain a measure of power over human consciousness and action. Thus, one should not fall into the trap of romanticizing the past, or imagining the world of antiquity as a purely symbolic world, displaced during the Renaissance, Industrial Revolution, and recent time periods by utilitarian perspectives. Glacken (1967: 118) explained:

> In the ancient world, there was a lively interest in natural resources and how man could exploit them; in mining, in ways of obtaining food, in agricultural methods, in canals, in maintaining soil fertility, in drainage and grazing and many other economic activities which—even if they produced only a partial philosophy of man as

> a part of nature which he was engaged in changing—are eloquent proof of his busyness, his incessant restlessness in changing the earth about him.

The historical review presented here suggests that most water symbols center around five general meanings: creation and birth, spiritual and emotional growth, cleansing, journey, and fulfillment.

Symbolic meanings do not necessarily replace utilitarian views, but co-exist with them to extend understanding of the components and processes of the natural world.

The key conclusions drawn from the historical and cultural analysis presented in this chapter may be summarized as follows. The utilitarian approaches to understanding water-as-resource have generally failed to account for symbolic (spiritual or secular) aspects of water. The historical review presented here suggests that most water symbols center around five general meanings: creation and birth, spiritual and emotional growth, cleansing, journey, and fulfillment. Across cultures, water symbols have typically represented female-based views of nature and natural processes. Water symbols are often used as referents for interconnectedness, and are linked with other symbols of nature to imply wholeness and totality (birth/death, rivers/mountains). Thus, water can be viewed as both linear and circular. Moreover, symbolic aspects of water have both psychological and social components. These are expressed as individual beliefs and values, but they are also, simultaneously, demonstrated culturally as shared meanings, rituals, and patterns of behavior. Finally, power arises from control over water, whether by ancient gods, Roman city architects, engineers, or public lands managers.

Recreation resource agencies seeking to incorporate symbolic understandings into current management practices might look to these conclusions as a starting point for action. If symbolic aspects of water are typically ignored under utilitarian approaches, for example, then resource management is based on incomplete views of society's experiences of water, and management choices and alternatives should be expanded. Focusing on the meanings of water symbols and female symbolism associated with natural processes of water may introduce new dimensions to resource management, including consideration of experiences that are difficult to quantify and price (these might include qualities like beauty, delight, loss, health, spiritual renewal, and so on). If water is conceived as both linear and circular, a symbol of connectivity, then life processes should be viewed as a web of interrelated parts and resource management should have as a goal managing systems of interdependency among natural and social elements. New research and management about individual and social aspects of water recreation are also suggested by the assertion that water symbols are simultaneously individual as well as collective.

Finally, the claim that entities (deities, rulers, agencies) have achieved and retained power by controlling water symbols and representations is a reminder that language and power are basic components in the social construction of meaning, and both must be considered in creating alternative schemes of water management.

The conclusions noted above link historical and contemporary approaches to water symbolism and recreation. The remainder of this chapter explores these issues more fully by considering the implications of water symbolism for recreation management and research.

Water Symbolism in Contemporary Recreation Resource Management

The classical water symbols identified in earlier eras and cultures provide fundamental representations signaling close human relationships with elements of the natural world. How can ancient mythologies and cultural practices inform current policy related to water management? Although earlier world views may not offer a direct prescription for research or management, one answer is certainly that knowledge of historical perspectives and beliefs can provoke comparisons and lessons for contemporary circumstances. Studying historical water symbols and their cultural expressions reminds us that other societies conceived of the world, its natural and physical elements, and the relationships among humans and nature differently than we do today. The idea of a cosmos privileging human actions and control over nature is a very recent social construction that stands in counterpoint to views that link deities, humans, and nature in one interwoven tangle of dependent relations. Looking to the past may thus offer new ways of imagining the future in water recreation planning and management.

Additionally, understanding historical approaches may stimulate social and political transformation now and in the future. Societies and their bureaucratic organizations conduct business activities in fairly predictable ways until the status quo is challenged. Then, when dramatic change or a crisis occurs, regular patterns of institutional behavior are disrupted and new responses are required. The current projections of emerging water crises around the globe (see the United Nations reports at www.un.org) may present just such a turning point. Remembering the traditional symbolic values of water may inspire creative new organizational and cultural forms that apply historical symbolic referents to stimulate global water appreciation and conservation. These actions might even foster new symbols that support innovative solutions to emerging water crises.

Personal experiences of nature may also be enhanced with a broader understanding of historical water symbolism. In the same way that a skilled figure skater experiences ice differently than does a novice skater (the advanced skater feels, interacts with, and responds to the variable textures in an ice surface, which is more than just a slippery flat plane for skating **on top of**, as beginners often imagine), individual experience of water may be enlivened by knowledge that others have conceived it as the medium of good or evil spirits, and have developed alternative systems of meaning and cultural practice to explain its behavior. An agency's efforts to expand public education and interpretation services may enhance a visitor's experience of water settings. Beyond agency-mediated actions, individuals and groups aware of historical water symbols might independently seek new forms of meaningful experience in water recreation.

The classical water symbols discussed earlier can be seen as a set of fundamental organic symbols linking humans closely with a living natural world.

The classical water symbols discussed earlier can be seen as a set of fundamental organic symbols linking humans closely with a living natural world. Although diverse, these water symbols are typically associated with either the water feature itself (flowing or stock water sources) or natural cycles and events. But, these organic symbols are not the only water-related symbols or meanings to emerge over time. Contemporary reviews of water must also acknowledge a range of symbols produced by at least three other natural resource-related sources: public resource agencies that manage water resources, visitors engaged in recreation activities at water resource places, and community and environmental groups that direct their attention to conservation and protection of water in the landscape. Beyond these, of course, are other water symbols that have emerged primarily in popular culture (mass mediated images of water presented in marketing campaigns, for example). The following sections bound the discussion of research and management priorities principally around natural resource issues, leaving other areas for future research.

Although fundamental water symbols identified in antiquity persist in current times, the historical world views supporting direct symbolic encounters with water have been displaced by more utilitarian perspectives that give prominence to human control over nature.

Agency Management of Water Recreation Resources

Although fundamental water symbols identified in antiquity persist in current times, the historical world views supporting direct symbolic encounters with water have been displaced by more utilitarian perspectives that give prominence to human control over nature. Refocusing the broad discussion of water symbolism to the more specific topic of recreation management introduces two concepts that were not central in classical versions of water symbolism: **resource**, and **management**. The term resource was introduced earlier, and refers to a distancing and objectification of natural elements and processes. Defined as a resource, a commodity taken

from nature, water loses its personal, subjective relevance and becomes an object that can be manipulated to achieve managerial goals.

The second concept, management, reinforces the position of external control and authority. Resource managers define agency goals while operating under bureaucratic processes that privilege actions associated with controlling, consuming, and allocating water resources. Typically, managers enact planning processes that are based on scientific, technological, socioeconomic, and political considerations. Within these frameworks, organic symbolism that gave social and cultural meaning to water is subjugated to instrumental approaches that advance agency and public goals. Indeed, new water symbols are created in the transformation, as Worster (1994: 33) noted: "The leading symbol of (19th and 20th century) conquest of water is the large masonry or concrete dam, and arguably it is the leading icon of progress throughout the world today….The dam represents the blessings of technology, economic development, and modernity."

The image of a dam illustrates that contemporary resource agencies are not bereft of water symbols, but the pertinent symbols of current times are not those of antiquity. Traditional water symbols, though, have not disappeared in modern times. As they become mediated from within agency management frameworks, traditional symbols become secondary to newer symbols and meanings that emerge from management imperatives formalizing functional relationships between humans and nature-as-resource.

How can recreation resource managers working within agency contexts facilitate opportunities for symbolic appreciation of water in natural landscapes? Traditional processes of resource allocation tend to differentially affect groups of citizens. Rationing systems, including payment schemes, permitting, and carrying capacity limits, are examples of policies that tend to favor some visitors over others. Agencies also favor certain kinds of participation styles over others (coordinated and permitted river access for rafting companies, for example, rather than allowing free-for-all entry). These choices are intentional rulings that do not allocate or distribute water resources equally; they are rational because to do otherwise might diminish resource quality, adversely affect visitor experience, or negatively influence management capabilities. Nevertheless, these approaches often produce contentious outcomes.

Reliance on market-based solutions may not solve those problems. A colleague recently relayed a story about visiting a park in Costa Rica where, for a small entry fee, visitors could soak in thermal pools and waterfalls in a lush forest setting. The

river that formed these attractions also spilled out into a meadow outside the park, and it was there—near the parking lot—that local people went to bathe and relax in the hot springs. Their complementary experience was free, but it had none of the privacy or scenic amenities that park visitors could purchase with the entry fee. Even if people are eminently adaptable to conditions, one must conclude that the market solution failed. By treating the recreation experience as a commodity to be bought and sold, it created an inferior activity for local residents while also reinforcing social class divisions.

Encouraging the use of water sites for varied symbolic purposes (including those that may be considered spiritual or ritualistic) will require new management approaches.

Allowing or encouraging the use of water sites for varied symbolic purposes (including those that may be considered spiritual or ritualistic) will require new management approaches. Water allocation decisions are, after all, ways of defining reality. To see water in its symbolic form, as more than an objective resource, requires both imagination and conviction that a new approach will ultimately foster a more philanthropic attitude that better serves nature as well as humans. Management practices that extend beyond park and forest borders—those that consider entire water systems as relevant and meaningful for human well-being, and that foster collaborations with local communities—would seem fairer, more benevolent, and ultimately more sensitive in allocating recreation opportunities and fostering symbolic appreciation. Yet, social inclusiveness may not be easily obtained, and may require setting-based or time-based use zones to accommodate various types of recreation symbol-seekers. It may also require a rethinking of pricing schemes and access issues. There is value, though, in the effort toward diversity, community, and inclusion. Resurrecting symbolic approaches to water and incorporating these into resource planning and practice may help expand an agency's repertoire of visions, policy choices, and opportunities for dialog with constituents.

Another way to enhance symbolic aspects of natural environments might be to redesign landscapes in ways that afford more diverse and meaningful encounters with nature. A model for this effort can be found in Litton et al.'s (1974) analysis of the aesthetic values of water in natural landscapes. Litton and his collaborators developed a landscape assessment system based on visual inventory and documentation of water qualities, surrounding land forms, and associated vegetation features. Although they did not specify a definition for the term "aesthetic," the authors did relate aesthetic appreciation to scenic landscape factors, nonmonetary values, and quality aspects of recreation experience. They also identified three operational criteria for analyzing aesthetic qualities: unity, variety, and vividness. In their discussion of future research needs, the authors noted the relevance of water symbolism for resource management:

> People differ in the symbolic associations they have for water (and water resources). These associations may provide a key to understanding people's aesthetic preferences. Some examples of symbolic associations for water are: purity, power, timelessness, refreshment, life support, wildness, distance, serenity, continuousness, challenging (to navigate or cross), unpredictability. This area is essentially unexplored.

The Litton et al. (1974) assessment might be considered a precursor to a system of managing water-related landscapes for experiential and symbolic qualities. Such an approach might be based on the Recreation Opportunity Spectrum (ROS; see Douglass 2000). A water-based ROS would create a classification scheme to specifically link symbolic experiences of water recreation with variable environmental and setting characteristics and managerial alternatives. To create a classification system for water-based resources, managers would first need to develop an inventory of symbols associated with experiential outcomes of water recreation, arrayed across landscape features. Problems and possibilities inherent in managing resource areas to favor symbolic meanings are as yet unknown, and it is unclear whether agencies can even manage for personal experiences such as those associated with symbolic encounters (especially if these are nonvisual in character). Moreover, creating a water-based ROS is a conservative approach that reinforces traditional methods of public lands management, rather than introducing new, innovative approaches to nature-human interactions. Nevertheless, the Litton et al. (1994) study offers a potential application for extending traditional frameworks of resource management.

From Agency to Recreationists: Water Symbols on a Personal Level

Considering the symbolic aspects of water raises many important research questions. Is there a definable set of water symbols that appeal to many public lands visitors (either as individuals or groups)? Do different kinds of recreation activities and use patterns signify different kinds of symbolic content and meaning? What types of symbols and their associated meanings are problematic or unappealing to users? Which symbols differ by individual characteristics (sex or education, for example) or cultural group affiliation? Which symbols might be responsive to management, and which others are so highly personal that management would have no effect or might intrude on the experience? Are there nonsymbolic water features or

nonsymbolic landscapes? How does use intersect with symbolic value: do symbols or meanings change if the water features are transformed? Additionally, how should managers deal with nonvisual aspects of water?

Despite the lack of knowledge about these issues, evidence exists to suggest that organic symbolic meanings are already inherent in many recreation pursuits, even if unexamined by either users or managers. River rafting, sea kayaking, and associated activities provide examples of the journey or quest symbolism applied to recreation activity. Also, researchers and participants consistently claim that symbolism related to contemplative experience and spiritual renewal is a central feature of many types of wilderness experience. Similarly, adventure recreation activities have been described as producing "flow" experiences (Csikszentmihalyi 1990), a term that recalls creation and journey metaphors of water, where people are carried along on the crest of meaningful, fluid experience. The pleasure of water in natural settings is at least partly attributable to the notion that, whatever form it takes, water is unpredictable and potentially uncontrollable, and thus has unexpected possibilities. As Logan (1975: 98) explained,

> There was a certain magic in waking on a summer night and hearing a storm begin…. Rain was one of the things beyond our ability to control. We accepted it when and as it came, as happy to have it as was the land, which drank it in to surround the millions of roots it cradled.

The mysteries related to water and its potential for symbolic interpretation reach beyond questions about how to influence emotions during recreation.

The mysteries related to water and its potential for symbolic interpretation reach beyond questions about how to influence emotions during recreation. The challenge, instead, may be for agencies to create (or expand) opportunities for many different kinds of visitors, each with different skill levels, to experience sensuality and unpredictability in water recreation. This obviously does not mean that agencies should create intentionally dangerous situations—but it does mean that heightening the pleasures of the senses should be encouraged in water-based natural settings. One way to do this is to increase artistic sensitivity and creativity related to natural processes in resource settings. A Colorado river rafting company already ventures into this realm by offering rafting trips accompanied by artists playing classical music. The company's Web advertising notes that the musicians—skilled members of regional symphony orchestras—play music that "will touch the mind and soul. Often surpassing the concert hall setting, the alpine forests and ancient sandstone caverns along these spectacular rivers redefine the musical experience" (Dvorak Expeditions 2004). There likely are many other types of

opportunities that would enhance symbolic water experiences and involve recreation participants in closer relationships with natural environments. What is needed is creative thinking about the symbolic values of the water recreation experience.

Many of the administrative tasks performed by resource managers are routine and cyclical, but science-based management of resources should not mean that mass production of recreation experiences is the desired outcome. Creativity in management planning and design are possible avenues for fostering symbolic meanings that enrich recreation experience. An example is provided by Croutier, who wrote about visiting Bad Ragaz, Switzerland, and participating in a ritual dinner that celebrated the start of a new hunting season; the meal comprised a variety of local game. The author wrote (Croutier 1992: 145), "Our host told me that each hunter had to be over 50 years old, was allowed only one deer a season, and was required to go up into the mountains and feed an animal in winter." What is represented in this example is a policy that facilitates intimate experience with nature (the "resource" aspect is secondary) such that individual experiences, hunter responsibility, and meanings of nature are given primacy. Although this personal approach might be difficult to accommodate under large-scale, bureaucratic management approaches, it can serve as an ideal for developing water-based schemes that base allocation decisions on local, community, or ecocentric criteria.

Social and Community Issues in Water Management

In 21st-century Western societies, ancient deities may exist only in memory, but many forms of ritual activity involving nature symbolism exist across societies and cultures. Group-based meditations on nature, social activism in the pursuit of ecological protection, workshops devoted to living mindfully and in harmony with nature, revival of nature-based pagan rituals as well as Native American and conventional religious practices, and other examples of "spiritual ecology" are intended, as Merchant (1992: 129) wrote, "to effect a transformation of values that in turn leads to action to heal the planet." Although these expressive activities—many of which involve water environments—are often thought to be outside the bounds of typical outdoor recreation activity, the number and variety of these alternative approaches indicates their social and cultural importance.

Public resource agencies have traditionally managed independent landscape units. Recent trends toward integrated resource management and ecosystem management (Field 2000), however, as well as collaborative watershed planning (Brick et al. 2001; Wescoat 2000), suggest a need for coordinated planning involving both

agencies and communities. The active participation of geographic and interest communities in management efforts that attempt to foster symbolic appreciation of water and other natural features is desirable for many reasons. Grassroots planning processes can support ecologically sound, economically viable, and socially meaningful natural places, as poet and author Gary Snyder proposed (1995: 229, 235) in an essay entitled, "Coming into the Watershed":

> The surface (of the earth) is carved into watersheds—a kind of familial branching, a chart of relationship, and a definition of place….Watershed consciousness…is not just environmentalism, not just a means toward resolution of social and economic problems, but a move towards resolving both nature and society with the practice of profound citizenship in both the natural and the social worlds.

Innovative ways of designing landscapes and ecosystems should also encourage new ways of imagining human communities and their relationships with water.

Innovative ways of designing landscapes and ecosystems should also encourage new ways of imagining human communities and their relationships with water. Working within current public-private property arrangements, one might envision the creation of new water trails, grottos, or interpretive exhibits that facilitate symbolic appreciation of water while maintaining resource area boundaries. Or, traditional notions of property rights and boundaries could be challenged. Rather than viewing forests, parks, and water resources as separate areas set apart from other regional landscapes and managed by agencies external to a local community, for example, these places might be reconceptualized as public interaction spaces. Redesigning traditional recreation sites—campgrounds, picnic areas, trails, beaches, or other sites near water features—for many different kinds of cultural uses might foster new kinds of community involvement. Integrating resource management personnel and programs into community settings (school activities, municipal planning projects, land conservation programs) would also broaden the conception of resource area borders, and could strengthen relationships between agencies and communities.

Communities of locale and sentiment can also provide focal settings for basic research about noninstrumental values of water. People understand the meanings and functions of water primarily through their participation in and attachments to local places. Typically, individuals first enjoy water recreation in the company of their immediate family, and the water settings they initially encounter are those in local neighborhoods and communities. Indeed, many communities take advantage of the appeal of water recreation places by designing community gathering places

around local water features. Many town squares have fountains; city parks often include ponds and lakes; rivers meander through downtown areas. Even fire hydrants are summer recreation places for children in urban neighborhoods. Seaboard and river cities have redeveloped their waterfronts for active and passive recreation, linking history with commerce and leisure uses. Residents of island communities gather at the ferry dock to greet neighbors and catch up on local news. Community festivals and celebrations are held at waterfront parks. Theme parks, ice arenas, and public swimming facilities offer water-related entertainment that draws residents and tourists alike for socializing and pleasure.

All these are examples of shared community interaction spaces evolving around local water features. A further example is offered from personal experience, as members of my own neighborhood shoveled snow after a winter storm that brought local traffic and business to a near-standstill. The snow was light and cleansing, glittering in moonlight, slipping into small avalanches with each new shovelful, piling up in mountains that made valleys of driveways and the street itself. Neighbors helped dig each other out while children slid down the massive piles and pelted each other with snowballs. People walking dogs and sliding down the unplowed road on cross-country skis stopped to talk. Winter is a hibernating season in Vermont, so it was the first time my neighbors had seen one another in weeks. The hard work of shoveling was made easier by those interactions. For those of us who experienced the event, snow now symbolizes the community of our neighborhood.

Geographic communities also fulfill another special function: they provide settings where leisure and recreation opportunities can be seen as "shadow measures" for the symbolic meanings of water. Shoveling snow with neighbors is restorative of both personal well-being and communal spirit. Uninhibited play around fountains, on beaches, and at hydrants brings both children and adults into contact and conversation, fostering public discussion while participants enjoy the cleansing spiritual and physical aspects of water. Observation of lakes and other water bodies across the seasons, a casual leisure pursuit, reveals the passage of time, connecting people to the natural world in a pleasurable way while symbolizing the passage of life. Even engineered water features retain a measure of water's symbolic value. The Ballard Locks in Seattle, Washington, for example, draw scores of local people and tourists each day for passive recreation and entertainment. Visitors enjoy watching commercial and pleasure boats bobbing through the channel, salmon jumping up the fish ladder, and whiskered sea otters cracking abalone while

Because contemporary water symbols emerge in local contexts, their meanings contribute to a shared sense of place and community.

floating along on their backs. The symbols of water journeys and the circularity of nature are implicit in the activities of the locks, a subtle message of nature-human connectedness evoked by water.

Because contemporary water symbols emerge in local contexts, their meanings contribute to a shared sense of place and community. The topic of sense of place is becoming increasingly prominent in scholarly research journals and other public media. Academics interested in recreation, geography, rural communities, and other disciplines, as well as popular writers, have been using the term to elaborate and explore meanings of human experience in natural environments. In general, the concept refers to the emotions people experience, and the behaviors they enact, when they develop special attachments to landscapes, settings, and communities (Moore and Graefe 1994, Stokowski 1991, Williams et al. 1992). A person's sense of place may be intangible, but it is expressed as emotions, attitudes, behaviors, and relationships that are observable.

Whereas encounters with nature may create a sense of place for specific individuals, much of what people know or feel about places is mediated by others, as explained by the sociologists Peter Berger and Hansfried Kellner. These authors wrote (1964: 1), "The reality of the world is sustained through conversation with significant others." Ryden (1993: 241) elaborated, "Places do not exist until they are verbalized, first in thought and memory and then through the spoken or written word." If a sense of place is sustained through interpersonal interaction and participation in community, then water symbols are etched in collective consciousness, identity, and memory through language. Symbolic meanings of water can be seen as social constructions, made visible in the images, narratives, and myths of people who share a common experience of place. As Johnstone (1990: 5) explained, "Just as narrative structures our sense of self and our interactions with others, our sense of place and community is rooted in narration. A person is at home in a place when the place evokes stories, and, conversely, stories can serve to create places." Thus, resource places are not only objective sites existing in a landscape or a local community, but are places of social encounter, experience, and recollection "remembered in the stories, language, and history we collectively share as members of a human community" (Stokowski 2000).

Imagery is one form of language used in illustrating how humans imagine the world and explain their interactions with it. Ingram (1998: 155) wrote that, "More than merely conveying reality, images actually construct reality….different images give credibility to alternative and competing models of how the world works and

where the power and moral responsibility lie." Images are often used in constructing symbolic explanations about human relationships with water, but images are complex and go beyond pure logic. Images and symbols are created not only from scientific facts, but also from artistic, spiritual and humanistic ways of knowing that can be called "fundamental tools of imagination" (Lopez 1986: 224).

The use of imagery in water symbolism can be seen in a recent conference program of the International Water History Association (IWHA). Formed in 1999 with the goal of "promoting understanding of the history of the control and use of freshwater resources throughout the world" (www.iwha.net), this organization devoted a segment of their 2001 conference in Bergen, Norway, to the theme "Images of water in religion, myths, literature and art." Four other themes were drawn around functional uses of water (water ownership, the history of hydrology, water in social development and poverty, and sanitation and health), but about 35 papers were presented in the "Images…" thematic area. The IWHA conference theme reinforces the idea that emergent culture continually influences the creation and institutionalization of water symbolism.

One imaginative application of imagery is evident in the use of metaphor. In an essay about spiritual values of nature, Schroeder (1996: 91) observed that, "Because the deeper values of nature are rooted in an experiential dimension for which there is no clearly delineated, objective structure, a conceptual understanding of these values is most naturally formed in terms of metaphors." Many of the water-based landscapes protected and managed by public agencies are unique or memorable in their composition and arrangement of natural features—and so evoke deep feelings and attachments from visitors. To know natural places in metaphorical terms is to enjoy new ways of experiencing and remembering nature. Makine's (1998: 17) story about a Russian village provides an evocative example of the power of water and nature metaphors:

> And spring did come: one fine day the village broke its moorings. Our river began to move. Vast acres of ice began their stately procession. Their progress grew faster; the glittering layers of water dazzled us. The raw smell of the ice mingled with the wind from the steppes. And the earth slipped away under our feet. And it was our village, with its izbas, its worm-eaten fences, its sails of multi-colored linen on the lines, it was Svetlaya that was embarking on a joyful cruise….The voyage did not last long. A few weeks later the river returned to its bed and the village landed on the shores of a fleeting Siberian summer.

Images and metaphors are often basic elements in narratives about place. People relate to the natural world in a myriad of ways, and their symbols are revealed in narratives. Narratives are the stories people tell to organize their experience of the world, and in instances where symbolic relations are elaborated in stories, the resulting narratives are simultaneously rich as well as insufficient. For example, Lopez (1986: 208) wrote of explorers who described seeing the aurora borealis, "It is unusual in the literature of exploration to find a strictly consistent reaction, but virtually everyone who wrote down his thoughts about the aurora described, first, the inadequacy of his language, and second, a pervasive and stilling spiritual presence."

To fully appreciate water symbolism, one might look to the power of narrative to present ways of knowing and experiencing the natural world beyond scientific rationalism and objectivity.

To fully appreciate water symbolism, one might look to the power of narrative to present ways of knowing and experiencing the natural world beyond scientific rationalism and objectivity. Narratives are important not because of their truth content (which may vary) but because they establish connections between and among people and place, help organize human memory, and are used in public discussion to legitimize social action (see Stokowski 1996 for examples). Images, metaphors, and narratives do not only report on the world, they are the forms of language that help structure social reality. New approaches to water management may require new languages of agency and community involvement.

What new understandings could be obtained by closer examination of people's imagery, metaphors, and narratives related to water and its symbolism? Ingram (1998) believes that the language and policies associated with water allocations have divided people, forcing them to compete rather than collaborate, and that better solutions exist in creating outcomes that benefit entire communities of people. Her test for equity in water allocation policies includes five criteria: reciprocity, value pluralism, participation, promises, and responsibility—values that could emerge as central in developing new symbolic approaches in water management.

A focus on language also introduces the issue of power (Stokowski 2002). How is water defined in outdoor recreation settings? Are there alternatives to defining water as resource? Who participates in creating the definitions, and who is excluded? How are symbolic meanings and images applied in managerial action? If there are conflicts over definitions and uses of water, how are those conflicts addressed and resolved? How can different values for water features be compared?

These questions illustrate the political aspect of water, its symbols, and the discourses of water use and management. They also suggest that there are many

difficulties associated with incorporating symbolic meanings into management priorities, and favoring some symbolic uses over others is likely to produce divisiveness between user groups. If even defining water as a resource may inhibit innovative ways of thinking about water and its noninstrumental, symbolic meanings, one solution may be to conceive of new languages that create meaning systems useful within contemporary contexts. Methods of linguistic analysis, semiotics research, and cultural analysis, among others, may be appropriate in developing new languages of symbolic meaning around water as well as other natural elements and processes.

Discussion

In the transformation from the ancient world of spirits to a world organized according to science, personal relationships between humans and the natural world have been replaced by objective laws and principles. Science considers natural elements to behave in regular and predictable ways, removed from the realms of emotion and capriciousness, such that the actions of nature can be anticipated and measured. Ancient cultures, however, experienced natural events as the whims of deities: the gods acted over people by creating floods, storms, droughts, and other natural events. Merchant (1992: 43) argued that, in ancient times, "The image of the earth as a living organism and nurturing mother served as a cultural constraint restricting the actions of human beings….As long as the earth was conceptualized as alive and sensitive, it could be considered a breach of human ethical behavior to carry out destructive acts against it." The post-Enlightenment practice of conceiving the Earth as a machine-like system distances people from nature as well as from the consequences of human actions in nature.

Contemporary approaches to recreation resource management are scientifically-based and utilitarian in scope. The symbols associated with current conditions are those that favor control over nature, agency progress, and managed human encounters with nature. Behind these images, though, are many examples of people—individually or collectively—seeking meaningful encounters with water and other natural elements. The symbolic power of water known to the ancients and members of earlier cultures has not disappeared. It is hidden behind the prevailing resource management philosophies of contemporary land management agencies. These agencies operate under bureaucratic imperatives that feature symbols associated with resource management; incorporating organic symbols into current management practices may require alternative visions of reality.

Some examples of alternative visions are already present in humanistic approaches to both water and human community. Elder (1998: 232), for example, described the living, transformative qualities of water when he wrote:

> The mountain brook and Otter Creek both mark watering places—where the rising, falling, turning, carving constancy of current shows "water" to be not just a noun but also our most perpetually active verb. Intransitive, it rushes with no destination, completed at every standing wave within the gorge. Transitive, it waters the new shoots that make a landscape live.

Images of nature as alive have not disappeared in current times, but the associated symbols and meanings have taken on new social and cultural forms. Natural spirits have been linguistically removed from the contemporary world of objective reality and re-directed to exist primarily in the abstract world of the arts and humanities. From there, though, they continue to reach out to us, as seen in Nabokov's (1995: 435) elegant description of a lake in his short story, "Cloud, Castle, Lake":

> It was a pure, blue lake, with an unusual expression of its water. In the middle, a large cloud was reflected in its entirety….Of course, there are plenty of such views in Central Europe, but just this one—in the inexpressible and unique harmoniousness of its…parts, in its smile, in some mysterious innocence it had…—was something so unique, and so familiar, and so long-promised, and it so *understood* the beholder that Vasiliy Ivanovich even pressed his hand to his heart.…From the window one could clearly see the lake with its cloud and its castle, in a motionless and perfect correlation of happiness….

Nabokov's story reminds us that there are alternate realities and approaches to nature for those who are open to innovative thinking. Water symbolism is not absent from contemporary life, but an understanding and appreciation of water symbols in the 21st century will require a relaxation and replacement of purely objective criteria that typifies current resource management practices.

Expecting resource agencies to change their typical ways of conducting business is unrealistic. Thus, the review of issues related to water symbolism in contemporary recreation resource management suggests three practical alternatives for future agency direction—and one other unusual alternative. First, an agency may

choose to ignore water symbolism in their management activities. Such a hands-off management approach is based on the rationale that appreciation of organic water symbols is best accomplished by individual recreationists. Symbolic meanings are already inherent in many recreation pursuits, and individual public lands visitors can best decide how to achieve meaningful symbolic encounters with water. The benefits of this approach are in encouraging individual recreation choice without bureaucratic interference. The drawback, though, is that the approach is potentially noninclusive (it maintains the status quo through normative methods that discourage new uses and users). Thus, it offers an agency little control in avoiding conflicts over use of particular areas on agency-managed lands.

Alternatively, resource agencies might wish to create new internal policies intended to facilitate visitors' symbolic encounters with water. Within current organizational structures, this could potentially be accomplished with greater support for interpretation and education, planning efforts incorporating various forms of public input, and landscape design efforts that foster new kinds of visitor encounters with water resources. New divisions of bureaucracy and ad hoc committees might be needed to accommodate atypical forms of organizational activity (for example, incorporating discourse-based collaborations in planning and design processes). This approach would demonstrate willingness by agencies to expand their traditional functions, but might be derailed by bureaucratic inertia.

Finally, if the two previous models are unacceptable or unworkable, there are many other models of agency restructuring that could be devised. Some of these might include partnering with local communities for oversight of resource places; others may depend on coalitions of land management agencies (with or without other interest groups) sharing goals and work; other models could include ad hoc advisory groups that emerge and disappear as necessary. If water symbols are an integrative medium for fostering allegiance to social values that extend beyond any individual or group—then the form of organizing is less important than the goal of fostering water appreciation through symbolic understanding.

Beyond agency-initiated actions or agency structural reformation, there is another, perhaps more extreme alternative approach to management that would foster stronger appreciation for the organic and emergent symbolic meanings of water: transfer power to communities. Resource agencies manage public lands for public values, but the definition of "public" arises from communal interaction and participation. Daniel Kemmis (1990: 117), the writer and former mayor of Missoula, Montana, wrote, "What holds people together long enough to discover their power as citizens is their common inhabiting of a single place." Communities are sets of

people linked in interdependent networks, supported by friendships, and partnered in civic cooperation. Community identity arises from shared engagements with a local place, and a shared identity is made manifest by collective symbols and meanings. As Flora and colleagues (1992: 66) noted, community symbols represent the core values around which residents orient: "When members of the community have grown up within a common culture or have…accepted a common set of values and norms …the community develops a set of sacred symbols that reflect its most strongly held values." This chapter has argued that at least some of those valued symbols of community identity are associated with water settings and sources, and moreover, recreation and leisure provide the contexts where symbolic meanings are most vividly expressed.

Conclusions

In Aristophanes' comic play *Lysistrata* (written about 411 B.C.), the women of Athens refuse to sleep with their husbands until the men stop fighting wars and agree to make peace (in van Ghent and Brown 1968). Their vow was repeated in Sirt, Turkey, in summer 2001, where women of that village, "tired of hauling water…have been refusing sex until the men of the village provide running water to the village" (Burlington Free Press 2001: 10A). If utilitarian aspects of water can be addressed with symbolic actions, then it is not so extraordinary to suggest that recreation management may be equally transformed by approaches that foster symbolic meanings. Recreation places are not merely background to human experience, but rather are integral sites linking people and nature in close relation. Ian McHarg (1969: 19) provided direction for future management actions when he wrote:

> Clearly the problem of man and nature is not one of providing a decorative background for the human play….it is the necessity of sustaining nature as source of life, milieu, teacher, sanctum, challenge, and, most of all, of rediscovering nature's corollary of the unknown in the self, the source of meaning.

In contemporary resource management, it is perhaps unnecessary that agency members, visitors, and residents of surrounding communities be educated in the organic symbols that attach to water features in natural landscapes. After all, most people can easily enjoy various forms of water without much prior knowledge or even experience. But, even if understanding water symbols is not necessary to recreation experience, it may be advantageous in a culturally diverse world that a

public land management agency lead by example in fostering more sensitive relationships among people and nature. In this world of conflict and confusion, there is no harm in treating both nature and people subjectively and respectfully. Recreation and leisure opportunities provide the contexts for developing civic traditions that link humans and nature in meaningful ways illustrated symbolically.

As populations grow and place increasing demands on water resources and water sources, a focus on symbolic aspects of water may lessen some of the emerging conflicts by reminding us of the inherent restorative, cleansing, spiritual, creative, and transformative values of water. Even a small measure of renewed sensitivity to the living qualities of water should ultimately foster more responsible stewardship for our world.

Even if understanding water symbols is not necessary to recreation experience, it may be advantageous in a culturally diverse world that a public land management agency lead by example in fostering more sensitive relationships among people and nature.

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Chapter 3: Assessing and Evaluating Recreational Uses of Water Resources in the Pacific Northwest: A Review and Synthesis

Christina Kakoyannis and George H. Stankey[1]

Introduction

This chapter presents a literature synthesis regarding the interactions between water (excluding snow and ice) and outdoor recreation. Water long has played a significant role in the types, patterns, and levels of recreation use, and studies of projected trends in recreation use suggest a continuing close link between water and recreation. Although the extent and rate of changes in the biophysical system (e.g., global warming, species extinction) are subject to dispute, there is more certainty and consistency in projections of socioeconomic changes (e.g., population growth, technological trends). Because these social and economic changes promise to be profound (Rayner and Malone 1998), it is important to understand their impact on water resources.

Water possesses a complex array of symbolic meanings. These meanings often have ancient origins, some shared across cultures, others unique.

Recreation as a Symbolic Use of Water

As Stokowski discusses in chapter 2, a symbol is an image that represents something else. Water, she argues, possesses a complex array of symbolic meanings. These meanings often have ancient origins, some shared across cultures, others unique. One particular meaning focuses on the notion of rejuvenation—both physical and mental—and the idea that water is the source of life. In other words, water is critical to **re-creation** of both individuals and societies. In more contemporary terms, water has become a critical element in the recreation behavior of many people. The importance of water to recreation gained serious attention as early as 1962 with publication of the Outdoor Recreation Resource Review Commission report, *Water for Recreation—Values and Opportunities,* and has gained subsequent confirmation in a host of empirical and policy studies over the years. Whether in it (swimming), on it (boating), using it (fishing), or looking at it (camping), water is common to many forms and styles of recreation.

[1] Christina Kakoyannis was a research associate, Department of Forest Resources, Oregon State University; she is now an AAAS Science and Technology Policy Fellow at the Environmental Protection Agency, 1200 Pennsylvania Ave., NW, Washington, DC 20460; George Stankey was a social scientist (now retired) U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Forestry Science Laboratory, 3200 SW Jefferson Way, Corvallis, OR 97331.

The reasons for this are complex and varied. They certainly transcend a tautological explanation; that is, people like to be around water because they like it. Clearly, people undertake water-based recreation activities because they find some kind of value in it. Moreover, the provision of opportunities for such activities generally is taken as a social good, that benefits not only the individual but the larger society. The nature of the particular values derived from such engagements, however, is less than apparent. The question has attracted the attention from philosophers to policymakers, and a host of typologies and classification schema have emerged. For example, a recent review by Putney (2003) examining the values associated with natural settings described recreational values as a subset of a broader group of intangible values, as distinguished from material or instrumental values, such as biodiversity conservation or the provision of medicinal wild species for human health. These recreational values involve qualities that engage humans with the environment in ways that "restore, refresh, or create anew through stimulation and exercise of the mind, body, and soul (i.e., re-creation)" (Putney 2003: 7).

Fishing involves more than catching a fish; it can be symbolic of a life-long journey, an opportunity for spiritual renewal, a reliving of the past, or the capacity to demonstrate one's capacity to stand independent of civilization.

The interaction between human behavior (e.g., a recreational activity, such as fishing) and a biophysical setting (e.g., a lake) yields experiences for the participant. However, as Stokowski discusses, the experiences that both motivate and emerge from this interaction can take on highly symbolic aspects. Fishing, for example, involves more than catching a fish; it can be symbolic of a life-long journey, an opportunity for spiritual renewal, a reliving of the past, or the capacity to demonstrate one's capacity to stand independent of civilization. In short, the apparently obvious, even transparent activity of fishing is, in reality, a complex expression that can only be understood in terms of the symbolism served by such an activity and the setting in which it occurs. And as Stokowski's chapter reveals, water has long served as a powerful symbol of various human connections—with one another, with life, with history, with nature. Accordingly, human activities, such as recreation, that are dependent upon water become ways in which these symbolic meanings play out.

However, our capacity to describe and depict these activities and their associated meanings is limited. In particular, the symbolic meanings of recreational engagements in water environments are poorly understood. The reasons for this differ. Contemporary planning approaches focus largely on the quantitative and observable aspects of recreation behavior—how much, when, where, for how long, by how many, etc. Such a perspective gives little attention to underlying motivations or to other qualitative aspects of the behavior. But it is also a function of the

underlying complexity and difficulty, for both participants and investigators, of expressing the links between water-based recreation activities and the symbolic meanings they possess and reflect.

Nonetheless, we do possess a significant body of knowledge about water-based recreation. This knowledge embraces several different aspects of these activities: the types of activities involved, the numbers of participants, the spatial and temporal patterns of use, the key drivers underlying use (e.g., population growth, technology), and the relationship between water-based recreation and other demand sectors, such as agriculture and municipal use. Although such information is clearly not **sufficient** for a comprehensive, integrated management strategy, it is nonetheless **necessary**.

It is the purpose of this chapter to provide a summary of this knowledge base. To do this, we have organized our discussion around a series of propositions regarding the current state of knowledge. Propositions are tentative statements reflecting a conclusion; their validity and applicability remains arguable, subject to validation and testing. They primarily are intended to facilitate discussion and analysis. They derive from an assessment of both the research literature and management experience and, where relevant, describe knowledge gaps surrounding these topics.

We open with three propositions relative to the underlying drivers of demand for water-based recreation. These include the impact of population growth and migration on demand (Proposition 1), the impact of shifting population demographics, such as age and ethnicity, on demand (Proposition 2), and the key causal factors, such as shifts in leisure time and the impact of technology, that affect recreation demand (Proposition 3). We then turn to a discussion of the role of water as a key attribute in the choice process of recreationists (Proposition 4), and also describe how flawed, inconsistent methodologies limit the ability to describe current use patterns or to predict future changes (Proposition 5). We close with a discussion of how competition for water, for municipal use, agriculture, or environmental services, will continue to grow, thereby impacting the ability to accommodate growing recreation demands (Proposition 6) and how manipulations of flow regimes, either for industrial or commodity purposes or to satisfy ecosystem management concerns, can impact recreation uses and values (Proposition 7). We close with a brief discussion of the management implications of this synthesis for more effectively addressing the role of water-based recreation as a medium for the expression of symbolic values.

Our discussion focuses on the United States, with a particular emphasis on the West and Pacific Northwest.[2] However, many of our findings generalize to other regions of the country and overseas; e.g., the general aging of the population, with its attendant impacts on recreation participation patterns and rates, is a phenomenon shared across many Western industrialized societies.

As suggested above, the body of knowledge regarding water-based recreation is necessary but not sufficient to understand the complex symbolic role of water in such behavior or to frame appropriate management programs and policies. As Stokowski concludes "The symbolic power of water…is hidden…behind the prevailing resource management philosophies of contemporary land management agencies…incorporating organic symbols into current management practices may require alternative visions of reality." In this sense, this chapter provides a rudimentary base of knowledge from which such alternative visions might become fashioned.

Many different societal trends will influence water-based recreation in the Pacific Northwest, but none appear to have as great a potential impact as population growth and the demographic components of population change.

Proposition 1: Population Growth and Migration Influences the Spatial Distribution of Recreation and Affects Public Judgments of Acceptability of Water Management Strategies[3]

A discussion of recreation trends must account for the major determinants of those recreation trends—population change, migration, and demographic components of population. An understanding of these population shifts is critical to understanding the future of outdoor recreation trends in the United States in general and the Pacific Northwest in particular.

Population Growth

Many different societal trends will influence water-based recreation in the Pacific Northwest, but none appear to have as great a potential impact as population growth and the demographic components of population change. Although population growth rates in the United States have been declining for some time, the 1999 estimates for the population growth in the Pacific Northwest show a rapid increase

[2] In this report, "Pacific Northwest" refers to Alaska, Oregon, and Washington.

[3] Much of the research literature discussing the link between demographic changes and recreation is not specific to water-based recreation. Therefore, key drivers of change will focus on how demographic variables influence general recreation. The few examples of research studies that examined the effect of demographics on water-based recreation are included.

in population for all three states (table 1, fig. 1). Both Oregon and Washington were within the top 10 fastest growing states in the Nation in the 1990s (10th and 7th, respectively), while Alaska was 13th. Furthermore, if census 2025 projections for population growth in the region are reasonably accurate, the population of all three states will grow between 31 and 43 percent in the next quarter century (U.S. Census Bureau 1997). Considered by itself, this dramatic increase in the Pacific Northwest population suggests that additional demands will be placed on natural resources for recreation in general and on water resources in particular. Assuming the acreage of federally owned lands remains relatively constant, the increase in population will decrease the amount of federal public land available per person. However, it is not enough to consider the effects of increased population growth alone. Demographic components of this population growth—such as migration, shifting age structure, and shifting racial composition—confound the effects of population growth on management of natural resources in the future (McCool and Kruger, n.d.).

Demographic components of population growth such as migration, shifting age structure, and shifting racial composition confound the effects of population growth on management of natural resources in the future.

Regional Migration

Not only will population increases have profound impact on future recreation patterns and management of water, but the spatial distribution of this population growth across the United States will further complicate future scenarios. The trend throughout the United States is for residents to migrate from the Northeast, Midwest, and Plains States to the South and the West; the growth in the Pacific Northwest reflects these national migration shifts (fig. 1). The population of the Pacific Northwest continues to grow owing to natural increase (births minus deaths) and increased international and domestic migration. Census projections for net domestic and international migration into the Pacific Northwest estimate that Oregon and Washington will continue to rank high in both net international and particularly net domestic migration (table 2), whereas Alaska's rate of immigration will slow. Whether or not the population is growing or declining in specific regions of the country holds important implications for the conflicts between water for recreation and other uses. Current trends hold particular significance because they reveal a general pattern of migration from more water-rich regions of the United States towards more arid, Western States. These regional migration patterns could have dramatically different effects on diverse regions of the country—bringing increased conflicts over scarce water resources in some locations (e.g., southern California) and less impact in regions of lower growth, particularly those already with an abundant water supply (e.g., Michigan). Even in the Pacific Northwest, a region

Whether or not the population is growing or declining in specific regions of the country holds important implications for the conflicts between water for recreation and other uses.

Table 1—Population and percentage population change for the Pacific Northwest

State	1999 population (estimate)	Population change (1990–1999)	2025 population (projection)	Population change (1999–2025)
		Percent		*Percent*
Alaska	619,500	12.6	885,000	43
Oregon	3,316,154	16.7	4,349,000	31
Washington	5,756,361	18.3	7,808,000	36

Source: U.S. Census Bureau 1997.

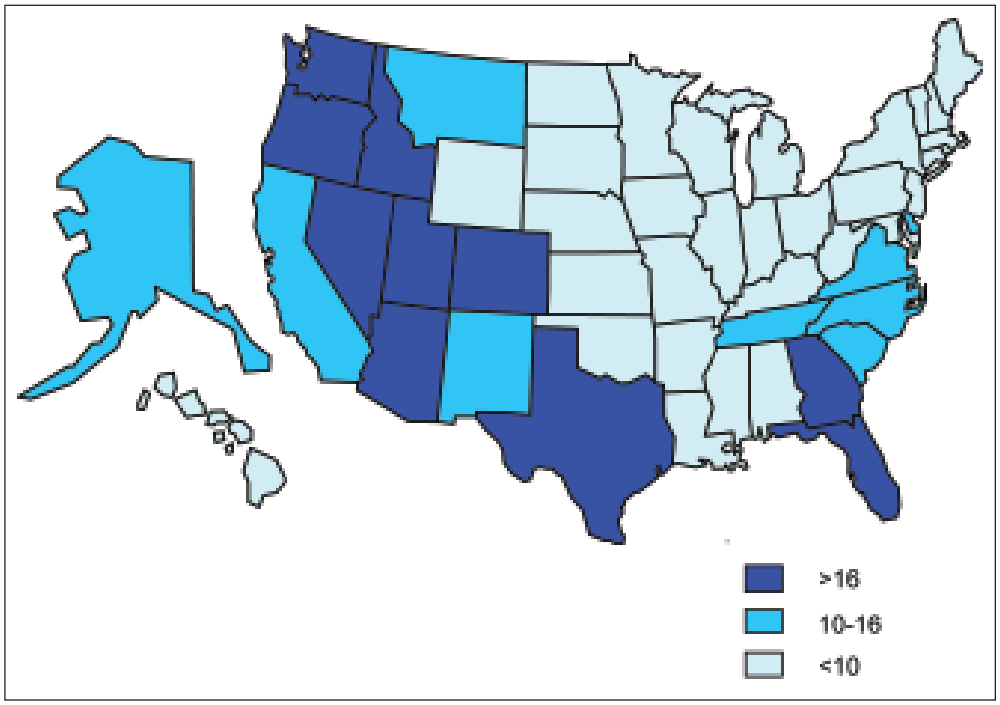

Figure 1—Percentage of population increase for the United States, 1990–1999 (U.S. Census Bureau 2001).

Table 2—Projections for net domestic and international migration for the Pacific Northwest, 1995–2025

State	Net domestic migration	State ranking	Net international migration	State ranking
Alaska	-84,000	37th	28,000	41st
Oregon	712,000	8th	197,000	19th
Washington	931,000	5th	394,000	11th

Source: U.S. Census Bureau 2001.

commonly considered to have abundant water resources, variations in climate result in extremes of both wet and arid conditions within Washington and Oregon. Thus, the spatial pattern of rainfall coupled with the spatial pattern of migration into the Pacific Northwest will result in diverse impacts upon different regions of the states.

Urban to Rural Migration

The recent movement of people from urban to rural locales is another important migration trend in the United States, reflecting a pattern of population "deconcentration" (Johnson and Beale 1998). Throughout the early half of the 20th century, internal migration in the United States consistently reflected a migration stream flowing from rural to urban areas. However, in the 1970s there was a shift in net migration of people from metropolitan to nonmetropolitan areas, including remote, rural counties (Blahna 1990, Fuguitt 1985). This trend, termed the "rural renaissance" or "population turnaround," revealed a pattern in which natural increase contributed less to the population growth in nonmetropolitan counties than did migration (Johnson 1993).

In the 1980s, this pattern reversed as people began moving back to urban areas in greater numbers, in part owing to the economic recession and the farm crisis of 1980–1986 (Johnson and Beale 1994). Consequently, many researchers believed that the population turnaround of the 1970s was an aberration in the traditional rural to urban migration pattern that characterized most of the 20th century. However, data from migration patterns in the early 1990s once again revealed increasing numbers of people moving from metropolitan to nonmetropolitan areas (Johnson and Fuguitt 2000). This suggests that the period of slower growth of nonmetropolitan areas in the 1980s was atypical of the overall pattern of urban to rural migration in the past three decades (Shumway and Davis 1996).

As the rural renaissance trend began to unfold, researchers sought to determine the causes underlying this migration. Although economic needs for employment fueled much of the migration from rural areas to cities in the first half of the century, the population turnaround of the 1970s was influenced by other factors. Fuguitt et al. (1989) noted several possible causes, including narrowing wage differentials between urban and rural areas, increased accessibility to rural areas through modernization, and a relative shift in the value placed upon economic as opposed to noneconomic (e.g., amenity) factors affecting personal decisions to move. Ploch (1978) found that quality-of-life factors such as a rural orientation, slower pace of life, peacefulness, environmental quality, and natural beauty were primary motivations for inmigration to Maine.

Although economic needs for employment fueled much of the migration from rural areas to cities in the first half of the century, the population turnaround of the 1970s was influenced by other factors.

The relationship between migration and the presence of environmental amenities in rural counties is well documented. Johnson (1993) found that the two fastest growing groups of counties in the 1980s were retirement counties and recreational counties (as determined by hotel, motel, trailer park, and camp spending per capita). In an examination of nonmetropolitan population growth in the mountain West from 1970 to 1995, Shumway and Davis (1996) found that the counties that experienced the greatest net migration were adjacent to metropolitan counties and had high amenities for retirees, high percentages of federal land, numerous recreation opportunities, and few extractive industries. In the interior Columbia River basin, counties experiencing recent growth have been found to be economically different from traditional boom and bust counties because they typically contain high concentrations of environmental amenities (Troy 1998). Similarly, Rudzitis and Johansen (1989, 1991) found that counties adjacent to wildernesses had higher rates of growth from migration than more distant counties.

The urban to rural migration pattern has many implications for natural resource management. The pattern of population deconcentration reflected in the movement of people from cities to less settled rural locations has likely contributed to changes in land use patterns in these nonmetropolitan regions (Johnson and Beale 1994). However, the influence of land use changes on public land recreation in general and water-based recreation in particular, is uncertain. Declining access to private forest and pastureland might increase the demand for recreation on federal and other public lands (McDonough et al. 1999).

Considering the urban to rural migration pattern for natural resource management is important because the composition of the new residents will likely influence acceptance of management decisions.

Even beyond the problem associated with population growth, considering the urban to rural migration pattern for natural resource management is important because the composition of the new residents will likely influence acceptance of management decisions (Troy 1998). Even if the net effect of migration into a county is zero, the compositional change in communities may be significant for resource management. Much of the interest in the population redistribution (both from the North/East to the South/West and from urban to rural counties) is that it often changes the demographic composition of residents, which in turn results in shifting values, attitudes, behaviors, and knowledge regarding resource management (McCool and Kruger, n.d.).

Shifts in migration patterns raise numerous questions concerning the effect these incoming residents will have on recreation patterns and on management of water in their new residence. Super and Cordell (1990: 813) noted that the recreational use of the Nation's public lands reflects the "values, tastes and preferences

of the U.S. population—a very diverse population that is ever evolving in the types of recreation it demands." By influencing the predominant values held by the local citizenry, population change will therefore create new challenges for resource managers who will need to adapt to shifting recreation needs and shifting notions of what are acceptable water management strategies. Without a better understanding of the nature of these changes, particularly in terms of their connection with the symbolic values of water, managers will lack preparedness for the magnitude and direction of future recreation and water management needs.

The shifting composition of incoming residents is important because research suggests that new inmigrants often hold differing values and attitudes regarding natural resource management than long-time rural residents. Rudzitis and Johansen (1989, 1991) noted that rural migrants held higher levels of environmental concern and were more likely to support management of public lands for environmental benefits instead of commodity production. In an examination of migration patterns in Maine in the 1970s, Ploch (1978) noted that families migrating to rural counties were younger, smaller in size, more educated, and more likely to hold professional and managerial occupations than were Maine residents. The author also noted that the inmigrants' desire to maintain the rural atmosphere and quality of life for which they migrated could conflict with local individuals' desire to promote economic growth. Fortmann and Kusel (1990) found little difference in environmental attitudes of long-time residents and newcomers, but instead found that, because of their willingness to express dissatisfaction with forest management decisions, newcomers provided a "voice" for pro-environmental attitudes already existing in the community. These findings suggest that the migration of politically savvy newcomers to rural communities will increase local scrutiny of natural resource management decisions.

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Most research has found that new residents differ from long-term residents in terms of demographic variables; many studies have examined the influence of these differences in demographic characteristics on environmental concern and knowledge. Although these studies have mixed findings, generally they suggest that levels of environmental concern are influenced by gender, residence, political ideology, education, and particularly, age. Typically, researchers have found that women, urban dwellers, people with a liberal political ideology, well-educated people, and younger cohorts tend to show more environmental concern than their more conservative counterparts (Jones and Dunlap 1992, Steel et al. 1994, Van Liere and Dunlap 1980). Thus, the makeup of individuals migrating into a region can

have an impact on levels of environmental concern and subsequent natural resource management actions, programs, and policies. Higher levels of environmental concerns could then translate into shifts in the acceptability of specific water management strategies.

The public's level of knowledge also influences judgments of acceptability. However, public attitudes or knowledge is not fixed; it may evolve in response to new information, experience, peer pressures, etc. (Shindler et al. 2002). One of the best-known examples of this was the Smokey Bear campaign, based on the premise that fire should always be suppressed in natural ecosystems. Although the original campaign was quite successful in terms of public support, in recent years the public's increasing knowledge of the beneficial role of fire in natural ecosystems has led to greater public acceptance of practices besides total fire suppression (Shelby and Speaker 1990, Stankey 1976).

In summary, the increase in population and redistribution occurring across the United States will likely have a major impact on recreation trends and water management in the Pacific Northwest, both in terms of increase in numbers and in terms of changing demographic composition of incoming residents. These changes could also presage shifts in the nature and strength of symbolic meanings and importance associated with water and water-based recreation activities.

Proposition 2: Changing Demographics—Such as Age, Race, and Ethnicity—Will Alter Trends in Water-Based Recreation That Require a Shift in Water-Based Recreation Management in the Pacific Northwest

Age

A demographic change expected to have a major influence on recreation participation in the future is the aging of the population. Projected population trends suggest that the 15- to 24-year-old age group could decrease from 18.7 percent of the U.S. population in 1980 to 13.1 percent of the total population by 2030. In contrast, the elderly population is expected to increase from 11.3 percent to 20.1 percent over this same period (U.S. Census Bureau 2001). Unlike changes in migration patterns and racial and ethnic makeup, the aging of the population is expected to similarly occur throughout the United States. In 1995, only five states had greater than 15

Table 3—Population over 65 years, 1998 and 2025

State	1998	2025
	Percent	
Alaska	5.5	10.4
Oregon	13.2	24.2
Washington	11.5	20.2

Source: U.S. Census Bureau 1996.

percent of their population over 65 years of age. By 2025, 48 states are expected to have over 15 percent of their population over 65 years of age (U.S. Census Bureau 1997). In the Pacific Northwest, both Oregon and Washington are expected to have high percentages of older Americans by 2025 (table 3).

The increasing proportion of the population of people over 65 years of age reveals the importance of examining specific components of population change in the United States. Models that only use total population of the Nation to understand and predict the future pattern of outdoor recreation will be inaccurate owing to the confounding effects of age or racial makeup, for example, on recreation behavior. Without a better understanding of changes in these variables, it is difficult to estimate how projected population increases will affect future demand for recreation or for specific facilities and programs.

Population aging likely will have a great impact on recreation participation trends because the relationship between age and participation is often negative (i.e., as age increases, participation decreases), particularly in high-intensity activities such as water skiing.

Population aging likely will have a great impact on recreation participation trends because the relationship between age and participation is often negative (i.e., as age increases, participation decreases), particularly in high-intensity activities such as water skiing. For activities such as motorboating, the relationship is more stable, or shows the highest rates of participation at middle age. Thus, the demand for some activities will grow faster than the population grows, whereas others might drop. One complicating factor is that people over 65 today are more active than the same cohort decades ago. Although Wood et al. (1990) noted that the population of 70 to 90 year olds are healthier and more mobile today than their predecessors and still participate in recreational activities, the nature of these activities appears to change over their lifetimes. For instance, Luloff and Krannich (1990) found that hunters tended to be younger on average than were anglers. Specifically, they found that 2 percent of hunters were over 65 years of age, whereas nearly 7 percent of anglers and 7 percent of nonconsumptive recreation participants were over 65 years of age. These findings suggest that participation rates in hunting are likely to be more negatively affected by the population aging than participation rates in fishing.

In summary, the most important implication of the large percentage of older Americans is that the growth rate of many high-intensity water-based recreational activities will show a slowing in the growth rate while certain lower intensity activities favored by older citizens may show stable or increasing participation rates (Murdock et al. 1991).

Increasing Racial and Ethnic Diversity

Increasing racial and ethnic[4] diversity of the United States is another major component of population change likely to affect recreation participation. A combination of high rates of natural increase (births minus deaths) and immigration of ethnic populations will increase the proportion of minorities in the United States. Unlike the aging of the population that will affect the entire country, increasing racial and ethnic diversity is expected to be greatest in the South and Southwest. Although the rate of increase will be slower in the Pacific Northwest than elsewhere, race and ethnic diversity are still predicted to increase over time (table 4). Much of the increase in diversity in the Pacific Northwest will come from increases in populations of non-Hispanic Asian/Pacific Islanders and Hispanics.

Ethnic groups differ in the recreational activities in which they traditionally participate.

As with the aging of the population, the effect of increasing racial and ethnic diversity may have a profound influence on future recreation trends. The differing ways in which various racial and ethnic groups recreate and their potentially differing levels of acceptability for natural resource management practices are important factors to consider. Much research has reported differences in the recreation patterns of various racial and ethnic groups, particularly among African Americans, Caucasians, and Hispanics.

One consistent finding is that racial and ethnic groups differ in the recreational activities in which they traditionally participate. Although African Americans and Caucasians are significantly more likely to participate in more active recreational activities, Hispanics are more likely to participate in sedentary recreational activities such as picnicking (Hutchison 1987, Hutchison and Fidel 1984).

Caucasian households are significantly more likely than African American households to participate in a variety of water-based or water-enhanced recreational

[4] An ethnic group is typically defined as a collection of people (e.g., Hispanics) who have in common a particular set of attributes such as language, culture, or religion (Husbands and Idahosa 1995). In contrast, race is defined in the American Heritage Dictionary (2000) as a "local geographic or global human population distinguished as a more or less distinct group by genetically transmitted physical characteristics" (e.g., African Americans, Asians).

Table 4—Population in racial and ethnic groups, 1995 and 2025 projection

Race and ethnic groups	Alaska		Oregon		Washington	
	1995	2025	1995	2025	1995	2025
			Percent			
Non-Hispanic White	73.0	57.1	89.5	82.0	85.0	76.1
Non-Hispanic African Americans	4.0	3.9	1.7	2.0	3.1	3.1
Non-Hispanic Asian/Pacific Islander	4.3	21.5	2.8	4.7	5.0	8.8
Non-Hispanic Native American/ Eskimos/Aleuts	15.0	10.7	1.3	1.5	1.6	1.8
Hispanics (any race)	3.8	6.7	4.8	9.8	5.2	10.2

Source: U.S. Census Bureau 1996.

experiences such as non-pool swimming, motorboating, river canoeing, and primitive camping (Dwyer and Hutchison 1990). Similar results from the 1994 to 1995 National Survey on Recreation and the Environment found that Caucasians were more likely than African Americans to have participated in selected water-based recreational activities at least one time in the past 12 months (Wellner 1997). For example, the survey found that 43 percent of Caucasians versus only 17 percent of African Americans participated in non-pool swimming, 26 percent of Caucasians had gone freshwater fishing versus 15 percent of African Americans, 10 percent of Caucasians had gone water-skiing versus 1 percent of African Americans, and 9 percent of Caucasians had gone floating or rafting versus 2 percent of African Americans.

Understanding the differences in recreation participation between racial and ethnic groups is important because models used to predict future outdoor recreation trends will misrepresent rates of recreation change if they assume that participation rate among these groups are similar. If minority recreation participation rates remain constant, the absolute growth in minority populations will lead to an increase in the rate of activities in which they tend to participate more such as fishing and salt-water swimming. Conversely, there could be a slowing of the increase in the participation rate for activities in which they are currently underrepresented, such as motorboating.

Not only have studies revealed racial or ethnic differences in the specific types of activities undertaken, but studies also have identified differing reasons for participating in recreational activities. In an exploratory study of anglers in two Mississippi communities, Toth and Brown (1997) examined how race influences the meanings associated with recreational fishing. They noted that African American anglers evidenced a greater focus on fishing for subsistence, whereas

Caucasian anglers gave greater importance to fishing as a sport. Studies have also shown differences in the manner in which the groups typically participate in recreational opportunities. Studies have shown that Hispanics, more so than Caucasians, tend to recreate in larger groups—typically expanded family groups—and when camping, prefer campsites with other campers nearby (Hutchison 1987). Hutchison and Fidel (1984) found that the average size of recreating Mexican-American groups was 5.7, whereas the average size for recreating Anglo groups was 2.5 persons. In addition, their research noted that Mexican-American recreating groups more often contained people of mixed ages. Among Caucasians and African Americans, it has been noted that African American households show a preference for meeting people—particularly peers—and recreating in group-based activities in developed urban settings, whereas Caucasian households show a preference for individual-oriented wildland recreation and for getting away from others in their outdoor recreation experiences (Dwyer and Hutchison 1990, Edwards 1981, Irwin et al. 1990).

Furthermore, even accounting for sociodemographic characteristics such as income, some studies have noted that African American households were less likely to travel long distances to find recreational opportunities than Caucasian households (Dwyer and Hutchison 1990, Kelly 1980, Washburne and Wall 1980). This helps explain why African Americans have lower participation rates in activities such as wildland recreation that require extensive traveling. Manning (1999) summarized findings from studies that examined differences in recreation participation between Caucasians and minority groups. In general, this work reveals that minority groups, as compared to Caucasians, tend to use highly developed, urban recreation facilities close to home; recreate in larger groups that contain a diversity of ages; participate in more sport and fitness-type activities; stay longer; and participate in land-based activities more than water-based activities (Manning 1999).

There are two major theories as to why significant differences exist in recreation participation patterns among racial and ethnic groups: the marginality and the ethnicity explanation (Husbands and Idahosa 1995). The marginality theory explains the racial and ethnic differences in recreation patterns through the groups' differences in demographic variables (such as age and urban-rural distribution), poverty, and discrimination (Washburne 1978). The theory posits that differences in these characteristics lead to differing opportunities to access recreational resources (Edwards 1981). It acknowledges that traditional minority participation rates may not reflect their real demand for recreation (Dwyer 1995). Historically, African

Americans have had more limited recreational experiences than Caucasians in part owing to lack of resources (e.g., money) and reduced access to both public and private recreational opportunities.

The second major theory—ethnicity theory—posits that recreation differences are a function of the values, norms, and experiences of different ethnic groups (Husbands and Idahosa 1995). Meeker et al. (1973) suggested that African Americans' preference for urban-based activities results from their view of the city as a place of greater refuge from racism than natural landscapes. Although national parks are seen by Caucasians as virgin lands (e.g., the "Garden of Eden") untouched by human activities where one could find escape from civilization, the conception of nature as separate from people was not a significant part of the cultural systems of groups such as Native Americans.

Unlike the culture of European settlers where nature was considered separate from human activities and thus needed to be protected from civilization, the culture of African Americans and Native Americans ascribed more to a philosophy in which humans are more integrated with natural processes (Meeker et al. 1973). Furthermore, Taylor (2000a) noted that since their inception, national parks and wilderness areas have been used primarily by middle class Caucasians and that minority populations traditionally have felt uncomfortable recreating in these areas. This reluctance likely was formed and sustained by the celebration of Caucasian "discoveries" of areas previously known to, and used by, Native Americans and Chicanos, the lack of minorities employed in land management agencies, and the lack of minorities in books, guides, and film footage of wildland areas.

The differences between these theories hold certain implications for recreation management as the diversity of the United States increases over time. If research suggests that the marginality hypothesis accounts for most of the differences in recreation participation among racial and ethnic groups, then programs could be developed to make recreation more accessible to individuals at all socioeconomic levels. On the other hand, if research suggests that cultural norms and values account for variations in recreation participation, then recreation managers could attempt to focus more of their efforts on activities preferred by those racial and ethnic groups whose populations are increasing (Edwards 1981). A better recognition of how race and ethnicity influence the meaning of recreational activities is needed for resource professionals to manage natural resources for diverse participants.

The Combined Influence of Demographic Variables

In conclusion, our examination of major shifts in certain demographic variables in the United States suggests certain major trends in the future. The U.S. population is growing, although at a slower rate than in the past. Americans are becoming increasingly older, more racially and ethnically diverse, and more likely to reside in the South and the West. Although participation rates in outdoor water-based recreational activities will not increase rapidly, there will certainly be a shift in the demographic makeup of recreationists (Schuett 1995). Because demographic variables are important determinants of recreation participation, changes in the demographic composition of the American population will have profound effects on future recreation use trends, especially owing to the interrelated effects of age, ethnicity, and race. These variables work in combination, suggesting an increase for some activities and a decrease for others.

Because of the increasing proportion of older residents and minorities, rates of increase in most outdoor recreational activities will slow (Murdock et al. 1991). Because of the slower growth of minority populations in the Pacific Northwest as compared to other regions (e.g., the Southwest), racial and ethnic differences in recreation participation will have less impact in the Northwest than in other parts of the country. However, if the growth in minority populations in the Northwest is concentrated in certain locations (e.g., urban areas), it will have a greater influence on recreation participation in those areas than overall percentage of growth rates in Northwest minority populations might first suggest. Possible differences in the spatial pattern of increasing minority populations in the Pacific Northwest highlight the importance of having site-specific information on demographic trends. Because there is a clear relationship among race, ethnicity, and recreation participation, changes in the constituency of a particular area will have strong implications for recreation management.

However, in general, the influence of population aging in the region likely will have more impact on recreation trends than will increasing racial and ethnic diversity. This suggests that the Pacific Northwest might see increasing demand for water-based recreational activities in which older adults participate—such as motorboating on lakes or camping in developed campgrounds near lakes (Cordell et al. 1997). In contrast, high-intensity activities such as primitive camping along rivers likely will see a decline in growth rate. Activities such as salt-water fishing that have high participation rates for both minorities and older Americans are also predicted to have a higher rate of growth in the future (Murdock et al. 1990).

Owing to the complexity of demographic variables influencing recreation, there is a need for models that can account for these combined effects (Murdock et al. 1990). Because demographic groups have different participation rates in leisure activities, it is not sufficient to simply project future recreation participation rates based on population increases. The uncertainty surrounding modeling and predictions of recreational behavior make it particularly important to have consistent monitoring of recreation use to prepare managers for changing recreational demands (Dwyer 1995).

Proposition 3: Knowledge of Other Causal Factors Affecting Recreation Demand—Such as the Role of Technology and the Influence of Leisure Time—Is Limited

Technology

Our understanding of the influence of technology trends on water-based recreation patterns is limited, in part by the rapid rate of technological change. In recent years, new technologies have been created at an accelerated pace, creating a situation in which there is some uncertainty as to what the future will hold. Rayner and Malone (1998) pointed out that whereas it took 100 years, from 1844 to 1936, for people to develop commercial telegraphy, the telephone, broadcast radio, and television, it took only 20 years for video cameras, computers, cellular phones, and the Internet to become widespread.

Compounding the confusion over technology's influence on water-based recreation and management is the reality that technology is neither inherently beneficial nor harmful, but instead depends on its application. Two extreme, but simplistic, viewpoints—that technological improvements will solve all problems or that technology creates problems—both inadequately describe the complexity of the impact that technology may have on water-based recreation.

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Increased access has two effects. First, advances in technology increase recreational opportunities by removing some of the barriers to access into many remote locations thereby allowing more people to participate in recreational opportunities (e.g., elderly or disabled individuals). By facilitating access to a broader spectrum of society, technological increases also have a positive effect on political interest in recreation and recreation management. If there are more people who value recreational opportunities, there will be more people who will attempt to influence the

political system with regard to recreation, at least in theory. This is particularly true of older Americans who typically are more politically active than younger cohorts (Steel et al. 1998). On the other hand, improved access resulting from technological advances can lead to detrimental impacts on surrounding riparian habitat. Improved access expands available recreational sites by allowing individuals to recreate in locations previously considered too remote. Improved access can intensify the use of existing sites that are vulnerable to recreational pressure. Furthermore, to some individuals, the mere presence of technology in wildland areas is antithetical to their value systems, as evidenced by the controversy over snowmobiles in Yellowstone National Park.

Advancements in technology also influence demographic trends, such as the urban to rural migration pattern, that affect water-based recreation and management. Johnson and Beale (1998) noted that advances in transportation and communication (e.g., satellite technology, the Internet) have given people the ability to reside in nonmetropolitan communities without needing to consider proximity to urban areas or the availability of local employment. Improvements in transportation corridors also have resulted in growth of rural counties that are now considered within commuting distance to major metropolitan centers. Johnson and Beale (1998) also observed that urban to rural migration is sometimes fueled by negative aspects of technology; e.g., traffic congestion in urban areas has increased people's desire to leave cities for less populated rural areas. The growing numbers of people migrating into rural counties likely will increase recreation pressure in these locations and, as a result, also will increase conflicts over management of water resources for differing uses and values. As previously discussed, technological advances not only will increase population growth in remote, rural counties, but it will also increase the number of individuals holding different values, beliefs, and knowledge regarding natural resource management.

Another trend that will impact water-based recreation and management is the information technology explosion. As before, this trend will result in both positive and negative impacts for management of recreation and the water resource. The increase in information technology will expand opportunities for individuals to obtain information about recreational activities and potential recreation sites with relative ease (e.g., through Web sites). The Internet gives management agencies the ability to spread real-time information about recreational opportunities. However, Stankey (2000) noted that not only is there a possibility for dissemination of inaccurate information about a recreation site, such as on unofficial Web sites, but

widespread information regarding appealing recreation sites can result in increased crowding in formerly pristine locations. Furthermore, advances in Internet and e-mail technologies give individuals and organizations the ability to become informed almost instantaneously about potential management strategies, giving them the ability to mobilize pressure on agencies for particular natural resource management strategies.

The Influence of Leisure Time

Because the availability of leisure time is related to the ability to participate in recreational activities, leisure trends in the United States are important for projecting future recreation patterns. Leisure time is defined as the available free time a person has after completing paid work time, unpaid work time (e.g., household chores, childcare), and personal care (e.g., sleep, eating) (Robinson and Godbey 1997).

Polling in the United States reveals an increase in the median number of hours Americans work per week and a corresponding decline in leisure over the past 30 years. By asking respondents to estimate how long they work per week (including commuting time), the Harris Poll (Taylor 2000b) found that the median number of work hours increased from 41 hours in 1973 to 50 hours in 2000. When adults estimated how much leisure time was available to them each week, the poll found that the median number of leisure hours decreased from 26 hours per week in 1973 to 20 hours per week in 2000. In her book, *The Overworked American*, Schor (1991) estimated that the average employed person worked 163 hours more in 1987 than they did in 1969. Data from the Bureau of Labor Statistics' Current Population Survey similarly shows that leisure time is less available for working Americans, particularly single parents or dual career couples with children (Burtless 1999). In contrast, older Americans and younger adults without children tend to have greater amounts of free time today than did their predecessors (Lagerfeld 1998).

Some researchers dispute the claim that leisure time has declined in recent decades for Americans overall. Using time diaries, Robinson and Godbey (1997) found that not only had the overall number of paid work hours fallen from 1965 to 1985, but they found that people responding to surveys significantly overestimated how much time they had spent at work the previous week. However, their results also showed that increased leisure time was concentrated in certain groups of Americans: the unmarried, the 18- to 24- and 55- to 64-year-old cohort, and

those without children. These findings were consistent with most research on leisure, which has found great variation in leisure time among different groups of individuals.

It is generally acknowledged that, for whatever reasons, Americans feel more pressed for time now than ever before (Lagerfeld 1998). Davidson (1994) suggested that Americans' real or perceived decline in leisure time results from five "mega-realities": population growth, increasing volumes of information, increasing media coverage, growth in the paper trail, and an overabundance of choices. For example, the author noted that increases in knowledge and mass media coverage in the United States overwhelm people by bombarding them with information, while population growth has contributed to increasing gridlock on transportation routes and longer commuting times for work and other tasks. Furthermore, Schor (1991) pointed out that consumerism (e.g., trying to "keep up with the Joneses") locks workers into a work-and-spend cycle. For the purposes of understanding leisure's impact on recreation trends, Americans' **perceptions** of their leisure time are more important than their actual leisure time because it is their perception that will influence decisions regarding when, where, and how often to recreate.

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The quality of leisure time is as important as the quantity. For example, Bittman and Wajcman (2000) found that although men and women have similar amounts of free time, the nature of their available time suggests that a gender gap in leisure exists. By comparing time diaries in 10 countries, the authors discovered that men's leisure was more likely to be uninterrupted and of longer duration and was less likely to be associated with unpaid work such as child care than was women's leisure. There are some indications that, in general, Americans' recreation patterns are shifting owing to changes in the duration of leisure time. Americans are now more likely to split their leisure time into several, small mini-vacations or long weekends rather than go on a few extended vacations (Hartmann et al. 1988). In addition, Lime et al. (1995) noted that developed and accessible recreation areas have experienced greater growth in visitation than backcountry settings.

This trend can have an important impact on recreation patterns resulting in an increase in the numbers of visitors at urban-proximate recreation sites, particularly day-use sites, and a decrease in the numbers of visitors to more remote locations that require more travel time or longer stays. In combination with preferences for water-related recreation, this shifting pattern of leisure time suggests increasing pressure on water resources near urban areas. This will place further pressure on water resources for different values such as clean drinking water, riparian habitat, or industrial use. In contrast, these trends suggest that wildland recreation might

face less pressure as people have limited time to reach those sites. In general, trends in leisure time suggest that water recreation management requires focusing on sites located near population centers.

Proposition 4: The Presence of Water Surfaces Is Essential to or Enhances the Satisfaction of Recreationists Engaged in Most Outdoor Recreation Activities

The presence of water contributes to many recreational opportunities, including both water-dependent and water-enhanced recreational activities. Water-dependent activities are those in which water is essential to conducting the activity, such as fishing, boating, water-skiing, swimming, kayaking, rafting, canoeing, sailing, and most waterfowl hunting. Water-enhanced recreational activities are those in which water is not required in order to participate in the activity, but which greatly contributes to the recreationists overall experience. These activities include, but are not limited to, hiking and camping along bodies of water, viewing scenery, and nature study. These categories are rarely distinct, even within a specific recreational activity. Depending on the species sought (e.g., waterfowl, pheasants, or deer), hunters might or might not require access to water. In addition, campers traveling long distances who are unable to carry sufficient water will require water sources periodically. Furthermore, recreationists seldom fall solely into one category, but instead often participate in several activities during their recreation visits. For example, boating allows people to participate in a variety of water-based recreational activities such as water-skiing, swimming, and fishing.

Management of the water regime can influence both water-dependent and water-enhanced recreational opportunities, either positively or negatively, inadvertently or purposefully. Recreationists participating in water-enhanced activities can be as affected by changes in the water resource as participants in water-based activities. Furthermore, they might find it equally difficult to locate adequate substitutes in the event their traditional, water-oriented sites are no longer available. To effectively manage water resources for a variety of different uses of water, including recreation, we must understand how recreationists use and value water in their outdoor experiences. Studies of visitor attitudes and preferences indicate that water is a fundamental component of many forms of recreation on public lands and can contribute to recreationists' satisfaction with a site (Rollins and Chambers 1990). Recreationists often rate water as the most important attribute of their chosen

setting. Studies of campground users consistently have found that access to water is one of the most important characteristics that recreationists look for in a campsite (Clark et al. 1984, Lime 1971, Moore et al. 1990).

Other studies found that campers place high importance on recreating near an accessible body of water (Bumgardner et al. 1988, Lucas 1970) and that the amount of land/water edge and surface water are positively related to increased scenic value of the area (Zube et al. 1975). In a survey of visitors to the Aravaipa Canyon Wilderness in Arizona (Moore et al. 1990), respondents ranked 13 characteristics of the Canyon in order of importance; water was the most frequently mentioned item. In a study developing a typology of site attributes desired for camping, Brunson and Shelby (1990) noted that one of the three most important attributes needed to provide a minimum-level quality camping experience was proximity to water. Water is important not only as an essential component of water-dependent recreational activities, but also as an "aesthetic backdrop for non-water oriented activities" (Field and Martinson 1986). In a study of how people make choices about recreation sites, Vining and Fishwick (1991) asked 10 subjects to verbalize their thought processes as they chose between 45 pairs of outdoor recreation sites. The authors noted that most subjects used the presence and absence of water in their evaluation. The study also revealed that water was considered more important than simply serving as a "medium" for conducting an activity. Instead, attributes of water (e.g., miles of shoreline) were associated with contributing to the peaceful or secluded atmosphere of a site. Thus, not only is water essential for many water-based recreational opportunities, but these studies also indicate that symbolic aspects of water, such as its restorative capacity, also are important to the quality of outdoor recreational activities.

Proposition 5: Available Data Suggest That Participation Levels in Water-Dependent Activities Continue to Increase Although Participation Rates Are Slowing. However, Flawed and Inconsistent Methodologies Limit Accurate Analyses of Recreation Use Data

Information on recreation participation levels is essential for effective management. For example, knowledge of recreation trends can help managers direct monetary resources or personnel most appropriately. However, obtaining accurate recreation use data is difficult, particularly for dispersed recreational activities.

A limitation to the compilation of accurate recreation use data stems from the lack of cost-effective, valid sampling methods. Consequently, although numerous research studies have collected recreation data, our ability to compare across these different studies is limited. Currently, recreation data are not comparable or consistent enough to compare information from one year to the next (Loomis 2000). For example, depending on the survey, questions referring to boating can include sailing, canoeing, kayaking, rowing, floating, rafting, motorboating, water-skiing, or jet skiing. Without a clear understanding of how recreation categories have been compiled, it is not possible to compare recreation use across different survey instruments, areas, or time. Even more problematic is the lack of continuity in survey questions. The tendency to alter survey instruments by dropping or rephrasing particular recreation use questions in subsequent versions of the questionnaire effectively eliminates the possibility of comparing recreation use trends over time.

An example of the difficulty of comparing across studies is exemplified by the use of two different measurements of recreation units: visits and visitor days. Visits represent an occurrence; one person entering a park is one visit, if they leave and return later in the day, they are now counted as two visits. Visitor days, on the other hand, provide an approximate measure of length of stay, typically the equivalent of 12 hours. One person in an area for 12 hours is 1 visitor day, two persons for 6 hours would also be 1 visitor day, and so on. Because visits and visitor days measure two different aspects of recreation intensity, the continued use of both units in recreation research adds to the difficulty of comparing data across studies. Recreation use data are further confounded by the fact that participation is always a function of supply; participation rates in selected activities are influenced by availability and access to the activity, not solely demand for participating in the activity (Manning 1999). Consequently, activities that are widely abundant are reflected in high participation rates, whereas more preferred, but not easily accessible, activities reflect low participation rates.

In summary, the accuracy of recreation data is generally suspect as are the methodologies used to obtain recreation use figures. This is a fundamental, recurring problem that has plagued recreation management for decades. Furthermore, in many instances, recreation data simply are not available. As a component of this report, a case study on one county in the Pacific Northwest was planned. It was envisioned the case study would provide an opportunity to examine the impacts that demographic changes (e.g., population growth, migration patterns) have had on water-based recreation in a specific county. However, analysis of the case study

was contingent upon having an accurate recreation use database. Unfortunately, no such database was available and the case study analysis subsequently was abandoned. The possibility or even likelihood of inaccurate or nonexistent data from one county alone raises serious questions as to how managers can determine how to appropriately allocate limited resources, both staff and time, at regional, state, or national levels. For example, Statewide Comprehensive Outdoor Recreation Plans (SCORP) report recreation participation information for water-based activities. Unfortunately, each state's SCORP is administered separately making it difficult, if not impossible, to make comparisons between states.

The lack of a comprehensive database, coupled with lingering concerns regarding the accuracy of such data, further exacerbate the dilemma identified earlier regarding the ability to describe adequately the symbolic aspects of the water-recreation interface. As noted in chapter 1, "The absence of appropriate metrics that express the presence and magnitude of symbolic uses and values handicaps their inclusion in decision making." In short, the lack of an accurate, systematic program to collect, operationalize, and incorporate data about these uses and values virtually ensures the failure to take them into account in land and water resource management.

Despite these caveats, some general observations regarding water-based recreation trends can be explored (also, see chapter 4). In the 1970s and 1980s, a number of studies identified trends in water-based or water-enhanced recreation. Snepenger and Ditton (1985) used data from a national survey of hunting and fishing taken every 5 years to determine general trends in these activities. They noted that while participation in hunting as a percentage of U.S. population had declined from 1955 to 1980, participation in fishing increased over the same period. In addition, they reported that increasing numbers of anglers and hunters lived west of the Mississippi, in part reflecting the Nation's general westward migration trend. Warnick and Vander Stoep (1990) studied water-based trends by geographic region from 1979 to 1989 and found that national participation rates in three water-based activities (sailing, power boating, and water-skiing) had declined over the 9-year period. In contrast, Hof and Kaiser (1983) predicted that outdoor recreation participation would increase, with snow- and ice-based recreation showing the highest rates of increase, followed by water-based recreation, and lastly, land-based recreation.

Recreation use data are obtained from descriptive national surveys including the National Survey on Recreation and the Environment, which is conducted every 5 years (Cordell et al. 1997) and the annual national survey administered for The

Recreation Roundtable (Recreation Roundtable 2000). Until peer-reviewed studies analyze the sensitivity and accuracy of these data in more detail, these surveys provide the best picture, albeit primarily descriptive, of the major national trends in recreation. These surveys reveal that water remains an important aspect of recreation for Americans. When respondents were asked about their outdoor recreation participation in 1995, water-based activities such as swimming, boating, and fishing were three of the most frequently mentioned outdoor recreation activities (table 5). A comparison of these three popular water-based activities from 1982-83 to 1994-95 showed that the number of people boating and swimming increased over this period, while the number of people fishing was found to have decreased—even though participation remained high (table 6).

Other findings also reveal that boating is one of the most popular outdoor recreational activities in the United States. The National Marine Manufacturers Association (1997) estimated that 78 million people participated in recreational boating in 1997. Industry estimates of recreational boats sold show that the number of boats owned has grown steadily except for a short decline in the mid-1990s, with an estimated 13.2 million outboard motorboats owned in 1997. A more recent national survey in 1999 again identified swimming, fishing, and boating as the three most popular water-based activities, with swimming and fishing among the five most popular outdoor recreation activities.

Notwithstanding our earlier remarks concerning the lack of comparability between state-prepared SCORPS, they nonetheless provide some basic information about recreation participation within individual states. Oregon's SCORP (1994) found that water-based recreational activities ranked high in terms of recreation participation in Oregon. The second and third most frequently conducted activities out of 19 dispersed recreational activities presented to respondents included swimming in lakes, rivers, or the ocean, and boat fishing was noted by 59 percent and 41 percent of the households, respectively. In addition, between 24 and 40 percent of the households surveyed engaged in nonmotorized boating, motorized boating, and bank or dock fishing.

In the Alaska SCORP (1999), the most popular water-based activities undertaken by Alaskans included sportfishing (76 percent); clamming/beachcombing (53 percent); motorboating (42 percent); and canoeing, rafting, or floating (31 percent). When Alaskans were asked which activities they did not participate in, but would like to, the top five responses (snowmobiling, downhill skiing, sea kayaking, jet skiing, and cross country skiing) were activities all dependent on water. In

Table 5—Participation in outdoor recreational activities as a percentage of the total population of the United States[a]

Activity	Percent	Activity	Percent
Swimming (nonpool)	39.0	Floating, rafting	7.6
Boating (any)	30.0	Canoeing	6.6
Fishing (any)	29.1	Sailing	4.8
Studying nature near water	27.6	Personal watercraft riding	4.7
Camping (any)	26.8	Rowing	4.2
Freshwater fishing	24.4	Migratory bird hunting	2.1
Motorboating	23.4	Windsurfing	1.1
Saltwater fishing	9.5	Kayaking	0.7
Water-skiing	8.9		

[a] Determined as the percentage of people 16 and older who participated in the activity at least once in the past 12 months.

Source: National Survey 1996.

Table 6—Boating, nonpool swimming, and fishing participation and percentage of change from 1983–1995

Activity	1982–1983	1994–1995	Change
	– – – – – Millions – – – – –		*Percent*
Boating:	49.5	58.1	+25.0
Sailing	10.6	9.6	-9.4
Motorboating	33.6	47.0	+39.9
Water-skiing	15.9	17.9	+12.6
Swimming/nonpool	56.5	78.1	+38.2
Fishing	60.1	57.8	-3.8

Source: Cordell et al. 1997.

Washington, a survey found that 72 percent of Washington households had participated in some type of water activity (e.g., swimming, water-skiing, sailing, boating) in the past year and 57 percent had participated in fishing (Washington SCORP 1995). As a result of the SCORP process, the Interagency Committee for Outdoor Recreation in Washington found that the public's demand for water access was not being met and recommended that the state invest in 2,000 acres of public water access sites in the future.

Boating is a popular water-based activity in the Pacific Northwest. According to the National Marine Manufacturers Association, Alaska, Oregon, and Washington rank 25th, 15th, and 24th, respectively, in the number of boating registrations on a per

capita basis. Fishing is even more popular than boating in the region. A national survey of fishing, hunting, and wildlife-based recreation compared data on fishing among the states of the Pacific Northwest Region (National Survey 1996). In terms of numbers of anglers, days of fishing, and fishing expenditures, Washington ranks first in the Pacific Northwest, followed by Oregon, then Alaska (table 7). However, as a percentage of the state population, Alaska contains more anglers, followed by Oregon and Washington. Nonresident anglers fishing in Alaska accounted for approximately 40 percent of the total days of fishing, whereas nonresident anglers accounted for only 6 and 7 percent of the total days of fishing in Oregon and Washington, respectively. These figures suggest that natural resource decisions in Alaska have the potential to affect a more geographically diverse constituency and that debates regarding management decisions in Alaska will be driven more by out-of-state individuals than similar debates in Oregon and Washington. In all three states, freshwater fishing is preferred over saltwater fishing (table 8), implying that management changes in freshwater resources would have greater implications for recreation participation than would changes for saltwater resources.

As previously discussed, there is an absence of current peer-reviewed studies examining recreation use trends. Trend research has been replaced with studies that focus more specifically on components of the recreation experience, such as visitor satisfaction or perceptions of crowding. Although such research is needed to better understand recreation behavior, it is important that we continue to examine and to project recreation use trends in the United States. Because different methodologies are used to obtain recreation data, it is important for peer-reviewed studies to examine long-term trends in recreation while accounting for the limitations arising from inconsistent methodologies. Without improved, continuous monitoring of recreation trends, managers will be caught unaware of the changing needs of the recreating public and unprepared to deal with the potential impacts of recreation use shifts on the water resource. Most recent survey data indicate that in the Pacific Northwest, water remains essential to a person's ability to continue participating in their preferred recreational activities. Because water is such a critical element in the choice process for many recreationists, managers must design water management strategies that acknowledge both the importance of recreation to the public and the importance of water resources to recreation.

Table 7—Numbers of anglers and days of fishing for the Pacific Northwest region

State	Anglers (resident and nonresident)	Anglers (as a percentage of state population)	Days of fishing
		Percent	*Millions*
Alaska	463,000	29	5.3
Oregon	658,000	16	8.0
Washington	1,000,000	15	12.9

Source: National Survey 1996.

Table 8—Total days of freshwater and saltwater fishing in the Pacific Northwest in 1996

State	Total days of freshwater fishing (state residents and nonresidents)	Total days of saltwater fishing (state residents and nonresidents)
Alaska	3,602,000	1,949,000
Oregon	7,118,000	870,000
Washington	10,975,000	2,135,000

Source: National Survey 1996.

Proposition 6: Conflicts Over Competing Uses of Water—Including Recreation, Municipal Uses, Industrial Uses, Irrigation, Habitat, Etc.—Will Likely Grow in the Future

Any decision that results in changes to the water resource will have impacts, either intentional or unintentional, on management of water for other uses and values. Because water is a crucial but limited resource, conflicts will increase over water requirements for a variety of uses: urban needs, irrigation, hydroelectric power, recreation, municipal water supply, private ownership of property with water frontage, and habitat conservation (Naeser and Smith 1995). Not only does recreation have the potential to affect other uses of the water regime, but these other uses of water can have reciprocal effects that influence the quality of water-based recreational experiences.

Owing to the spatial arrangement of both water resources and population growth, there will continue to be a spatial component to the conflicts surrounding water use. In the United States, major urban centers historically have developed adjacent to rivers and other waterways that served as transportation corridors. Today, many cities (e.g., Portland, Oregon) are proximate to major water sources

that are used for drinking water, transportation, hydropower, and recreation. Although conflicts over water use and distribution would have occurred regardless, social trends such as population growth and migration shifts in the Pacific Northwest likely will escalate water conflicts in the coming decades. In particular, population growth and redistribution—especially to arid regions of the Northwest—will bring water conflicts to the forefront more quickly. By 2025, the populations of Oregon, Washington, and Alaska are expected to increase by approximately 3.4 million people; as a result, limited water resources will need to be distributed among more people, to satisfy more demands, particularly in urban centers.

Rapid population growth serves to increase both the probability of water shortages in the future and the difficulty of deciding how to allocate water among differing, often incompatible, uses.

Rapid population growth serves to increase both the probability of water shortages in the future and the difficulty of deciding how to allocate water among differing, often incompatible, uses. As the United States becomes more diverse (culturally and demographically), more people will have differing expectations for water use. Furthermore, the continued adoption of new technologies in recreational equipment and the resulting diversification of recreational opportunities is likely to escalate conflicts among recreationists, particularly if recreation participation continues to grow (Manning 1999).

Understanding the conflicts surrounding the distribution of water is important because they can negatively affect water-based recreation. For some recreationists, conflicts can lead to reduced satisfaction in an activity, whereas for other recreationists, conflict can lead them to engage in coping behaviors in an attempt to evade the conflict. Conflict for an individual is defined as "goal interference attributed to another's behavior" (Jacob and Schreyer 1980). The level of perceived conflict is not constant among all recreationists, but differs in response to a variety of factors. An individual's sensitivity to conflict has been found to be influenced by activity style (personal meanings associated with a recreational activity), resource specificity (the importance placed on a particular resource such as a swimming hole), lifestyle tolerance (willingness to share resources with members of other lifestyle groups), and mode of experience (preferred ways of experiencing the environment) (Jacob and Schreyer 1980).

Recreation conflict can be classified into three main categories: recreation versus other uses of the water resource, interactivity recreation conflict, and intra-activity recreation conflict (Schreyer 1990).

Recreation Versus Other Uses of Water

Although many studies have been conducted on how different logging practices impact recreation (e.g., visual quality of camping sites) (Brunson and Shelby 1992,

Langenau et al. 1980), less research focused on conflicts between water-based recreation and management of the water resource for other uses. Water conflicts can occur when alternative uses of water are not compatible. For example, water appropriated for out-of-stream uses (e.g., irrigation) reduces waterflow for recreational opportunities. There is an extensive literature on how flow impacts water-based recreational experiences (Shelby et al. 1992b) (see Proposition 7), but we still have a poor understanding of how industrial or commercial water use, for example, affects decisions to recreate.

Robertson (1989) noted both direct and indirect impacts on recreation from other uses of urban waterways. Some direct impacts include private ownership of waterfront properties and subsequent development and problems associated with the navigation of large ships into commercial ports. Indirect impacts to recreationists include reduced opportunities to view wildlife, a reduction in the visual quality of a recreation site, or increased noise (Clark 1986, Robertson 1989). For much of the history of the United States, urban rivers and waterways were designated primarily for commercial and industrial purposes overseen by the Army Corps of Engineers (Robertson 1989). With the increase in people recreating in urban-proximate waters, recreationists have come into conflict with industrial and commercial activities using the same water resources.

Competing demands on the water resource can alter the quality of the recreation experience. In a study examining the impact of commercial and industrial uses of water on recreation in a Midwest urban river corridor, Robertson and Burdge (1993) found that effects on water quality associated with commercial navigation and water withdrawals (e.g., siltation, turbidity, water pollution) significantly reduced recreationists' satisfaction with their water-based experience.

The effect that other uses of water have on recreation depends on the extent to which the public perceives negative impacts to the water regime. Studies of public perceptions of water quality suggest that people make determinations regarding water quality based primarily on vision (Smith et al. 1991), and secondarily on smell and touch (Lant and Mullens 1991). Using photographic slides of water settings that differed only by water color and amount of litter, Dinius (1981) found that people believe increased litter corresponds to decreased water quality at the site.

Public perceptions of pollution influence decisions to recreate. Some impacts to the water regime from other uses may be so great that they eventually displace recreationists to other locations or convince recreationists to stop their activity

altogether. Water clarity is important for swimming suitability. David (1971) noted that the presence of green scum or algae would prevent 80 percent of recreationists from swimming, whereas the presence of cans or glass in the water would prevent 70 percent of respondents from swimming. In a study of swimmers in New Zealand, Smith et al. (1991) found that the ability to see to 2.2 meters in depth was a necessary distance for 90 percent of recreationists to consider the water suitable for swimming. Perceptions of water quality also influence people participating in water-based activities that do not involve body contact with water. In an examination of water-based recreation at Lake Red Rock in Iowa, Robertson and Colletti (1994) found that 45 percent of the boaters surveyed had either reduced the frequency of their visits or had avoided the site altogether because of problems with excessive siltation.

Interestingly, although recreationists use visual cues to determine the level of water pollution of waterways, water quality measures for gauging public health traditionally include nonvisual indicators such as bacteria levels or toxicity of organic compounds. On the Salt River in Arizona, Nelson and Hansen (1984) found no relationship between water clarity and fecal coliform levels in recreation sites. These findings suggest that efforts to improve water quality for recreationists also will have to improve visual indicators from the recreation site such as the amount of litter and the water clarity. Otherwise, water that is considered of good quality by toxicity or bacterial standards might still be perceived as unclean by recreationists (Dinius 1981).

Interactivity Conflicts

Most studies of recreation conflict have examined interactivity conflict—the conflict occurring among recreationists participating in different activities. Empirical research on water-based recreation has reported problems between anglers and water-skiers (Gramann and Burdge 1981), anglers and canoeists (Driver and Bassett 1975), and particularly between motorized and nonmotorized boaters (Shelby 1980). For example, jet skis often disturb people engaged in recreational activities such as fishing or swimming (Burger 1998).

A common finding throughout these research studies has been the asymmetrical character of interactivity conflict: although people participating in a certain recreational activity might not mind the presence of recreationists of another activity, these congenial feelings often are not reciprocated by participants in the second activity. For example, studies have documented an asymmetric conflict between

motorized boaters and nonmotorized recreationists such as canoeists. Although motorboaters typically are indifferent or even have positive associations with their encounters with canoeists, canoeists dislike encounters with motorized recreationists (Shelby 1980). In the Boundary Waters Canoe Area of Minnesota, Adelman et al. (1982) found that 71 percent of paddling canoeists disliked meeting or seeing motorcraft users, but only 8 percent of motorcraft users disliked meeting or seeing paddling canoeists. Furthermore, motorcraft users typically were unaware that other recreationists were disturbed by their activities. Over 85 percent of motorcraft users believed they seldom or never disturb paddling canoeists, even though 79 percent of paddlers felt they were occasionally or frequently disturbed by motorcraft users. This asymmetrical aspect to recreation conflict complicates management of water resources for recreation.

Intra-Activity Conflicts

Intra-activity conflicts are those conflicts that arise between recreationists who are participating in the same activity (Schreyer 1990). The literature on crowding is a well-researched example of this form of recreation conflict. For example, in a study of boating on West Virginia's Cheat River, Whisman and Hollenhorst (1998) found that 64 percent of commercial boaters and 84 percent of private boaters experienced higher than normal levels of crowding. Crowding is defined as a "negative evaluation of a certain density or number of encounters" (Shelby et al. 1989) and can result from a combination of increased visitation, inadequate infrastructure, and changes in visitor use patterns such as bus tours (Lime et al. 1995).

Numerous studies have attempted to document perceived levels of crowding. Shelby et al. (1989) reviewed 35 studies in the United States and New Zealand that used the same single measure of crowding (rated along a nine-point scale from not at all crowded to extremely crowded). The studies had a wide range in levels of perceived crowding by recreationists—from 17 percent of goose hunters experiencing crowding on the Grand River Marsh in Wisconsin to 100 percent of boaters experiencing crowding on Oregon's Deschutes River. The review also noted that perceptions of crowding varied by time and season of use (e.g., holidays, summer), resource abundance or availability (e.g., opening day of fishing season), resource accessibility or convenience (e.g., near population centers), and management actions (e.g., management restricting density) (Shelby et al. 1989).

Recreation Substitutability

Recreation substitutability is the degree to which a particular recreational experience can be an acceptable substitute for another (Manning 1999). The need for recreation substitutes arises when circumstances (such as increased crowding or a limitation on use) detract from the recreational experience in a fundamental way and compel recreationists to somehow modify their leisure activity. The notion of substitutability is important owing to the multiple demands placed upon water resources for both recreation and other uses. Competing demands (both among different uses or within recreation itself) increase the likelihood that some recreationists will be forced to find alternative forms or locations or both as a result of management decisions affecting the character of the water regime.

The extent to which there are alternatives to a recreation experience differs. Depending on the characteristics of an activity, "real" choices are limited for those displaced by some management action. When management actions affecting the water regime are envisioned, there is often an implicit, but flawed, presumption that recreation users can find adequate substitutes by relocating or by participating in another activity. Particularly for specialized or unique activities such as kayaking, the required presence of a particular combination of physical and environmental attributes (e.g., gradient, flow, obstructions) might mean that few, if any, readily accessible substitutes exist.

In addition, because of a long history of involvement with a particular place, such as a fishing hole, people often form strong bonds with specific landscapes over time (Brown and Perkins 1992). Sites that hold special place meanings for recreationists are often irreplaceable, and therefore, the existence of strong place attachments often is sufficient to mobilize people into challenging management decisions perceived as harmful to a valued location. Although place-based sentiments often are overlooked in natural resource management decisions, the strength of the meanings and ties that people have with particular places within the natural environment are an important consideration for water management (Mitchell et al. 1993).

Although place-based sentiments often are overlooked in natural resource management decisions, the strength of the meanings and ties that people have with particular places within the natural environment are an important consideration for water management.

Under certain circumstances, if recreationists are unable to continue participating in a recreational experience, they might find an acceptable substitute by modifying a particular aspect of the experience such as the timing or access to the activity, the resource setting, or the resource activity (Brunson and Shelby 1993). Shelby and Vaske (1991) have created a typology of alternatives for recreation substitutability (fig. 2). If recreationists can substitute a different time for conducting

	Resource	
Activity	Same	Different
Same	A. Temporal/ strategic substitute	C. Resource substitute
Different	B. Activity substitute	D. Resource and activity substitute

Figure 2—A typology of substitution alternatives (Shelby and Vaske 1991).

the activity or a different means of gaining access to the resource (fig. 2), the same activity and resource setting can be retained. However, if the resource setting is held constant, but the activity is changed, the recreationist has undergone an activity substitute (e.g., switching from fishing to swimming in the same lake). A resource substitute occurs when a recreationist moves to a new resource setting yet continues participating in the same activity (e.g., switching from fishing in a lake to fishing in a river). Finally, if a recreationist changes to both a new setting and a new activity, such as switching from bait fishing on a river to fly fishing in a lake, they have made a resource and activity substitute.

Research on recreation substitutability has discovered that activities considered as similar activity types (e.g., waterfowl hunting and deer hunting) are not necessarily equivalent substitutes from the recreationist's perspective (Baumgartner and Heberlein 1981). Consequently, recent studies place greater emphasis on understanding the recreationist's subjective judgment as to what makes an acceptable substitute to a recreation experience. In particular, research suggests that instead of altering activities, recreationists typically attempt to substitute a different setting, time, or access method (Manfredo and Anderson 1987, McCool and Utter 1982). For example, in the event that a free-flowing river was converted to a reservoir, river recreationists are more likely to seek other rivers upon which to float as opposed to boating in the reservoir. As a result, changes in the management of any one area can have profound consequences on other similar, nearby riparian areas to which recreationists become displaced.

Our understanding of recreation substitutability suggests the importance of appreciating how any management action relative to the water regime can affect recreation. This includes the possibility of actions that create substitutes for recreation opportunities that are lost elsewhere. For example, the loss of a reservoir

because of a decision to increase flow for power or salmon restoration could possibly be offset by the creation of a reservoir elsewhere. In other cases, creating or locating a substitute cannot offset negative consequences resulting from management actions. The potential for affecting recreationists illustrates the importance of a sound understanding of both the preferred and minimum conditions of attributes associated with different recreation activities. It also suggests that we should have available comprehensive inventories of water resources that transcend organizational boundaries in order to define locations of possible substitutes. Finally, it highlights the importance of a planning framework that facilitates an understanding of cross-sectoral impacts and consequences (e.g., Clark and Stankey 1979).

Management Implications

There is a paucity of research examining how natural resource managers can reduce conflicts between water-based recreation and other uses of water. Instead, most research regarding water management strategies for reducing conflicts with recreation is limited to inter- and intra-activity conflicts. In particular, it focuses on how to reduce crowding at recreation sites to minimize damage to riparian habitats or reducing the quality of the recreation experience. A reduction in the quality of a visitor's recreation experience can lead to displacement of recreationists to a different area of the site, a different time, a different location, or by altering their recreational activities altogether (Robertson and Colletti 1994). From a management perspective, it is important to understand the impacts of recreationists becoming displaced from one setting to another or from one activity to another so that unintended consequences such as site degradation are not simply transferred to a new location.

Managers often have to decide whether to minimize crowding (or a recreationist's perception of crowding) by redistributing use, promoting off-peak times, or limiting overall use. Before restricting access by limiting overall use, managers can first attempt indirect or direct methods to limit visitors or visitor damage (Bates 1992). Indirect approaches attempt to modify behavior without regulations that limit a person's choice. In particular, if recreationists' behavior is a problem, providing education and information might reduce visitor damage. This might include information that clarifies what appropriate behavior is and the rationale underlying management rules and regulations. Educational programs that establish a code of conduct and increase tolerance of different recreational groups and activities could also reduce conflict (Manning 1999). In addition, informing

recreationists about the numbers of people using a resource provides them a basis on which to choose alternative sites at which to recreate. However, when increased visitation is the underlying problem affecting the resource or the perception of crowding, these indirect methods of limiting visitors and damage might prove inadequate.

Under these circumstances, direct options—which apply regulations to affect behavior—are often necessary. A more direct method of reducing visitation is accomplished through implementing a limited visitor permit system (e.g., allocating boating permits on limited entry rivers) (Bates 1992, Shelby 1991). The system of distributing these limited permits can include advance reservation, lottery, first come-first serve, price, merit, zoning, and priority for first-time users (Shelby 1991, Wikle 1991). For example, a price-based system requires a user fee to recreate at the site, whereas a lottery system distributes permits randomly in an applicant pool.

The type of system applied is important because it will determine the pool of recreationists that are willing and able to continue participating in these recreational activities. A user fee system may discriminate against lower income individuals, whereas a reservation system would not work well for people who do not plan for their recreation far in advance. Differences also can exist between the preferred rationing policies of recreationists and managers. In a study examining recreationists' and managers' opinions regarding three policy scenarios, Wikle (1991) found that although river users were more likely to accept advance reservation and merit as rationing policies, managers were more likely to prefer zoning. For this reason, it is important to consider upon what information (and from what sources) water management decisions are based.

In addition, other conflict management strategies, such as binding arbitration, facilitation, mediation, and nonbinding arbitration, can also successfully resolve natural resource conflicts. These dispute resolution techniques differ primarily in the level of responsibility that the facilitator has over the process and in the level of obligation to accept the outcome (Susskind and Cruikshank 1987). As a result, the choice of negotiation technique used will depend on the level of conflict and complexity of the natural resource issues under dispute.

In summary, population growth and redistribution in the United States suggest that water conflicts will continue to escalate in the future. In this proposition, three types of recreational conflict were explored—conflict between recreation and other uses of water, interactivity conflict, and intra-activity conflict. Among these three

forms of recreation conflict, much more is known about the variety of management techniques for reducing or avoiding intra-activity conflicts over crowding. However, less is known about how conflicts between recreation and other uses of water are resolved. Because future conflict and debate over water management will involve diverse uses of water, we need a better understanding of the relationship between water-based recreation and other uses of water and how management can reconcile differing water needs.

Proposition 7: Management Alterations of Flow Regimes Can Affect Water-Based Recreation Opportunities and Experiences

At the same time that conflicts over out-of-stream uses of water such as irrigation or drinking water have increased, attention has also grown regarding maintaining **instream** flows for a variety of purposes. Instream flows affect different uses of water including hydropower, recreation, navigation, transport of waste materials, and fish and wildlife habitat (Narayanan 1986). Conflicts over streamflow result from water uses (and even different recreational activities) requiring different optimum levels of streamflow. For example, increasing flow in the upper Arkansas River for rafting reduced the quality of fishing experiences on the rivers. More rafters decreased the angler's desired solitude, and the increased flow diminished the fishery over time (Naeser and Smith 1995). The diversity of preferred streamflow levels highlights the importance of understanding the tradeoffs that inevitably occur when allocation decisions are made.

Conflicts over streamflow result from water uses requiring different optimum levels of streamflow.

In recent years, much study has focused on the relationship between streamflow and fisheries. In the Pacific Northwest, changes in the level and timing of instream flows as a result of hydroelectric dam construction have contributed to declines in anadromous fish populations. Although streamflow also affects water-based recreational experiences, only recently has a substantial body of literature addressed the impact of flow on recreation (Shelby et al. 1992b, Shelby and Whittaker 1995). However, understanding the interaction between water-based recreation and streamflow is more important than ever as the Federal Energy Regulatory Commission (FERC) begins relicensing numerous hydropower projects.

Although the Federal Power Act initially gave the FERC considerable flexibility in licensing nonfederal hydroelectric power projects, Congress and the courts have established progressively more restrictive procedural requirements for the commission (Spence 1999). These new regulations require the FERC to give

environmental concerns more consideration in deliberations over dam relicensing applications. Specifically, the passage of the Electric Consumers Protection Act in 1986 required the government to consider fish and wildlife habitat, aesthetics, environmental quality, protection of archeological sites, and recreation as much as it did energy development (Baker 1994, Burkardt and Lamb 1997). It required the FERC to assess the impact of hydropower projects and, if necessary, to deny the application outright or to require conditions be met for approval (Baker 1994). Although relicensing of hydroelectric power projects typically occurs every 30 to 50 years, at present, numerous projects are scheduled for renewal in the near future (Baker 1994). For this reason, it is important that we clearly understand how streamflow influences water-based recreation.

The Impact of Streamflow on Recreation

The influence of streamflow on recreational opportunities and experiences is often substantial. Variations in flow strongly influence a variety of recreational experiences including fishing (Loomis et al. 1986), rafting/floating (Shelby and Whittaker 1995), and hiking along rivers (Shelby et al. 1997). Many water-based recreational activities require a minimum level of streamflow for the activity to occur. Whitewater rafters are particularly limited by streamflow in their attempts to find suitable rivers for their recreational experience (Shelby and Lime 1986). Rapid fluctuations in riverflow from changing dam operations also impact water-based recreational activities. Cole (1989) revealed how unanticipated changes in streamflow owing to higher than expected releases of water at Glen Canyon Dam affected his float trip when he awoke one morning to find the Colorado River sweeping through his campsite.

Studies of streamflow and recreation often include both a descriptive component and an evaluative component (Shelby and Heberlein 1986). Descriptive components involve objective information about the resource (e.g., number of rapids in a river) and how management affects these characteristics. Evaluative components describe how humans react to descriptive components (e.g., low flows may be too easy for whitewater rafters or may prevent use completely) and are used to determine which of the descriptive conditions are the most or least desirable for recreation. Through an examination of both descriptive and evaluative components, researchers have found that changes in streamflow affect recreational experiences in a variety of ways.

Most fundamentally, it can alter the requisite attributes of waterways by changing, for example, the volume of water for kayakers. It also can alter the

safety of recreational activities and recreationists' perceptions of crowding, scenic beauty, and recreational satisfaction or quality (Shelby et al. 1992b). Streamflow can increase the danger of certain water-based recreational activities (such as the level of difficulty of rapids) or recreationists' perceptions of safety. In an Arizona river, Moore et al. (1990) found that as streamflow fell below 23 cubic feet per second (cfs), visitors were more likely to treat creek water before using it for drinking. Because changes in streamflow can alter the safety of recreational experiences, a recreationist's acceptable level of flow often depends on their experience and skill level. In a study of the flow preferences of backcountry hikers in Zion National Park in Utah, Shelby et al. (1997) found that challenge-oriented hikers believed high streamflow levels were more acceptable than did scenic hikers whose skill levels were low to intermediate. Depending on whether hikers desired a scenic hike or a challenging hike, the acceptable level of flow ranged between 30 cfs and 150 cfs, owing to the increased difficulty associated with crossing rivers at high streamflow.

Streamflow also affects recreationists' perceptions of crowding. In a study of private and commercial boaters, Tarrant and English (1996) reported a negative relationship between perceived crowding and flow on the Nantahala River of North Carolina. Assuming a constant level of perceived boater crowding, an increase in flow from 400 to 600 cfs was shown to allow for an additional 670 private boaters on the river. Research also has shown that streamflow influences recreationists' evaluations of the scenic beauty of the surrounding environment. Using video sequences from the Cache La Poudre River in Colorado, Brown and Daniel (1991) found a concave relationship between flow and scenic beauty with lowest scenic beauty evaluations at very low and very high waterflow levels, and the highest scenic beauty rating around a medium level of flow of 1,300 cfs.

The relationship between streamflow and recreationists' satisfaction with the quality of the recreational experience has been explored in greater depth. Whisman and Hollenhorst (1998) found that waterflow levels and related adventure experiences had a relatively strong impact on whitewater boating satisfaction. In Aravaipa Creek, Arizona, Moore et al. (1990) discovered that as streamflow decreased below the median flow, there was a 45 percent greater chance that recreationists would find water levels unacceptable. In a study of whitewater recreation, Herrick and McDonald (1992) examined the effects of eight independent variables on visitor satisfaction with their recreational experience and noted that satisfaction was most affected by setting characteristics, such as waterflow and number and difficulty of rapids.

Flow evaluation curves are used to quantitatively assess recreationists' evaluations of conditions at various levels of streamflow. In research studies, evaluations of flow often follow a bell-shaped or an inverted U-shape (fig. 3), with very low and very high flows being least acceptable for recreationists and intermediate flows contributing to the highest levels of recreational quality (Shelby et al. 1992a).

Although flow evaluation curves typically follow an inverted U-shape, the optimum flow level in cubic feet per second differs depending on the skill level of the recreationists or the recreational activity. For example, the acceptable level of flow for hikers might be too low for boating; however, both groups of recreationists have similar, bell-shaped flow evaluation curves, although over different magnitudes of flow. In this way, different recreational activities have differing "niches" of acceptable flow. On the Dolores River in Colorado, Shelby and Whittaker (1995) observed large differences in the flow evaluations of visitors using open canoes as compared to other watercraft (e.g., large and small rafts and kayaks), with open canoeists more likely to desire lower flow levels. Furthermore, greater agreement on minimum levels of flows was observed as compared to agreement over optimum levels of flows. Research studies on flow and recreation have also found that specific elements of a river trip—such as time to reach camp, availability of camping sites, safety of rapids, or the challenge of the trip, are

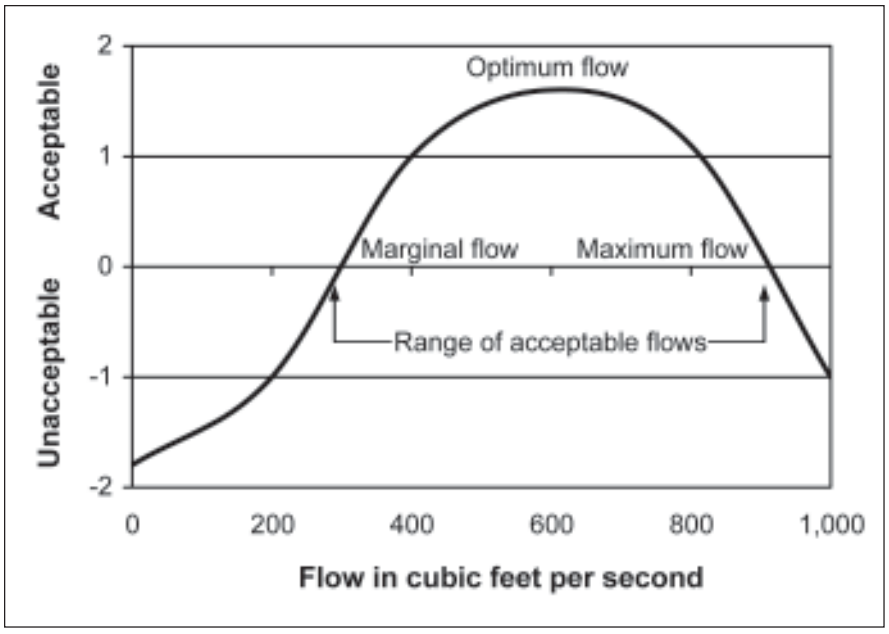

Figure 3—Relationship between recreation quality and streamflow (after Shelby and Whittaker 1995).

affected differently by flow and therefore have different levels of acceptable flow (Shelby et al. 1992a, 1998). Because the level of acceptable flow is dependent on many different variables, including the unique attributes of streams or rivers, it is not possible to generate a quantitative number for flow that can represent the optimum level of streamflow across all recreational activities or river types.

Understanding the Impact of Changes in Flow

Because optimum streamflow differs by activity, it is important for research studies to examine the relationship between flow and a variety of water-based recreational activities. Although some studies have examined the impact on fishing from reduction of flow levels owing to hydropower development or irrigation (e.g., Johnson and Adams 1988), most studies examining the relationship between streamflow and recreation have focused on rafters and boaters (see Brown et al. 1991, Shelby et al. 1992a for reviews) and, to a lesser extent, on hiking or swimming (e.g., Moore et al. 1990) (fig. 3).

Managers who release different volumes of water from dam-controlled rivers offer an opportunity for researches to examine the relationship of flow to recreation by observing the subsequent advantages and disadvantages to a variety of water uses. An ideal controlled flow experiment would include the release of a full range of flows while recording recreationists' responses to the different flow levels. As a result of the FERC relicensing process, controlled experiments are more easily arranged, although many difficulties (e.g., inability to release a full range of flows) could limit the potential of this approach (Shelby et al. 1998, Whittaker et al. 1993).

Natural resource managers have some influence over streamflow levels and the resulting impacts upon recreation. Under some circumstances, water from high spring runoff can be stored and released in the summer when flows naturally decrease (Brown and Daniel 1991). However, one of the management difficulties is that flow often is subject to demands from users who own proprietary rights to the resource (Naeser and Smith 1995). If managers are unable to manipulate flow levels to achieve desired flow levels, managers instead could provide recreationists current and accurate information on flow levels so that recreationists could make informed decisions (Whisman and Hollenhorst 1998). In certain circumstances, recreationists could substitute different activities when management decisions affect streamflow, such as when a formerly free-flowing river with its corresponding recreational activities becomes a reservoir with a different set of recreational activities.

Because of differing demands for water, it is unlikely that complete agreement on optimum flow levels is possible. However, managers still can attempt to combine research recommendations regarding the acceptable or necessary flow levels for recreation with the necessary flow levels for other uses of water such as fish habitat or channel maintenance so as to produce the best decision with the available information (Shelby et al. 1992a).

Implications for Research and Management

This paper has reviewed an extensive body of research focused on water-based recreation, with a particular emphasis on studies in the Western portion of the United States. The results of our review of the reciprocal relationship between recreation and the water regime not only provides information to help guide management of the water-recreation interface, based on the current state of knowledge, but it also holds implications for identifying future research needs. It also helps provide insight as to the ways in which recreation serves as a proxy for a host of symbolic values associated with water.

A key finding is that management of the water regime will be increasingly influenced by external influences (national and global) largely beyond the control of regional managers. The predicted change in future recreation patterns reflect demographic shifts underway across the country, such as a rapidly aging population, as well as regionally distinctive changes, such as extensive inmigration into the Pacific Northwest. The potential that these new residents will bring different values, knowledge, experiences, and expectations is significant for both recreation use patterns and public acceptance of water management strategies. With such shifts, it is also likely that the symbolic dimensions of the recreational use of water resources also will be affected. In particular, as clientele that are increasingly diverse ethnically and culturally become involved with water-based recreation, we can anticipate that the symbolic meanings of these engagements will become more complex and the chance for conflicts between meanings will grow.

Technological advances in transportation as well as the digital information revolution have the potential to dramatically impact the political landscape, as people located outside the region exercise their voting and political influence in ways that have direct impacts upon the future direction of water management in the region. Also, such a process also likely signals the likelihood that an increasingly diverse set of symbolic meanings will need to be taken into account in the

decisionmaking process. The research challenges in documenting such a phenomenon as well as assessing its social, political, economic, and biophysical impacts and identifying options for responding appropriately are substantial.

Because drivers of change—population growth and migration, economic conditions, information—have the capacity to affect recreation resources as well as other users, an understanding of these social trends is critical for anticipating and preparing for future recreation demands. Although the complexity associated with the combined impacts of demographic and technological variables make accurate forecasts difficult, sufficient data are available to anticipate the trajectory of some of the key social and demographic trends affecting recreation. To better inform management of the water resource, researchers need to link data on current demographic and technological trends with their potential impacts on recreation and water management.

In contrast, a fundamental problem facing water management for recreation is the lack of sound, consistent, and relevant data on a variety of aspects related to recreation use, including who recreates, how often, in what activities, and so forth. Our inability to portray accurately current recreation use makes it difficult, if not impossible, for managers, planners, and policymakers to anticipate long-term recreation patterns and assess needs for the recreation supply sector, public and private. The lack of such information also means that the capacity to estimate trends over time is problematic. Because methodologies and measurements often differ from one study to another, it will prove difficult if not impossible to compare recreation use from one year to the next or from one area to another. The lack of a capacity to assess conditions across studies, areas, and time could be improved by using comparable research methodologies.

The lack of accurate and comprehensive recreation information fundamentally limits the ability of managers and planners to make informed decisions regarding shifting recreation demands, particularly in the context of this review, for water-recreation-related activities. However, the principal liability of the lack of a sound, comparable water recreation database is that it compromises the inability to forecast changes in, or impacts to, the diverse symbolic meanings associated with such activities. Although some research on recreation trends was conducted in the 1970s and 1980s, such works require continuous updating to account for changes over time.

Given rapid technological advances in recreation-related equipment, conclusions based on prior information might not be applicable today (e.g., pollution levels from outboard motors, development of all-terrain vehicles). Because of the

complex interactions among the factors influencing recreation behavior, existing models for estimating recreation use trends might need revision or revalidation before they provide improved measures of changes in recreation use and its associated impact on water and water management. Also, flaws in these models will compromise their utility in helping planners and managers gain a better estimation of how future changes might affect the values and meanings of water recreation.

Although a thorough understanding of recreation use patterns is needed to make informed choices regarding water management, we cannot afford to postpone management decisions until "all the data are in." Limitations in recreation use data simply mean that we will have to work in an environment of high uncertainty. Decisions affecting water-based recreation cannot be avoided, because the failure to act is itself a decision, with its own set of consequences. Managers will need to emphasize sound monitoring programs and an adaptive approach. Both of these offer opportunities for research; in the case of monitoring, there continues to be a need for improved protocols to guide monitoring efforts as well as evaluative frameworks for assessing results. Protocols and processes also are essential to making adaptive management a viable strategy for managers attempting to proceed in the face of uncertainty.

Lastly, we need to better understand how to integrate knowledge of water-based recreation with other uses of water. Although there are many interconnections between management of water for recreation and other values (e.g., municipal water supply), these relationships are poorly understood. Decisions are never made in isolation; management changes to the water regime for one purpose will have consequences and implications for other uses, including recreation and the complex array of meanings associated with it. For example, decisions affecting the allocation and management of water in response to declining fish populations will have implications, positive or negative, for recreation and other aspects of the water regime. Furthermore, management decisions have the potential to indirectly influence the water regime in other locations by shifting demand elsewhere. The relationships among water uses, including direct and indirect consequences to recreation and the water regime, need to be considered and fully accounted for in water management decisions. Research can assist by identifying protocols, decision-making frameworks, and appropriate criteria to facilitate integrated management across multiple sectors, diverse ownerships, and larger spatial and longer time scales.

Equivalents

When you know:	Multiply by:	To get:
1 Meter	3.28	Feet
1 Cubic foot per second	101.9	Cubic meters per hour

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Chapter 4: Water Recreation Economic Values and Future Demand

Jeffrey D. Kline, Laurie L. Houston, and Michio Watanabe[1]

Introduction

The general scarcity of water in terms of quality, quantity, or timing raises a number of issues about how to deliver water, when, to whom, and for what purposes. Although such questions can be resolved through appropriate institutional mechanisms, their resolution depends to a large degree on understanding future demands for water in all of its potential uses, the priorities society places on those uses, and how various groups within society value water's different uses (Houston et al. 2002). Such information provides the basis for anticipating how trends in particular water uses over time might affect other water users, and evaluating who might gain and who might lose as a result of particular management and policy decisions and actions.

Future growth in demands for recreational water uses will depend significantly on a variety of changing socioeconomic factors. These factors will include population growth, income levels, age, and education, as well as use-related factors such as public access, the proximity of recreation resources to growing population centers, and technological innovation that may alter existing recreational activities and introduce new ones, among others. Meanwhile, the availability of water to meet potential increased demands for water recreation will be determined in part by competing demands for water in nonrecreational uses that have the potential to impact both water quantity and quality. Demands for water in particular uses can be considerable, but also somewhat predictable within ranges of variability.

Nationally, the quantity of water demanded for nonrecreational uses will vary. Irrigation accounts for the largest proportion of all freshwater withdrawals and is projected to decrease by 3 percent from 1995 to 2040 owing, in part, to increased technological efficiencies (Brown 1999). However, expected reductions in projected irrigation water use will be offset by expected increased demands for water in other uses. Nationally, demands for water in domestic and municipal uses are projected to

[1]Jeffrey D. Kline is a research forester, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, 3200 SW Jefferson Way, Corvallis, OR 97331. Laurie L. Houston is an environmental economics consultant, 642 NW 12th Street, Corvallis, OR 97330. Michio Watanabe is a recent Ph.D. recipient, Department of Agricultural and Resource Economics, Oregon State University.

increase by 42 percent, while demands for water in industrial and commercial uses are projected to increase by 6 percent from 1995 to 2040. It is expected that these increases will result in a 7 percent increase in total net withdrawals by 2040 (Brown 1999). Competing demands for water in all of its uses will shape the context in which management and policymaking regarding water recreation will be conducted.

The availability of water for both recreational and nonrecreational uses will also be determined in part by factors beyond the direct control of managers and policymakers. Climatic conditions, drought cycles, and El Niño and La Niña ocean conditions, among other factors, will impact precipitation and water availability in the Western United States and play a significant role in shaping the water resource allocation decisions necessary in the future. Although future demands for water in various uses can be estimated based on historical rates of use and past trends in key factors affecting use, the long-term effects of weather and climatic conditions on future water supply may be more difficult to predict.

From an economic perspective, the optimal allocation of water equates marginal values of water across all users or uses.

From an economic perspective, the optimal allocation of water equates marginal values of water across all users or uses. Some uses, such as diversions for irrigation and instream recreational uses or maintenance of fish habitat, can be competitive with one another, because one use often can only be increased to the detriment of the other. Other uses, such as hydropower dam releases and whitewater rafting or kayaking, can be complementary, because dam releases often can be timed to increase benefits to these recreational uses without reducing hydropower production. Identifying potential complementarities among different uses often can minimize the need to make difficult tradeoffs between uses.

When complementarities do not exist, comparisons of the value of water in competing uses can help to identify socially and economically beneficial allocations of water among competing uses (Colby 1989). Allocating water among competing uses does not always have to result in specific users being made worse off to benefit others. Policy options will not always necessitate win-lose situations (Schaible 2000). Sometimes multiple users can all be made better off simply by changing such factors as the timing or duration of water withdrawals in ways that avoid the necessity for more difficult tradeoffs among competing users.

Allocating water among multiple competing uses will increasingly necessitate tradeoffs among economic, ecological, and societal values. The use and value of water in recreational uses will reflect trends in water demands and values associated with all water uses occurring in contemporary western North America. To a large

degree, these trends will affect the degree to which water resource planners and policymakers will be able to accommodate multiple water users, and resolve conflicts between recreational uses and nonrecreational uses. Anticipating the need to make tradeoffs between recreational and nonrecreational uses of water in the future, requires (1) information regarding the economic value of water in recreational uses, (2) information regarding projected demands for water recreation, and (3) information regarding projected demands for water for nonrecreational uses. Together, this information can aid in developing and implementing water resource policies that seek to balance the interests of both recreational and nonrecreational water users.

In this chapter, we examine water recreation economic values and projected future demands for water in both recreational and nonrecreational uses in the Western United States. Our intent is to provide, at a large scale, some of the information needed to make important water allocation decisions. We begin the chapter with a brief overview of water valuation methods, highlighting example value estimates reported in published literature for several water recreation categories. We discuss trends in socioeconomic and other factors that will affect future demands for water recreation, and discuss published water recreation demand projections through 2050 for the Western United States. Following this, we compute demand projections for several nonrecreational water use categories, including municipal, industrial, and agricultural, through 2050 for the Western United States. We conclude with a summary of policy implications and research questions.

Economic Values for Water Recreation Demand

From an economic perspective, the ideal allocation of water among all users over time and space is one where the marginal benefit of an additional unit of water to any one user would equal the marginal benefit of an additional unit of water for any other user. Actually allocating water in this way would require perfect knowledge regarding the value of water to different users over time and space, and the costs imposed by any externalities associated with those uses. Obtaining such information may be impractical in many cases because of the expense and time constraints frequently imposed on natural resource management and policymaking. As an alternative, information on the value of water in particular uses can be obtained from published literature to assist policymakers in understanding and evaluating tradeoffs associated with policy alternatives that may affect various users.

Economists have developed various nonmarket valuation methods to estimate the values of unpriced benefits.

For some uses, water can be valued as an input to the production of marketed outputs, such as agricultural products, industrial products, and power generation. In some cases, water values might even be observable from market transactions when clearly defined and tradable markets for water exist, such as might be the case in particular agricultural areas where markets may exist to buy and sell water diversion rights for irrigation. For many water uses, however, unpriced benefits exist that may be more difficult to quantify and for which markets may not exist. This is particularly true with instream uses, such as transportation, aesthetics, wildlife habitat and other ecological functions, and recreation, which are of significant value to society, but for which markets in the traditional sense have not developed. For these situations, economists have developed various nonmarket valuation methods to estimate the values of unpriced benefits. The most commonly used methods to value recreation activities are travel cost and contingent valuation, and these will be our focus (see Gibbons 1986 for a discussion of methods with which to value nonrecreational water uses).

The travel cost method is an indirect method for valuing recreation, because it determines value based on observed behavior of recreationists rather than on buyer-seller transactions in a market place. Travel cost studies generally involve surveys of recreationists who are asked to report details regarding their travel to a recreation site, such as the distance traveled and the expenditures incurred enroute (see, e.g., Caulkins et al. 1986, Donnelly et al. 1985, Layman et al. 1996, Sorg et al. 1985). Assumptions are made regarding recreationists' opportunity cost of time spent traveling to the site and added to travel expenses. These costs are assumed to reflect the value of the recreational activity to the recreationist and thus are used to estimate recreationists' willingness to pay to recreate at the site and to estimate a demand function for the recreational experience (Bockstael 1995, Young 1996).

The contingent valuation method also is a survey-based technique, but attempts to estimate recreationists' willingness to pay for a given recreational activity directly by simulating a marketplace for a particular recreation activity through a questionnaire or interview (e.g., Mitchell and Carson 1989). Where travel cost surveys obtain willingness-to-pay information through recreationists' observed behavior, contingent valuation surveys generally describe to respondents a particular recreation circumstance or hypothetical situation, then ask respondents directly, what they would be willing to pay to obtain the particular circumstance of situation. In this manner, the goal of contingent valuation surveys is to simulate a market for recreational activities and enable survey respondents to state or respond

to different price levels associated with different levels or attributes of the hypothetical recreational setting or experience offered. The contingent valuation method has been used to value many aspects of water that may affect recreation demand, such as water levels (Cordell and Bergstrom 1993, Eiswerth et al. 2000), instream flows (Duffield et al. 1994, Hansen and Hallam 1990, Kulshreshtha and Gillies 1994), and the value of wetlands (Bergstrom et al. 1990, Kosz 1996), among others.

Both the travel cost and contingent valuation methods can be appropriate for estimating economic values for water recreation activities. The most appropriate method often is determined by the context of a given study. For example, because demand estimation using travel cost methods requires sufficient variability in the actual travel costs incurred by survey respondents, it generally is not an appropriate method if most respondents travel equal distances (Forster 1989). An advantage of the contingent valuation method over the travel cost method is that it can be used to determine the value of hypothetical situations that may not yet exist. For example, values can be estimated for improved fishing conditions (Dalton et al. 1998, Donnelly et al. 1985, Sorg et al. 1985) and improvement and restoration of ecosystems (Loomis 1996), which could represent improvements to sites for certain recreation activities. The travel cost method generally can only be used to measure the value of what does (or did) exist, because values are based on costs actually incurred while traveling to a site in its current rather than hypothetical condition.

Contingent valuation also is the only method that can be used to determine nonuse values (Edwards 1988, Walsh 1990), such as bequest values (e.g., the value of maintaining recreation sites for future generations), option values (e.g., the value of maintaining one's option to recreate at particular sites), and existence values (e.g., the value of knowing a recreation site merely exists, even though one may never plan to visit). Poor survey design and administration sometimes can result in contingent valuation estimates that are unacceptably biased, particularly with respect to nonuse values. In 1993, a blue ribbon panel of economists established survey design methods and guidelines to minimize the potential for bias valuation estimates of such surveys (NOAA 1993).

Other less commonly used methods for water recreation valuation include conjoint analysis and choice experiments, and hedonic pricing. Conjoint analysis and choice experiments also are survey-based methodologies in which respondents are asked to state their preferences for outcomes or goods described by particular attributes (see, e.g., Hanley et al. 1998, Johnston et al. 1999). For water recreation

valuation, attributes might pertain to water quantity, quality, and accessibility, as well as the cost of access. Inclusion of a cost attribute enables dollar values to be derived for varying levels of attributes by using empirical analysis. Because choosing between bundles of attributes can be a more natural process than having to state one's willingness to pay, conjoint analysis and choice experiment-type survey questions increasingly are used in place of the willingness-to-pay question format of more traditional contingent valuation surveys.

Another valuation method is hedonic pricing. Hedonic pricing is an empirical technique that examines land or house values in terms of its specific attributes, such as size, location, and neighborhood characteristics (see, e.g., Freeman 1995, Steinnes 1992). This information is used to derive the dollar value contribution that each attribute makes to total land or house value. Water recreation-related attributes might include proximity to water, lake frontage, water views, water quality, or water access, enabling the use of hedonic pricing for water recreation valuation. Use of hedonic pricing to value water recreation has been less common than survey-based methods, although examples do exist (see Forster 1989).

Economic valuation measures generally are viewed as just one component in a set of criteria available for natural resource decisionmaking.

A common criticism of economic valuation in natural resource management is that valuation may not capture the full complexity of natural systems and the values society holds for them. This criticism can apply as well to the economic valuation of outdoor recreation. What may be less recognized by noneconomists, however, is that economists tend to agree on that point. "No one would suggest that economic values should rule the day" Bockstael et al. 2000: 1384). Rather, economic valuation measures generally are viewed as just one component in a set of criteria available for natural resource decisionmaking (Bockstael et al. 2000: 1389). Other criteria, including symbolic values, clearly have a useful role to play as well.

Example Values From Published Literature

There is an extensive published literature reporting estimated values for a variety of water recreation activities. Table 1 shows water recreation values summarized in a number of studies described in published literature. We focus on studies that report recreation values in terms of participant days–the average value to a participant participating in the activity for a day. There are many other studies that report recreation values in other units. Focusing on studies that have used the participant day as the valuation unit enables us to compare estimated values across different activities and different studies, once all values have been adjusted for inflation and expressed as real dollars. Moreover, there are many other recreation categories for

Table 1—Examples of water recreation values per activity day from published literature adjusted to 1998 dollars

Activity	Studies reviewed	Reported estimated values		
		Lowest	Highest	Average
	Number	*Dollars*		
Motorboating	9	4.57	176.28	36.10
Nonmotorized boating	13	15.62	273.93	63.96
Beach (saltwater) recreation	13	0.87	238.51	30.82
Fishing (all types)	39	1.80	219.14	37.29
Hunting (all types)	59	2.24	217.21	40.76
Wildlife viewing	16	2.45	167.87	31.86

Sources: Except for beach recreation, all values from Rosenberger and Loomis (2001: table 1). Mean hunting values are the average of big game, small game, and waterfowl values weighted by the number of studies for each category. Beach recreation values from Kline and Swallow (1998).

which published values are available (see Rosenberger and Loomis 2001). The particular water recreation categories included in table 1 were selected to be roughly consistent with those categories used in published demand projections discussed later in this chapter.

Average reported estimated values (table 1) are highest for nonmotorized boating ($63.96 per participant day), followed by hunting ($40.76), fishing ($37.29), motorboating ($36.10), wildlife viewing ($31.86), and beach recreation ($30.82). Although it is tempting to use reported values to rank the values of different water recreation activities, it is important to note that estimated values can differ significantly from one activity to the next and one study to the next. For example, published estimated values for motorboating range from $4.57 to $176.28 per participant day, with an average reported value of $36.10. Beach recreation has one of the lower average estimated values per participant day in average terms, but one of the beach recreation studies reported an estimated value ($238.05), which is one of the highest reported among all of the studies summarized in table 1. Similarly, in average terms, fishing has one of the higher reported estimated values ($37.29 per participant day), but one of the fishing studies reported one of the lower estimated values ($1.80) of those studies summarized.

Such variations can result from a variety of factors, including actual differences in values from one study population to the next, characteristic differences in the locations where studies were conducted and the precise activities valued, and differences in the particular survey and analytical methods used, among other factors.

For example, published estimated values for beach recreation range significantly from $0.87 to $238.51 per participant day, with an average of $30.82 (table 1). In this case, the 13 beach recreation studies summarized were conducted in a variety of locations, including Florida, New Jersey, California, and Hawaii, among other locations (Kline and Swallow 1998). It is likely that the relatively dramatic differences in estimated values could owe in part to significant differences in the locations and characteristics of the beaches at these different locations. The beach recreation studies reported also differ over a fairly broad timespan from 1972 to 1988. Even after adjusting for inflation, it is conceivable for estimated values for various activities to differ depending on when a study was conducted owing to changes in survey respondents' tastes and preferences, incomes, and differences in survey techniques as they evolved over time.

Many of the studies described in valuation literature are designed to meet specific needs and objectives, resulting in recreational values measured in units other than participant days. A common alternative in published literature to reporting values per participant day is reporting values for recreation activities as they relate to streamflow volumes and water levels. For example, Ward (1987) used the travel cost method to estimate the economic benefits to anglers and white-water boaters of augmenting streamflows in New Mexico's Rio Chama River. Reported aggregate annual values for water allocated to instream flow are estimated between $1,515 and $1,852 (converted to 1998 dollars) per acre-foot. Ward et al. (1996) used the travel cost method to estimate recreation values of different reservoir lake levels at several reservoirs in California. Reported aggregate annual values to campers and day users ranged from $9.36 to $936 (converted to 1998 dollars) per acre-foot. Loomis and Cooper (1990) used the travel cost method to estimate recreational fishing value relative to changes in streamflow on the north fork of the Feather River in northern California. Reported aggregate marginal values for streamflow diminished with increasing flow, from $123 (converted to 1998 dollars) at 20 cubic feet per second to $77 at 200 cubic feet per second. In most cases, valuation methods can be adapted to meet the needs of different settings and situations.

Prevailing opinion among economists is that well-designed studies following accepted protocols will result in useful information about values of water for recreation.

Although travel cost and contingent valuation methods both have been subjects of varying levels of controversy at times in academic literature, such controversies have led to significant refinements over the years. With a few exceptions, prevailing

opinion among most economists is that well-designed studies following generally accepted protocols outlined in published literature generally will result in information that can be useful for understanding the value of water for recreation. However, the direct comparability of recreation values estimated by using existing economic methods with economic values estimated for other nonrecreational uses by using other methods is debatable. It is important to consider the manner, circumstances, and period in which valuation studies were conducted when using reported water recreation and other values in water resource management and policymaking.

Future values for water recreation likely will be shaped by a variety of factors. Rising personal incomes typically result in people having more disposable income and could imply greater willingness to pay among participants for certain water recreation activities in the future. Increasing populations could lead to greater congestion at some recreation sites or the conversion of some sites to incompatible uses, making remaining uncongested sites more desirable to individuals willing to pay higher amounts for their access. Changing ethnicity could lead to changes in demands for certain types of recreation over others, leading to relative changes in the aggregate values of different activities. Changes in technologies could reduce the costs of recreation equipment, making certain activities more affordable to greater numbers of individuals, or introduce entirely new recreation activities not yet imagined. Such factors among others contribute to uncertainty in anticipating what water recreation values will be in the future.

Future Demands for Water Recreation

As with water recreation values, future demands for water recreation activities will be shaped by a variety of factors. Age, ethnicity, gender, income, education, previous recreation experience, and other factors all can influence recreation behavior (Bowker et al. 1999, Cordell et al. 1990, Hof and Kaiser 1983, Walsh et al. 1992). Future trends in socioeconomic and demographic factors are important to anticipating what water recreation demands may be expected. In particular, anticipated increases in population and real personal income are expected to be the most important factors influencing recreation over the next half century (Bowker at al. 1999), particularly in the West, which has a long history of inmigration. Increasing

populations imply greater numbers of recreationists. Rising personal incomes imply that people will have greater levels of disposable income to spend on recreation of all types.

National and regional outdoor recreation participation projections are periodically produced as part of the Forest Service's assessment of future prospects for the Nation's forest resources, projections mandated by the 1974 Resources Planning Act (USDA FS 2001). Projected participation rates for several outdoor recreation categories prepared for the 2000 Resources Planning Act assessment are described by Bowker et al. (1999). To our knowledge, these are the only comprehensive nationwide projections available characterizing the potential future demands for outdoor recreation activities of different types. The projections are based on reasonable assumptions regarding future trends in key socioeconomic, demographic, and other factors likely to affect future recreation demands. These include population, income, age, ethnicity, and gender, as well as potential increases in the scarcity of recreation opportunities associated with congestion, reduction in site quality, loss of access, and loss of sites owing to their conversion to more developed uses as population densities increase (Bowker et al. 1999).

Increases in population and real personal income are expected to be the most important factors influencing recreation over the next half century.

Recreation projections were developed by using two types of regional cross-sectional models (Bowker et al. 1999). Logistic regression models were used to estimate the probability that individuals will participate in given activities based on their individual characteristics and the recreation opportunities available near their primary residence. Results from these models were combined with regional population and income growth indices to estimate the total number of participants in each activity in each region. A second set of models relied on count data to examine individuals' participation levels, described by their reported number of days and trips spent participating in different activities, to estimate the total number of days and trips spent by individuals in each outdoor recreation activity. Results from these models also were combined with population and income growth indices to estimate projected values for the total number of primary purpose trips and the duration of trips, to obtain an overall estimate of the total number of participants, total number of trips, and total number of participant days for each recreation activity (Bowker et al. 1999).

Outdoor recreation participation projections for Western States (fig. 1) are presented for motorboating, nonmotorized boating (including canoeing, rafting, and floating), nonpool swimming, beach and water-side recreation, fishing, hunting

Figure 1—Western States included in demand projections. Note: Western States include Rocky Mountain/Great Plains region states: Arizona, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, South Dakota, Utah, Wyoming. Pacific region states: Alaska, California, Hawaii, Oregon, and Washington.

(including big game, small game, and migratory birds), and nonconsumptive wildlife activities (table 2). These water recreation categories are roughly consistent with those used in table 1 to summarize published estimated values of water recreation, although minor inconsistencies do exist. The projections indicate increased participant demand for most types of recreation activity categories examined through 2050 (table 2).

Motorboating is projected to have the greatest increase in demand, with participant days projected to increase by 152 percent, number of trips by 138 percent, and number of participants by 71 percent (table 2). This is followed by nonmotorized boating, projected to increase by 76 percent in participant days, 68 percent in number of trips, and 68 percent in number of participants, beach recreation (75 percent in participant days, 70 percent in number of trips, and 61 percent in number of participants), and nonconsumptive wildlife activities (88 percent in participant days, 40 percent in number of trips, and 62 percent in number of participants). Relatively significant though more moderate demand increases are projected for nonpool swimming and fishing. The only recreation activity projected to

Table 2—Reported projections of participant days, trips, and participants in water recreation activities for Western States, 2000–2050

Activity	2000	2010	2020	2030	2040	2050	Projected change 2000 to 2050
	Millions						*Percent*
Motorboating:							
Participant days	24.2	150.4	180.6	216.0	259.4	313.1	152
Trips	93.3	108.8	129.2	154.1	181.0	222.1	138
Participants	10.1	11.4	12.4	14.1	15.6	17.3	71
Nonmotorized boating (includes canoeing, rafting, and floating):							
Participant days	32.7	36.7	41.2	46.1	51.6	57.7	76
Trips	25.6	28.4	31.9	35.7	38.9	43.1	68
Participants	5.6	6.2	6.7	7.6	8.4	9.4	68
Nonpool swimming:							
Participant days	266.7	288.9	309.1	329.9	359.7	394.8	48
Trips	195.4	211.2	224.9	240.5	259.4	279.0	43
Participants	17.3	19.3	20.9	23.1	25.3	27.6	60
Visiting a beach or waterside:							
Participant days	898.4	1025.4	1146.7	1276.4	1418.8	1569.7	75
Trips	497.5	564.6	627.8	695.7	741.9	844.6	70
Participants	31.2	35.0	38.3	42.5	46.6	50.1	61
Fishing (includes warm and cold freshwater, and saltwater):							
Participant days	204.9	226.3	246.2	264.8	280.7	292.3	43
Trips	173.7	178.3	188.8	267.2	210.4	209.8	21
Participants	12.7	13.7	14.8	15.6	16.6	17.6	39
Hunting (includes big game, small game, and migratory bird):							
Participant days	68.3	70.4	72.5	73.9	72.4	71.2	4
Trips	56.3	50.6	51.1	51.7	51.5	52.0	-8
Participants	3.6	3.6	3.6	3.7	3.5	3.5	-3
Nonconsumptive wildlife activities (includes some nonwater activities):							
Participant days	1,553.4	1,856.2	2,187.4	2,498.6	2,750.6	2,917.5	88
Trips	414.2	462.2	505.3	544.1	570.2	579.5	40
Participants	28.3	32.1	35.4	544.1	45.7	45.9	62

Source: Bowker et al. 1999.

Note: Western States include Alaska, Washington, Oregon, California, Hawaii, Idaho, Nevada, Montana, Wyoming, Utah, Colorado, Arizona, New Mexico, North Dakota, South Dakota, Nebraska, and Kansas (see fig. 1).

experience little, or even negative, growth in demand is hunting, projected to increase by 4 percent in participant days, but decrease by 8 percent in number of trips and 3 percent in total number of participants (table 2).

The number of participants for all recreation categories, excluding hunting and fishing, are projected to increase faster than expected future growth in the western population. Population growth indices used by Bowker et al. (1999) to estimate projections of future recreation participation imply a 47 percent increase in the western population from 2000 to 2050. Although greater numbers of people imply greater numbers of recreationists, the projected increases in recreation participation rates also result from expectations about rising per capita personal incomes. Income indices used by Bowker et al. (1999) imply a 77 percent increase in real per capita personal income from 2000 to 2050. Rising incomes likely will make recreation activities more affordable to larger numbers of people, resulting in increasing participation rates over and above increases owing to population growth alone.

The number of participants for all recreation categories, excluding hunting and fishing, are projected to increase faster than expected future growth in the western population.

Other factors also influence projected demands. For example, Bowker et al. (1999) suggested that the largest factor contributing to projected increases in nonconsumptive wildlife recreation is the expected increasing age of the population. The projected increase also can be attributed to the complementary nature of nonconsumptive wildlife recreation with other forms of outdoor recreation and the availability of year-round opportunities to observe wildlife. The relatively small increase in hunting participant days, and decrease in hunting trips and hunters owes partly to expected increases in the proportion of nonwhites among the western population, as well as projected increases in population densities, which likely will reduce available hunting locations. Factors contributing to projected slower increases in fishing demand include anticipated declines in the number of sites available for fishing as a result of urban expansion and increasing population densities, and increases in real per capita personal income (Bowker et al. 1999). Although some types of fishing participation, such as fly fishing, can have a positive relationship with income, aggregate participation in fishing of all types has tended to have a negative relationship.

Existing published projections of future outdoor recreation participation suggest increasing demand for water recreation activities of most types in the foreseeable future. As with water recreation values, socioeconomic, demographic, and other factors will influence growth in these demands. Rising personal incomes could result in people having greater levels of disposable income and could imply greater willingness to pay among participants for certain water recreation activities

in the future. Changing ethnicity could lead to changes in demands for certain types of recreation over others. Changes in technologies could reduce the costs of recreation equipment, making certain activities more affordable to greater numbers of individuals, or introduce entirely new recreation activities not yet foreseen. All of the factors contribute to uncertainty in anticipating what water recreation values and demand will be in the future.

At the same time, it is possible that the number of sites suitable for some water recreation activities could decline over time. Population and income growth are projected to increase developed lands by 89 percent in the Southwest, Pacific Northwest, and California over the next quarter century, with a corresponding decline in rural lands (Alig et al. 2004: 227). Greater congestion at some water recreation sites, declines in site quality, and loss of some sites owing to their conversion to more intensive residential, commercial, or industrial uses, or changes in landowner objective, could make other remaining sites more desirable. Increased future demands coupled with possible reductions in the supply of suitable or desirable water recreation sites imply potential shortages in sites or reductions in the quality of water recreation experiences. Increased demands for water recreation of different types also raises the possibility for increased conflicts between recreation activities of different types. For example, if both motorboating and nonmotorized boating are projected to increase, it is reasonable to expect an increased potential for conflicts to arise between these two recreation groups, as they compete for a constant or decreasing number of suitable sites at which to boat. Although the likelihood and potential magnitude of these potential changes remain somewhat uncertain, they will occur in the context of changing demands for water in other nonrecreational uses, which is the topic we turn to next.

Future Demands for Nonrecreational Water Uses

Most water recreation activities depend on some minimum level of water quality and quantity. For example, white-water rafting depends on a minimum instream flow, swimming on a safe level of water quality, and fishing perhaps on a combination of both flow and water quality sufficient to maintain the habitat requirements of the target fish species. However, nonrecreational water uses, including public and domestic, industrial and commercial, and irrigation, can reduce the availability of water for instream recreational uses and can also diminish water quality when diverted water is returned to the channel in an altered condition. The degree to which recreational water uses will be impacted by nonrecreational uses in the future

depends in large part on future demands for water in nonrecreational uses. To provide a context for the water recreation demand projections, we developed estimates of projected freshwater withdrawals for nonrecreational water uses for the same Western States examined in the water recreation demand projections (fig. 1). The projections are estimated on a regional basis to account for differences in freshwater withdrawal trends among Western States.

There have been several attempts in the past to project water use in the United States (Brown 1999; Guldin 1989; Houston et al. 2003; National Water Commission 1973; Water Resources Council 1968, 1978; Wollman and Bonem 1971). The projections reported by many of these studies differ significantly from one study to the next, and there frequently are relatively large discrepancies between reported projections and eventual actual water use observed (Brown 1999, Guldin 1989, Osborn et al. 1986). The accuracy of water use (or demand) forecasts depends on correctly identifying the determinants of water use as well as carefully constructing a reasonable set of assumptions regarding future levels of those determinants. Even with such care, the accuracy of water use projections can be greatly affected by unexpected changes in technology and economic conditions, just as in the case of water recreation projections.

Our projections of future demands for freshwater withdrawals for public and domestic, industrial and commercial, and irrigation uses are based on the population and income growth indices used by Bowker et al. (1999) to estimate future outdoor recreation participation. Our projections also are based on reasonable assumptions regarding future trends in water withdrawals per capita and per income, the amount of irrigated land, and technological efficiencies. These assumptions were developed from historical water use averages and trends computed from the U.S. Geological Society (USGS) water use reports (Solley et al. 1988, 1993, 1998). With a few exceptions, our projection methods closely follow those used by Brown (1999) to estimate projected freshwater use for the United States as part of the 2000 Resources Planning Act assessment (USDA FS 2001). However, where Brown (1999) estimated freshwater withdrawals by watershed, we have estimated them by state so that our aggregate projections for all Western States would be consistent with water recreation projections reported by Bowker et al. (1999). The actual computational methods used can be found in Houston et al. (2003).

For our purposes, nonrecreational water uses include public and domestic, industrial and commercial, and irrigation. Public and domestic uses of water include firefighting, street washing, water supplied to municipal office buildings, parks and public swimming pools, and water supplied to households for drinking,

food preparation, bathing, washing, toilet flushing, and watering lawns and gardens. Industrial and commercial uses of water include water supplied to motels, hotels, restaurants, office buildings, commercial facilities, and civilian and military institutions; water supplied to industries (including thermoelectric producers) for processing, washing, and cooling; and water supplied to livestock. Irrigation uses include water used to irrigate agricultural crops and public golf courses. The water use categories roughly are the same as those delineated by Brown (1999). Each category can be expressed in terms of withdrawal or consumptive use (Brown 1999), and for this reason, none include hydropower.

Public and Domestic Uses

The principal determinants of freshwater withdrawals for public and domestic water uses are population and per capita water consumption. Future population projections are based on population growth indices for the Rocky Mountains and Great Plains and Pacific Coast regions reported in Bowker et al. (1999), and based on U.S. Census Bureau projections (table 3). The population growth indices were applied to 1995 population figures for each region reported by the Bureau of Economic Analysis (USDC BEA 2002). Estimates of future per capita freshwater withdrawals are based on a historical average per capita withdrawal reported in USGS national water use reports (Solley et al. 1988, 1993, 1998). From 1985 to 1995, per capita freshwater withdrawals for public and domestic uses averaged 146 million gallons per day in the Rocky Mountains and Great Plains region, and 161 million gallons per day in the Pacific Coast region. These regional averages were multiplied by projected population estimates to compute future freshwater withdrawals (table 4).

Increased technological efficiencies could reduce per capita consumption in the future.

Freshwater withdrawal projections suggest that demands for water in public and domestic uses will increase through 2050 by 44 percent in the Rocky Mountains and Great Plain region and 49 percent in the Pacific Coast region, for an average increase of 47 percent for all Western States from 2000 to 2050 (table 4). The rate of increase mirrors the rate of increase in the Western population, because we have assumed that per capita withdrawals of water for public and domestic uses will remain constant. Historically, per capita withdrawals had been increasing up until 1990, but have declined since then, creating some uncertainty regarding future trends (Brown 1999). It is conceivable that conservation efforts regarding public and domestic uses, and increased technological efficiencies could reduce per capita consumption in the future. In fact, such changes likely would be necessary to supply the increasing populations projected for the future.

Table 3—Projected population for Western States, by region

Region	2000	2010	2020	2030	2040	2050
			Millions			
Rocky Mountains and Great Plains	45.4	50.8	55.5	60.0	64.3	67.5
Pacific Coast	23.1	25.4	27.7	29.8	31.7	33.3
Total	68.5	76.2	83.2	89.8	96.0	100.8

Note: Projections based on population growth indices reported by Bowker et al. (1999) and derived from census projections (U.S. Census Bureau 1996) applied to 1995 population figures reported by the Bureau of Economic Analysis (USDC BEA 2002).

Table 4—Projected freshwater withdrawals for public and domestic water uses for Western States, by region

Region	2000	2010	2020	2030	2040	2050	Projected change 2000 to 2050
	– – – – – – – – Million gallons per day – – – – – – – –						*Percent*
Rocky Mountains and Great Plains	3,721	4092	4,449	4,788	5,096	5,351	44
Pacific Coast	6,635	7,436	8,120	8,779	9,407	9,882	49
Total	10,356	11,528	12,569	13,567	14,503	15,233	47

Note: Projections based on population projections (table 3) and historical trends in freshwater withdrawals for public and domestic uses reported in U.S. Geological Society national water use reports (Solley et al. 1988, 1993, 1998).

Industrial and Commercial Uses

Ideally, freshwater withdrawals for industrial and commercial uses would be based on expectations regarding growth in industrial and commercial production (or output), and trends in technological efficiencies. However, given that output is measured in a variety of ways for various industries, we use population growth as a proxy for output trends. Expectations regarding population growth provide a reasonable proxy for future trends in industrial and commercial output, because future demands for all goods will be driven, in large part, by increases in the population. A good measure of technological efficiency would be water use per unit of output. However, the wide range of outputs produced by industrial and commercial water users make it difficult to develop a single efficiency figure for use in estimating aggregate water use projections for the industrial and commercial sector. For this reason, Brown (1999) used a combination of real per capita personal income and withdrawals per income as a proxy for efficiency. Following this method, the

principal determinants of our estimated projections of freshwater withdrawals for industrial and commercial uses in the West are population, real per capita personal income, and withdrawals per income.

As with the projections for the public and domestic sector, population projections used to estimate projected withdrawals for industrial and commercial uses are based on population growth indices reported by Bowker et al. (1999). Projected real per capita personal income figures are based on income growth indices reported by Bowker et al. (1999) and applied to 1995 per capita personal income reported by the Bureau of Economic Analysis (USDC BEA 2002) (table 5). Estimated freshwater withdrawals per (real per capita personal) income are based on historical water withdrawals reported in USGS national water use reports (Solley et al. 1988, 1993, 1998). Freshwater withdrawals per income declined from 1985 to 1995 by an average 1.3 percent annually for the Rocky Mountains and Great Plains region and 1.6 percent for the Pacific Coast region. Brown (1999) noted, however, that nationally, withdrawals per income have slackened somewhat in recent years. Our computations of projected freshwater withdrawals per income are based on an assumed average annual percent decrease of 1 percent for both regions, which is slightly less than the average annual percentage decrease in the past 10 years (table 5). These figures were combined with projected population and per capita income figures (tables 3 and 5) to estimate projected freshwater withdrawals for industrial and commercial uses (table 6).

Projections suggest that water demands for industrial and commercial uses in Western States will increase faster than the rate of population growth.

Freshwater withdrawal projections suggest that demands for water in industrial and commercial uses will increase through 2050 by 54 percent in the Rocky Mountains and Great Plains regions and 59 percent in the Pacific Coast region, for an average increase of 56 percent for all Western States from 2000 to 2050 (table 6). The rate of increase implies that increases in technological efficiencies (as represented by declining withdrawals per income) will be more than offset by increasing real per capita personal incomes and population growth. Some additional efficiency gains likely could be expected if some water use shifts from water-intensive manufacturing and other heavy industry to service-oriented businesses. Without more significant increases in technological efficiency, increased conservation, or other changes, the projections suggest that water demands for industrial and commercial uses in Western States will increase faster than the rate of population growth, estimated at 47 percent from 2000 to 2050 for Western States.

Table 5—Projected real per capita personal income and freshwater withdrawals per income for industrial and commercial water for Western States, by region

Region	2000	2010	2020	2030	2040	2050
Real per capita personal income ($1,000s):						
Rocky Mountains and Great Plains	23.7	26.9	30.2	33.7	37.6	42.0
Pacific Coast	27.2	30.8	34.5	38.6	43.1	48.1
Withdrawals per $1,000 income (gallons per day)						
Rocky Mountains and Great Plains	19.1	17.2	15.6	14.1	12.8	11.5
Pacific Coast	5.5	4.9	4.5	4.0	3.7	3.3

Note: Real per capita personal income projections are based on income growth indices reported by Bowker et al. (1999) applied to 1995 per capita personal income figures reported by the Bureau of Economic Analysis (2002), and converted to 1998 dollars by using the Gross Domestic Product deflator from the Bureau of Economic Analysis. Projections of withdrawals per $1,000 income are based on historical trends in industrial and commercial withdrawals reported in U.S. Geological Society national water use reports (Solley et al. 1988, 1993, 1998) and historical income figures reported by the Bureau of Economic Analysis (USDC BEA 2002).

Table 6—Projected freshwater withdrawals (millions of gallons per day) for industrial and commercial water uses for Western States, by region

Region	2000	2010	2020	2030	2040	2050	Projected change 2000 to 2050
	Millions of gallons per day						*Percent*
Rocky Mountains and Great Plains	10,468	11,796	13,018	14,146	15,198	16,115	54
Pacific Coast	6,727	7,726	8,563	9,348	10,112	10,725	59
Total	17,195	19,522	21,581	23,494	25,310	26,840	56

Note: Projections based on population projections (table 3), real per capita personal income and withdrawals per $1,000 income (table 5), and historical trends in freshwater withdrawals for commercial and industrial uses reported in U.S. Geological Society national water use reports (Solley et al. 1988, 1993, 1998).

Irrigation

Irrigation traditionally has been the dominant use of water in the West. The principal determinants of freshwater withdrawals for irrigation are the amount of irrigated land and the application rates of irrigation water. However, several factors can affect irrigation water demand, including prices for agricultural commodities, federal agricultural policies, changes in irrigation technologies, and energy prices, just to name a few (Brown 1999). To simplify the process of estimating projected freshwater withdrawals for irrigation, Brown (1999) based future irrigation use on

historical and current trends in the amount of irrigated land and withdrawals per acre of irrigated land. This is the method we have used as well.

Our expectations of future irrigated acreage are based on historical trends reported by the U.S. Census of Agriculture (U.S. Census Bureau 1995, USDA National Agricultural Statistics Service 1999). From 1978 to 1997, total irrigated acreage has increased at an average of 0.02 percent annually in the Rocky Mountains and Great Plains regions and 0.1 percent in the Pacific Coast region. Growth in the amount of irrigated land is expected to slow as continued population growth and resulting land development make prime agricultural land and water supplies increasingly scarce. We assume that irrigated acreage will increase at 0.01 percent per year in the Rocky Mountains and Great Plains regions, but remain relatively constant in the Pacific Coast region as a whole, with irrigated acres increasing slightly in some states and decreasing in others (table 7). Our expectations of future freshwater withdrawals per acre of irrigated land are based in part on historical trends in irrigation withdrawals reported in USGS national water use reports (Solley et al. 1988, 1993, 1998), and assumptions found in Brown (1999). From 1985 to 1995, freshwater withdrawals per acre of irrigated land declined by an annual average rate of 1.7 percent in the Rocky Mountains and Great Plains regions and 0.4 percent in the Pacific Coast region, possibly owing in part to increases in technological efficiencies. Relatively large declines, such as those in the Rocky Mountains and Great Plains region, are probably unlikely to continue in the future. Following Brown (1999), we assume that freshwater withdrawal per acre of irrigated land will decline from an initial average annual percentage decrease of 0.08 percent to an average annual percentage decrease of 0.04 percent by 2050 (table 7). We estimated projected total region freshwater withdrawals for irrigation by multiplying projected irrigated acreages by projected withdrawals per irrigated acre (table 8).

Future irrigation water demand will be an important factor affecting the future availability of water for recreational uses.

Freshwater withdrawal projections suggest that demands for water in irrigation will decrease through 2050 by 2 percent in the Rocky Mountains and Great Plain region and 3 percent in the Pacific Coast region, for an average decrease of 2 percent for all Western States from 2000 to 2050 (table 8). Decreased irrigation water demand arises from expectations regarding reductions in application rates and little to no growth in irrigated acreage in Western States. In particular, the slight projected increase in irrigated acreage in the Rocky Mountains and Great Plains region is entirely offset by expected reductions in application rates. It is conceivable that increased technological efficiencies could lead to greater reductions in irrigation water use in the future, although this remains somewhat uncertain.

Table 7—Projected irrigated acres and withdrawals per irrigated acre for Western States, by region

Region	2000	2010	2020	2030	2040	2050
Irrigated acres (thousands):						
Rocky Mountains and Great Plains	23,913	23,937	23,961	23,985	24,008	24,032
Pacific Coast	11,856	11,856	11,856	11,856	11,856	11,856
Withdrawals per irrigated acre (million gallons per day):						
Rocky Mountains and Great Plains	3.08	3.06	3.04	3.03	3.01	3.00
Pacific Coast	3.67	3.65	3.62	3.60	3.58	3.57

Note: Projections of irrigated acreages based on historical trends in irrigated land reported in the U.S. Census of Agriculture. Projected withdrawals per acre are assumed to decrease by an average annual percentage **decrease** of 0.08 percent, declining to an average annual percentage **decrease** of 0.04 percent by 2050. Historical withdrawals per irrigated acre are based on historical trends in irrigated land (U.S. Census Bureau 1995, USDA National Agricultural Statistics Service 1999), and U.S. Geological Society national water use reports (Solley et al. 1988, 1993, 1998).

Table 8—Projected freshwater withdrawals for irrigation water uses for Western States, by region

Region	2000	2010	2020	2030	2040	2050	Projected change 2000 to 2050
	– – – – – – – Millions of gallons per day – – – – – – –						*Percent*
Rocky Mountains and Great Plains	73,754	73,298	72,903	72,568	72,293	72,076	-2
Pacific Coast	43,535	43,223	42,947	42,707	42,502	42,333	-3
Total	117,289	116,521	115,850	115,275	114,795	114,409	-2

Note: Projections based on projected irrigated acreages and withdrawals per irrigated acre (table 7) and historical trends in freshwater withdrawals for irrigation reported in U.S. Geological Survey national water use reports (Solley et al. 1988, 1993, 1998).

Aggregate Future Demands

Estimated freshwater withdrawals for nonrecreational water uses projected through 2050 suggest that relatively large increases in water demand in the public and domestic and the industrial and commercial sectors will be offset by only moderate declines in demands for irrigation water (table 9). This will result in a modest net increase of 6 percent in water withdrawals in the Rocky Mountains and Great Plains regions, and an increase of 11 percent in the Pacific Coast region by 2050, for an average net increase of 8 percent for all Western States. This is possible because irrigation is such a significant proportion of all freshwater withdrawals in the West.

Table 9—Summary of projected freshwater withdrawals for nonrecreational uses, by sector, for Western States, by region

Region	2000	2010	2020	2030	2040	2050	Projected change 2000 to 2050
	– – – – – – – – Millions of gallons per day – – – – – – – –						*Percent*
Rocky Mountains and Great Plains:							
Public and domestic	3,721	4,092	4,449	4,788	5,096	5,351	44
Industrial and commercial	10,468	11,796	13,018	14,146	15,198	16,115	54
Irrigation	73,754	73,298	72,903	72,568	72,293	72,076	-2
Total	87,943	89,186	90,370	91,502	92,587	93,542	6
Pacific Coast:							
Public and domestic	6,635	7,436	8,120	8,779	9,407	9,882	49
Industrial and commercial	6,727	7,726	8,563	9,348	10,112	10,725	59
Irrigation	43,535	43,223	42,947	42,707	42,502	42,333	-3
Total	56,897	58,385	59,630	60,834	62,021	62,940	11
West:							
Public and domestic	10,356	11,528	12,569	13,567	14,503	15,233	47
Industrial and commercial	17,195	19,522	21,581	23,495	25,310	26,840	56
Irrigation	117,289	116,521	115,850	115,275	114,795	114,409	-2
Total	144,840	147,571	150,000	152,337	154,608	156,482	8

Note: Projections from tables 4, 6, and 8.

Even with projected increases in water use by the public and domestic and the industrial and commercial sectors, and decreases in irrigation, irrigation is likely to remain as the largest water user in 2050. Our projections suggest that irrigation will represent an estimated 73 percent of total western withdrawals by 2050, equivalent to 114,409 million gallons per day or about 1,134 gallons a day per person. Given that irrigation will continue to account for the greatest share of all freshwater withdrawals, greater reductions in irrigation water use could free up water to meet expected increased demands for water in the other sectors. However, reductions in water use by either sector would increase future availability of water for instream uses, such as recreation and maintenance of habitat for riparian species.

Conclusions

Projected demands for water recreation are expected to increase in the future at rates exceeding those of anticipated population growth. Projected increases in water

recreation demands owe largely to projected increases in the population and expectations about rising personal incomes that will make certain activities more affordable to greater numbers of individuals. Demands for water in nonrecreational uses also are expected to increase, although at relatively more moderate rates. Although the composition of nonrecreational use will shift away somewhat from irrigation toward public and domestic and industrial and commercial uses, irrigation will still make up the largest share of total freshwater withdrawal. For this reason, future irrigation water demand will be an important factor affecting the future availability of water for recreational uses, as well as other nonrecreational uses.

The potential exists for increased competition between recreational and nonrecreational water users in future years.

The combination of projected increases in water recreation demands and moderate increases in nonrecreational water uses suggests that the potential exists for increased competition between recreational and nonrecreational water users in future years. The potential also exists for increased water recreation demand to lead to an increased potential for conflict between different types of water recreation, if certain types of recreation are perceived by their participants as incompatible with others. Along with increasing competition between recreational and nonrecreational water users, it is conceivable that the supply of recreation sites could decline in the future. Increased congestion owing to greater numbers of recreationists could diminish the quality of existing recreation sites. Increasing population densities and expanding urban areas could lead to the direct loss of sites as they are converted to more developed uses. Projected increases in water demands accompanied by a potentially diminishing number of water recreation sites, implies an increased potential for shortages in the availability of water recreation sites in future years. Changing socioeconomic factors will affect water recreation demand through increases in population and incomes, among other factors, and potentially affect water recreation supply by increasing demands for water in nonrecreational uses and by potentially diminishing the number of recreation sites available.

The degree to which changing socioeconomic factors and increased competition between various water users might adversely affect the availability of water recreation opportunities remains uncertain. One reason for this uncertainty is that projected future demands for water in recreational and nonrecreational uses, such as those reported in this chapter, are not directly comparable. Water recreation projected demands tend to be expressed in participant days or numbers of participants, whereas nonrecreational water demands are expressed in terms of volume per time (gallons per day, for example). Finding ways to examine and express water recreation demands in terms of flows, and increased nonrecreational water demands in

terms of potentially diminished flows, would enable recreational and nonrecreational water demands to be more directly compared. Because such a comparison would require information about streamflows, jointly evaluating recreational and nonrecreational water demands might best be accomplished at regional scales for which water use and supply data are available.

A second source of uncertainty stems from the tendency to report demand projections for both recreational and nonrecreational water uses that are aggregated for relatively large geographic regions. Increased competition between recreational and nonrecreational water uses is likely to manifest itself first at relatively local levels. For example, increases in water withdrawals by a specific nonrecreational user might adversely impact a particular recreation site in a specific locale. The site might be lost or its quality diminished, adversely affecting a specific group of individuals who recreate at that site. Such local impacts will be difficult to anticipate without demand projections for recreational and nonrecreational water uses reported on relevant local scales, which might be beyond the scope or interest of larger public natural resource agencies that may collect and report water use data. Analyzing future demands for water in recreational and nonrecreational uses at regional or more disaggregated scales could be necessary to identifying where and when potential conflicts between different water uses might occur.

Other challenges remain regarding evaluating socioeconomic tradeoffs among different water users when conflicts between recreational and nonrecreational water uses arise. Most water recreation valuation studies are conducted for particular sites or relatively well-defined geographic areas, necessitating the transfer of values or benefits functions derived in one location to another location, when conducting new studies is infeasible (see Rosenberger and Loomis 2001). However, recreation values estimated for one location may fail to capture the heterogeneous nature of a particular recreation activity at another location. For example, recreational fishing in a given location might comprise local residents as well as visitors who have incurred significant travel expenses, fly-anglers as well as "worm-dunkers," and those who use motorized water craft and those who use nonmotorized water craft or fish from shore. Estimated fishing values likely will vary from one characterization of fishing to another. Transferring reported recreation values in a rigorous and defensible way could require skills and knowledge of water recreation literature that may not be readily available to local or regional water resources managers and policymakers. Ensuring that water recreation valuation information is readily accessible and understandable to water resource managers and policymakers would

help facilitate its appropriate use in the development of water management and policy alternatives.

The future of water recreation in the Western United States will be characterized by changing demands and values for water in all of its potential uses. Information about likely future demands for water in both recreational and nonrecreational uses will be essential to anticipating where potential conflicts could exist between various water users in the future. Demands for water in all of its uses form the context in which water recreation planning and policy will take place. When conflicts arise, knowledge of the value of water in recreational uses can be an important factor in evaluating tradeoffs associated with water resource management and policy alternatives that might affect a variety of water users. Acknowledging the value of water to all users will help to ensure that the preferences and concerns of different users are fairly represented in water management and policy development.

Metric Equivalents

When you know:	Multiply by:	To get:
1 Cubic foot	0.0283	Cubic meters
1 Gallon	3.78	Liters

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Chapter 5: Symbolic Uses of River Recreation Resources: Whitewater Boaters' Special Places on the South Fork of the American River

Kelly S. Bricker and Deborah L. Kerstetter[1]

> For some, a river trip means water fights and wet summer fun; for others, it is mainly a testing of personal mettle. But for nearly all there is something more, something ineffable yet deeply satisfying, as we join the ancient currents and flow, for a brief time, between the timeless banks (Bangs and Kallen 1985: xiv).

Noted river adventurers Richard Bangs and Christian Kallen (1985) suggested rivers are "arteries of the planet" that have utilitarian value (i.e., expansion of civilizations) and are important in sustaining biological diversity and human civilization (see chapter 2 for further discussion on this issue.) They also noted the symbolic attraction of river running—in that people are "irresistibly drawn to rivers for recreation, refreshment, and reconnection…" (Bangs and Kallen 1985: i). In chapter 1, McCool et al. recognize that there is a symbolic attraction to rivers and suggest that such symbols and symbolic images associated with rivers lie at the heart of public controversy. Thus, in this chapter we build upon the work of Bangs and Kallen as well as McCool et al. by describing the **meanings** whitewater recreationists attach to a river—meanings that express symbolic, aesthetic, instrumental, and expressive values of individuals' lives (Williams and Patterson 1999). We also demonstrate how **meanings**, symbolic or otherwise, can inform natural resource managers about potential impacts that could arise from day-to-day management of the river landscape.

Through personal attachment to places, people acquire a sense of belonging and purpose that gives meaning to their lives and, from a global perspective, may be important to societal well-being.

Why is it important to examine "places" that hold special meaning to whitewater boaters? From a broad perspective, through personal attachment to places, people acquire a sense of belonging and purpose that gives meaning to their lives (Tuan 1980) and, from a global perspective, may be important to societal well-being (Canadian Council on Social Development 2001). This concept of "place attachment" suggests that there is a relationship between people and the natural environments they use. However, understanding what constitutes "place attachment"

[1] Kelly S. Bricker is an Associate Professor, University of Utah, Department of Parks, Recreation, and Tourism, 250 South 1850 East, Rm. 200, Salt Lake City, UT 84112; Deborah L. Kerstetter is an associate professor, The Pennsylvania State University, Department of Recreation, Park and Tourism, management, 801 Ford Building, University Park, PA 16802.

Most regard the benefits of participating in human-powered outdoor recreation as gaining a sense of accomplishment, escaping from the pressures of daily life, finding a connection with oneself, feeling young, and maintaining a healthy lifestyle.

and the degree to which it is developed within outdoor recreation activities remains unclear. Second, the meanings whitewater boaters attach to places may change over time owing to the number and characteristics of other users. From 1998 to 2003, participation in core outdoor recreation activities increased by 16 million to nearly 142 million—"far outpacing the impact of natural population growth in the United States" (OIF 2004: 11). The profile of participants also changed. Today males are increasingly represented (i.e., 56 percent of participants); historically underrepresented groups are slowly entering the market; and, participants are more likely to have children in their household and to be fairly affluent (OIF 2004). Most regard the benefits of participating in human-powered outdoor recreation as gaining a sense of accomplishment, escaping from the pressures of daily life, finding a connection with oneself, feeling young, and maintaining a healthy lifestyle (OIF 2004).

Although participation in outdoor recreation has increased overall, the primary draws have been hiking/backpacking, swimming, and fishing (OIF 2004). Whitewater rafting has not been as popular. In 2003, 10.3 million Americans 16 years of age and older participated in whitewater rafting—well below the participation level for 2001. Why has there been a shift in participation? Are Americans rafting less because of limited access to rivers or outfitters? Is participation related to mismanagement of rivers, including misinterpretation of the symbolic attachment individuals' hold for rivers?

Given the shift in demand for whitewater experiences as well as the pressures being faced by managers, we believe there is much to be gained from thinking about and examining the meanings boaters attach to the resource. Hence, our goals for this chapter are to review the literature on place attachment, introduce the results of a study on whitewater boaters, and discuss how such results can be used in the development of a management plan.

We begin the chapter with a brief overview of the place attachment literature. We then turn our attention to a journey down the South Fork of the American River (SFA), using special place meanings of the SFA expressed during a study conducted with whitewater boaters. In this section of the chapter, whitewater boaters' special places within the SFA are explored through an interpretation of complex meanings and expressions they assigned to the river. Results of past qualitative studies have demonstrated that a rich understanding of person-environment relationships is possible (Mitchell et al. 1993). We close by discussing how the results can provide a more comprehensive understanding of the "social condition" for which natural resource managers attempt to manage. The discussion

provides support for ecosystem management as a resource management philosophy and underscores the importance of recognizing that "society increasingly values natural resources in ways not easily captured by the commodity and production metaphors of "use" and "yield" (Williams and Vaske 2003: 830).

Place Attachment

Place can be described as a locale that serves as "…the setting or backdrop for everyday activity," or as a process that involves the transformation and appropriation of nature and space "…simultaneous with and inseparable from the transformation and reproduction of society" (Kruger and Jakes 2003: 819). Raitz (1987: 49) suggested that "to understand how a leisure landscape is constructed and uses space and how its parts or elements relate to the broader community, is to understand a good deal about the culture, values, and concerns of the people who built it and use it."

Regardless of how place is defined, it elicits an appreciation and attachment "…beyond the observable features of the landscape."

Regardless of how place is defined, it elicits an appreciation and attachment (i.e., a bond; see Altman and Low 1992, Fishwick and Vining 1992, Henderson and King 1999, Warzecha and Lime 2001) "…beyond the observable features of the landscape" (Petrich 1984: 67). This bond, conceptualized as "place attachment" consists of two primary dimensions—**place identity** and **place dependence** (Hammitt et al. 2004, Jorgenson and Stedman 2001, Williams et al. 1995).[2]

Place identity has been defined as "the symbolic importance of a place as a repository for emotions and relationships that give meaning and purpose to life" (Williams and Vaske 2003: 831). It has also been referred to as a component of self-identity (Proshansky et al. 1983) or a cognitive structure involving global self-identification (Jorgenson and Stedman 2001) that enhances self-esteem and feelings of belongingness (Korpela 1989, Tuan 1980). In outdoor recreation settings, place identity develops over a longer period and is associated with emotional and symbolic meanings (Moore and Graefe 1994). In addition, it is strongly associated with environmentally responsible behavior (Williams and Vaske 2003) and support for user fee policies (Kyle et al. 2004). Although much of the research on place identity has focused on individuals' response to a tangible site, Proshansky et al. (1983) have noted that place identity is not dependent on experience with a place and may instead involve a psychological investment in a place or activity over time (Giuliani and Feldman 1993).

[2] For a more comprehensive review of the various perspectives on place attachment, refer to Stedman (2002) and Williams and Vaske (2003).

Place dependence, on the other hand, is the level to which individuals perceive themselves as functionally associated with places or groups of places (Stokols and Shumaker 1981). Place dependence is theorized to be a function of "how well a setting facilitates user's particular activities" (Moore and Graefe 1994: 27) and its value is tied to the "…specificity, functionality, and satisfaction of a place…" as well as its "goodness" for activities such as whitewater boating (Kyle et al. 2004: 251). According to Hammitt et al. (2004), place dependence is affected by an individual's awareness, experience use history, and familiarity with alternative places, travel, mobility, and resource required. In terms of place attachment overall, the number of places visited, amount of time spent in a given place, length of residency, proximity to the site, and frequency of participation appear to have an effect (Bricker and Kerstetter 2000, McCool and Martin 1994, Mitchell et al. 1993, Moore and Graefe 1994).

Researchers [must] begin to focus on the symbolic meanings of place as a first step in "… understanding the implications of environmental change and why conflicts over resource management become so contentious."

There is evidence that additional dimensions of place attachment exist (Hammitt and Stewart, n.d.; Hay 1998). For example, in 1998, Nanistova provided evidence of four additional dimensions of place attachment—place rootedness, traditionalism, nostalgia, and loss of place. More recently, Hammitt et al. (2004) argued for a five-dimensional model of place attachment: place familiarity, belongingness, identity, dependence, and rootedness. Regardless of how many dimensions theoretically exist within the place attachment construct, ultimately the focus of such discussion is on **how much** a setting means rather than **what** the setting means to individuals (Stedman et al. 2004). Krannich et al. (1994) suggested that researchers begin to focus on the symbolic meanings of place as a first step in "… understanding the implications of environmental change and why conflicts over resource management become so contentious" (in Kruger and Jakes 2003: 820). Their argument is persuasive as "symbolic meanings underpin place attachment: …[individuals'] attribute meaning to… settings, and in turn become attached to the meanings" (Stedman et al. 2004: 581).

The South Fork of the American River

> …The South Fork of the American River Corridor, a place of challenging whitewater and heart stopping thrill, unequalled beauty; rich in nature's wildflowers and birds; a place to be cherished, fought for to be saved, preserved for generations to come. (comments from a whitewater boater cited in Bricker 1998)

The South Fork of the American River (SFA) begins high in the Sierra Nevada Mountains at 7,500 feet elevation and winds through the Sierra foothills into California's great Central Valley, the second richest agricultural center in the world (El Dorado County 1996). It is California's most popular whitewater recreation river and the second most popular commercial rafting river in the United States. The 20-mile Class I to III reach from Chili Bar to Salmon Falls is located in El Dorado County, northern California—the heart of gold rush country (see fig. 1). The SFA runs through the Coloma Valley and is considered the "heart and spirit of the Coloma-Lotus" area (The American River Resources 2005: 1). It provides a variety of recreational opportunities such as non-motorized boating, fishing, recreational gold mining, hiking, camping, and picnicking, and has been popularized as a diverse whitewater boating community. During 1996, the SFA served nearly 100,000 commercial rafters and over 40,000 private rafters, kayakers, and canoeists (El Dorado County 1996). The water is controlled by a dam, which allows boating opportunities year around. However, the SFA receives its greatest usage between Memorial Day and Labor Day, and most whitewater recreationists run the 20 miles in 2 days. The upper stretch, from Chili Bar to Henningsen-Lotus Park, is 8 miles and takes approximately 3-1/2 hours to run (at 1,700 cubic feet per second [cfs]). The lower stretch of the river, from Henningsen-Lotus Park to Salmon Falls Bridge, is 12 miles and takes approximately 5 hours to run at 1,700 cfs.

The South Fork of the American River (SFA) begins high in the Sierra Nevada Mountains at 7,500 feet elevation and winds through the Sierra foothills into California's great Central Valley, the second richest agricultural center in the world.

A Study of Special Places and the South Fork of the American River

To document special places along the SFA and the meanings individuals attached to them, we surveyed boaters during the summer of 1996. We began by asking whitewater recreationists to identify places they thought were special on the SFA. They were then asked to describe each place, including its location and special features; the meanings, experiences, feelings, ideas, and values associated with each place; and ideas, recommendations, problems, and wishes for specific management of these special places on the SFA. In our analysis of special place meanings, we identified the characteristics of place meanings and descriptions that helped to distinguish one from the other. The result was a set of complex meanings that included various combinations of dimensions, all of which were representative of the whitewater experience on the SFA.

To understand special places and place meanings of boaters on the SFA, respondents were asked to describe a place as well as what it meant to them. Several

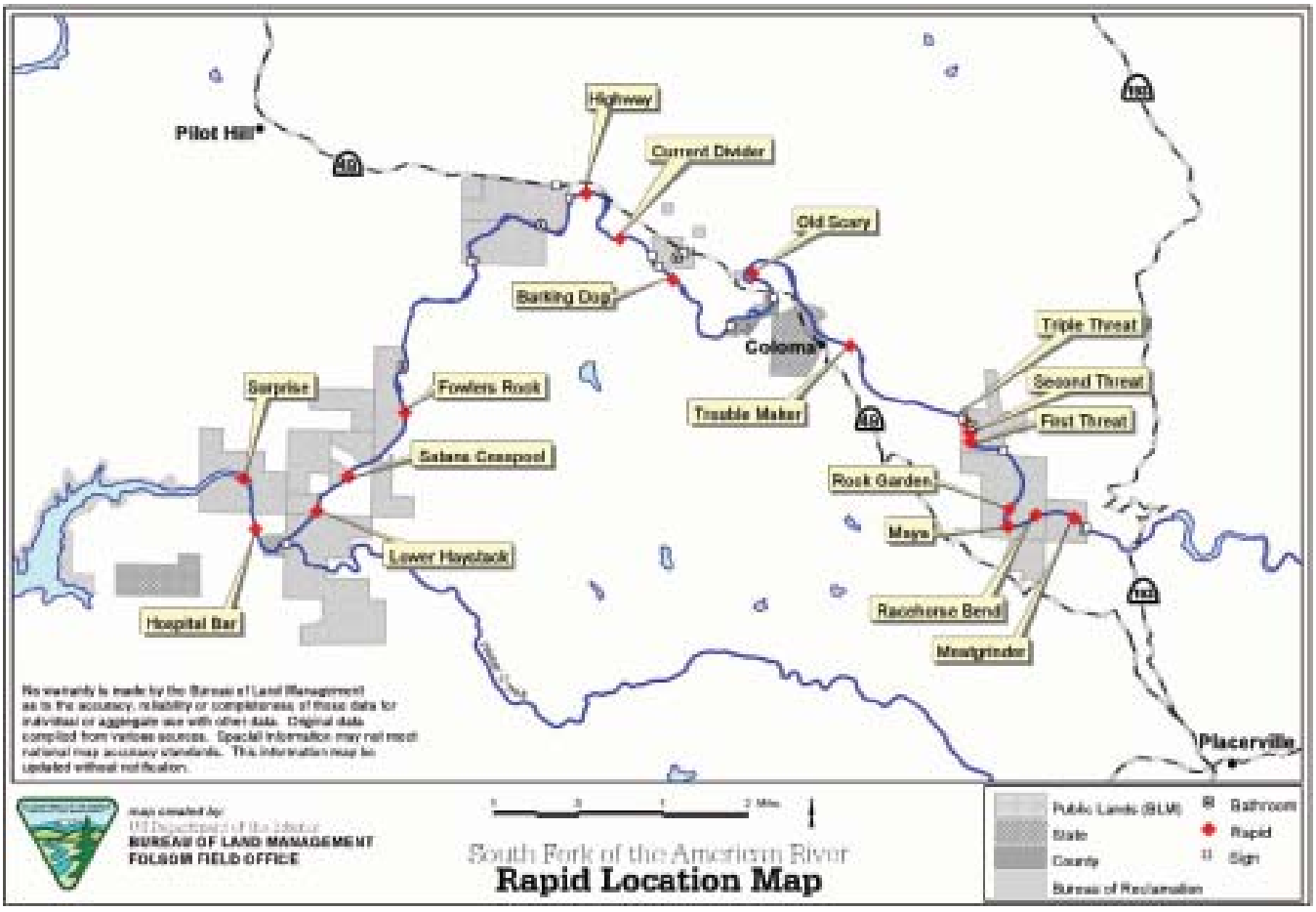

Figure 1—The South Fork of the American River.

The types of descriptions of places ranged from natural features on the river corridor to the community surrounding the river.

individuals recorded a place by name and gave no further description. Other individuals' responses ranged from broad generalizations about a place or area to detailed descriptions. Hence, the types of descriptions of places ranged from natural features on the river corridor to the community surrounding the river. If an individual did not describe a place, the name of the place was still included in the types of places cited. For example, one respondent did not describe Maya Rapid, yet the rapid was still included in the list of special places on the river. A description of how we interpreted the geographically defined places of respondents is included in Table 1.

To assist in the interpretation of the complex meanings people assigned to the SFA, we organized meanings by location along the river, from Chili Bar put-in, through each reach, to the Salmon Falls take-out. These meanings were derived from the comments made by 520 respondents. Seventy percent were whitewater rafters, and the remaining thirty percent were kayakers.

Table 1—Special places on the South Fork of the American River

Places described	Description
The South Fork of the American River	The entire river corridor from Chili Bar to Folsom Reservoir. The entire boatable stretch of river is 20.5 miles in length. Although some people raft the entire stretch in one day, the majority of commercial rafters and private boaters will break the run into two 1-day trips.
River reaches: Upper reach	Loosely defined as the upper run, from Chili Bar to Coloma or Lotus. Begins with Class III rapids and ends with one of the most difficult of them all, Troublemaker Rapid. This stretch extends approximately the first 8 miles of the river (miles 1–8) from Chili Bar put-in to Henningsen-Lotus Park take-out.
Coloma-Lotus run	The Class I to II section of mild water that runs parallel to the historic town of Coloma and the town of Lotus. This area includes a designated "Quiet Zone" established for residents living at rivers edge—it asks that boaters refrain from water fights and unnecessary yelling. This is the most developed section of the river from Chili Bar to Salmon Falls. This section encompasses approximately mile 6 through mile 10, depending on the put-in and take-out locations. This section of the river tends to be a training ground for new boaters, as the highest level of difficulty is Class II+.
Lower reach	Loosely defined as the stretch of river extending 10 miles from below the Coloma-Lotus run to the Salmon Falls Reservoir. This section includes other identifiable sections such as The Gorge and upper and lower Haystack Canyons. Mile 10 through mile 20.5 basically identify this section of the river corridor.
The Gorge	A classic section of continuous whitewater on the lower reach of the river marked at the start by a Class III rapid called "Fowlers Rock" and ending with a Class III rapid called "Hospital Bar."
Upper Haystack Canyon	An area within the Gorge run marked by continuous haystack waves. This section of the river comes prior to Satan's Cesspool, a renowned Class III rapid.
Lower Haystack Canyon	Very similar to "Upper Haystack," it occurs after Satan's Cesspool, within the Gorge proper.
Self-identified sections	These are sections of river that respondents created by personal description, identifying landmarks, places, or natural features of the river corridor.
Established sites	These areas of the river are identified by known names and places utilized by river users and other recreationists. Often times this category refers to places that are public lands or commercial camp areas. The following sites were described by whitewater recreationists: • Bureau of Land Management sites • Marshall Gold Discovery State Park • The town of Coloma
Natural sites	This collection of descriptions includes natural features of the South Fork of the American River. The following natural features were described by participants: Rapids, general (general descriptions without designated names) Rapids, common name (descriptions that included established names) Natural features, general (features that are simply places without names) Natural features, common name (e.g., The Lollipop Tree, Gorilla Rock, Poppy Hill)
Human-made features	These are areas that are not established sites, yet are remnants of human alteration of the landscape.

Source: Bricker 1998.

The Symbolic Meanings Boaters Ascribe to Special Places on the River

Respondents were asked to select from memory a place within the SFA corridor (i.e., Chili Bar to Salmon Falls) that stood out in their mind as being important, memorable, or special to them personally. It was suggested that it might be a place they have been to or floated through many times, or a place they would have only floated through or seen once. They did not have to know the exact location of the place.

Although rivers are naturally continuous corridors, for whitewater recreationists on the SFA, the river is also seen in varying degrees of specificity—from large stretches to relatively small, detailed locations.

Respondents were then asked to describe the thoughts, feelings, memories, and associations that came to mind when they thought about their place. They were also asked to describe what made the place important to them, including what experiences they had there. We emphasized that there were no right or wrong answers and that we were interested in anything they wanted to tell us about why this place is important or special to them (Bricker 1998, Schroeder 1996). Although rivers are naturally continuous corridors, for whitewater recreationists on the SFA, the river is also seen in varying degrees of specificity—from large stretches to relatively small, detailed locations.

Symbolic Meanings

Descriptions of special places were diverse, yet seemed to follow themes that captured how whitewater recreationists valued the river corridor, and the special places contained therein. For whitewater boaters, complex meanings were reflective of three main ideas: natural environment and recreational aspects of a special place, social and recreational aspects of a special place, and natural environment and human aspects of a special place (see table 2).

Natural Environment and Recreational Aspects of a Special Place

Descriptions of special places that referenced recreation and the environment also alluded to the aesthetic qualities of the river as well as a "vehicle" (raft or kayak) as the means to experiencing things like wilderness, beauty, and the tranquility of outdoor environments. Individuals also discussed aspects of degradation of the experience on the SFA owing to increased pressure, development, or environmental degradation. Seasonality was expressed as a mechanism for change in the type of boating experience one has on the river. Boaters also referenced accessibility—which came in the form of valuing access to a "wilderness" environment so close to an expanding urban area. Another interesting quality of this dimension was the

expression of meanings associated with "environmental signals." And, lastly, the special place meanings in this category related to a respect for the power of the river relative to their boating activity. The focus was on the aesthetic and instrumental or goal-directed meanings. Meanings were relative to how whitewater recreationists focused on the quality of the environment and aspects of the river that afforded opportunities or functional aspects of the experience.

Social and Recreational Aspects of a Special Place

The second set of descriptions of special places addressed integrated components of recreational and socially inspired aspects of the river. Within this larger concept, whitewater recreationists interpreted the river as a place to meet others of like interest in whitewater boating. They also discussed places on the river that provided personal challenge and growth. In fact, for several boaters, the river was a place to learn; a training ground for whitewater recreation. Teamwork, friendship, and pure enjoyment were all tied to whitewater recreation on the SFA. Some individuals described a sense of rootedness, in that their lives were intertwined with not only the boating activity, but the places that supported lifelong friendships and in some cases, a "lifestyle." Within this complex dimension, aspects of cultural or symbolic meanings as well as instrumental meanings emerged from our interpretations. For example, the simple act of moving downstream together in a craft powered by a team of paddlers symbolized teamwork; boaters also reflected on the "culture" of the boating community, the sense of camaraderie that was symbolic of the type of river the SFA was, as well as the type of surrounding community the river ran through. Individual/expressive meanings were also indicative of this complex dimension. Recreationists often referenced the SFA as a training ground, a place of challenge and personal growth.

Natural Environment and Human Aspects of a Special Place

Within this category, boaters were not focused on the activity of boating, but rather interpretations of places that solely embraced an environmental message or natural appreciation of the river corridor coupled with sharing these attributes with others; human-induced negative impacts on the river; and signs of human influences, both past and present. Places on the SFA were identified as places where individuals could appreciate nature or share their appreciation with others. There were places that evoked a sense of appreciation for indigenous people and the sites that remain. And, whitewater recreationists were disturbed by the increasing signs of encroachment and places where humans had caused environmental degradation. In essence,

Places on the SFA were identified as places where individuals could appreciate nature or share their appreciation with others. There were places that evoked a sense of appreciation for indigenous people and the sites that remain.

There were many descriptions [of places] that could not be tied to tangible measures, but instead evoked a sense of nostalgia, escape, and appreciation for signs of encroaching development, which may change the character of the resource, and especially the character of particular reaches in the future.

not all special places evoked positive responses—special places within the river corridor prompted concern for maintaining and protecting the natural features and experience the river provides. Many meanings within this dimension were reflective of intangible, symbolic, and expressive meanings (Williams and Patterson 1999). There were many descriptions that could not be tied to "tangible" measures, but instead evoked a sense of nostalgia, escape, and appreciation for signs of encroaching development, which may change the character of the resource, and especially the character of particular reaches in the future.

Whitewater Boating on the South Fork of the American River: An Interpretive Journey of Place Meanings

To understand the multidimensional character of meanings assigned to special places along the corridor, we will take an interpretive trip down the SFA. We adopted this approach because boaters commented about special places along the SFA at various levels of geographic specificity—from the entire river corridor, to recognized river reaches, to sections personalized or self-identified, to established sites such as put-in and take-out sites, to specific natural landmarks and human-made features. At each level of geographic specificity, we introduce a sample of meanings by using the multidimensional framework introduced in the previous section and in table 2.

River Mile 0: The Put-In

It is 9:00 in the morning and the Chili Bar put-in is bustling with the sound of air being pumped into boats, packing, laughter, and light conversation. This wide, flat gravel bar that borders the river's edge is speckled with smooth granite river rock highlighted with a rainbow of colorful rafts, kayaks, and people in life jackets. Chili Bar is located just below the dam, which controls flows to the rest of the 20.5-mile reach of the river. It is a starting place for kayakers and rafters entering the upper reach of the SFA. It is also a gathering place and place of friendship. It is a place where people can appreciate nature as they prepare for their river trip. Chili Bar provides a landscape that evokes a sense of natural appreciation in a collective sense. People spoke of the essence of the enabling environment that alludes to a goal-directed orientation, as well as a place to gather; a place where intense shared social exchanges occur or are facilitated. Chili Bar is symbolic of home, friendships, and an enduring pastime, which may be relative to an extended social world.

Table 2—Description of place complex dimensions and their subcategories

Dimension categories	Description
Natural environment and recreational aspects of a special place (n = 296):	
Aesthetic-recreation	Meanings combined the natural beauty of an area with descriptions or ideas about the recreational activity taking place within the environment.
River experience protection	Meanings associated with protecting the environment in which the participant engages in recreational activities.
Degradation	Meanings associated with observations of degradation (experiential or environmental) that have implications for enjoyment and the overall recreational experience itself.
Seasons	The environment of a recreational experience was expressed in terms of the experience that occurs within different seasons.
Access	Access to the recreational experience or environment in which the activity takes place are emphasized (positive and negative associations).
Environmental signals	Meanings associated with environmental attributes that served as signals or acknowledgements that something was about to happen or a reminder that something happened within that place.
Power-respect	Place meanings that tied the recreation experience to an appreciation or acknowledgement of the power of the river and respect for the natural forces within it.
Social and recreational aspects of a special place (n = 221):	
The gathering place	Place meanings that recognize the social nature of a place or experience. Recreation is the driving force behind a special place, yet just a chance to meet people or others that have similar interests is also present.
Challenge-growth	Place meanings associated with personal growth or witnessing the growth of others within the context of a recreational pursuit.
Shared experience—family	Place meanings associated with recreational experiences. However, special emphasis is placed on sharing the experience with others. Several individuals referenced the opportunity to share the experience with family members.
Teamwork-camaraderie	Meanings were expressed that emphasized teamwork or a sense of camaraderie being important or remembered.
Friendship	The bond of friendship was meaningful in the context of recreational pursuits and special places. Meanings emphasized the importance and memory of friendship ties.
Enjoyment	Places exhibiting meanings associated with the enjoyment of others engaged in a recreational pursuit.

Table 2—Description of place complex dimensions and their subcategories (continued)

Dimension categories	Description
Natural environment and human aspects of a special place (n = 58):	
Natural appreciation	Meanings associated with sharing an appreciation for the environment with others. An event in a place that is shared and refers to the natural attributes of that environment.
Native environments	Meanings associated with places that evoked a sense of kinship with humans that lived in the area prior to present day.
Protect and preserve	Meanings associated with protecting the environment from the impact of humans. Environmental messages shared with others or emphasized within the context of special places.

Source: Bricker 1998.

The environmental features also enhance the sense of wonder and perhaps "bits of magic" that set the stage for the experience to come. In the words of one boater:

> ….The River seemed pristine; the smells along the river banks were of sweet pungent trees, vegetation, aquatic life, blue skies, warm sun, laughter of all of us and respect we all have towards that phenomenon of wild, free, cold rushing water, timeless and enduring. (aesthetic-recreation)

From specific locations, to the entire reach, there are "play spots," places to contemplate, and places to affirm friendship. Some places change with the seasons and others with years.

River Miles 1–4: The Upper Reach

The upper reach begins with a series of exciting rapids and is mostly surrounded by public lands from Meatgrinder Rapid to Triple Threats, and little to no development. As we push off and begin floating down the river, it is important to pay attention right away, as the river immediately flows into classic Class III whitewater, starting with Meatgrinder, Racehorse Bend, and the Triple Threats! This reach of the river holds for many a sense of wildness, excitement, and a place valued because it is undeveloped. From specific locations, to the entire reach, there are "play spots," places to contemplate, and places to affirm friendship. Some places change with the seasons and others with years. The naturalness of the reach provides places to appreciate nature, a sense of wildness, and peace. The challenging rapids engage boaters in experiences in which they are mentally and physically tested. Several individuals identified rapids and/or kayaking play spots within this

area. Others remember the entire 4-mile corridor winding through public lands, removed from development. Meanings had two qualities: goal-oriented, with the functionality of the river aspects that highlight challenges and interesting boating opportunities; and symbolic of wilderness, not as a designated area, but symbolic of what early explorers may have experienced. One boater's reflection…

> The Chili Bar Section, below Meatgrinder and Racehorse Bend Rapids. The hillsides steep right bank is meadow-like, with a riot of spring flowers, tall grasses and few oaks. The left bank is densely wooded. There are no signs of human development along this corridor, so I can live the wilderness and forget about civilization. It means we are remote and on our own. It reminds me of early explorers. Please keep it wild! (protect and preserve)

As other recreationists floating the upper reach found, the reach succeeded in meeting goals, such as family or fitness…

> ….this is the first place my boys ages 7 and 10 have rafted. They are proud of the fact that they came down Trouble Maker and wait anxiously for the next trip. We camp with 4 other families at American River Campgrounds right at Trouble Maker and get together to view videos we've taken of each other conquering Trouble Maker in different crafts and styles. We feel it is a great family activity which has taught all of us to respect Mother Nature and the power of the river as well as the value of sports to your self confidence, and personal fitness. (shared experience/family)

Special places also symbolized relationships, places where, because of the types of activities that are enabled, long-lasting friendships form.

Special places also symbolized relationships, places where, because of the types of activities that are enabled, long-lasting friendships form…

> …Hanging out with good friends, beautiful warm days, watching the river float by. It was the first Class III rapid that I rafted and the first Class III rapid that I kayaked (many years later). It was my introduction to whitewater, which had led to many years of enjoyment and a lot of long lasting friendships. (friendship)

From the entire 4-mile reach, to specific rapids, to a quite place on the river, boaters expressed meanings at different levels of resource specificity. As we move down river, we float upon Maya rapid. This is an interesting place for kayakers

to play, although known for its surfing wave, the reflections of boaters represented much more than the functionality of the wave, this special place helped one kayaker memorialize a special member of her family…

> ... My great grandmother passed away last summer, and I found myself surfing a small easy wave thinking of her just a few days after she died. The other kayakers in my group floated downstream and I was all alone, paying my personal last respects to her. I didn't have to think about surfing that wave, I was just on it looking through the water at the river bed, the steep forested hills and the sunshine that warmed the blue skies, all the time saying good bye. The next time I went through that section, looking back upstream, there was a prism of colors that streamed across the blue sky. I know it was only light being reflected off ice crystals in the atmosphere, but I like to think it was Grandma O'Donnell toasting me a good day. (shared experience/family)

…For some paddlers, floaters, and kayakers, meanings reflect a symbolic interpretation, special places perceived as yet wild and free from the encroaching developments just around the next bend…

Paddling towards the last series of rapids before the upper reach becomes dotted with dwellings along its banks, we are reminded of the character of this reach and how for some paddlers, floaters, and kayakers, meanings reflect a symbolic interpretation, special places perceived as yet wild and free from the encroaching developments just around the next bend…

> …In this channel, especially along the edge of the rocks, the water swells up in funky eddy currents, almost whirlpools sometimes. It is the unknown reason for these currents that fascinates me. And the way the water will surge up unexpectedly. Despite all of the development along the South Fork and all of the people on the river, places like this remind me that in some ways the river is still wild, dams or no dams. I love just floating through this section watching the currents. And I love watching people see it for the first time, especially the people who perceive the mystery of it. And I like sticking my paddle in the water and feeling what the currents want to do to it. (natural appreciation)

River Mile 5: Troublemaker Rapid

We now enter the notorious "S-Curve" for descent into one of the most famous rapids on the river. The rapid is a popular spot for commercial picture and video

stands, as well as an entourage of summer onlookers hoping for a bit of excitement as a result of a poorly executed run. Typically people waiting on the rocks for boats to run through are called "vultures." Therefore, it is no surprise that this place evokes various interpretations and meanings for whitewater recreationists. For some, this commercialized component is meaningful in a negative way—degrading the experience of the previous upstream miles. For others, there is an acceptance level for peak summer weekends, and altogether different meaning during the off-season. And for the remainder, Troublemaker Rapid is a place where boaters find pure enjoyment, challenge, and camaraderie in running the rapid. The notorious rapid represents meanings associated with goal seekers, yet also reflects symbolic disgruntlement with commodification of nature, overuse, and resultant degradation. It is a beacon of excitement, challenge, discontent, and disgruntlement—a complex representation of how this section of river is managed or not managed by comparison. For some, this "special place" provides a discreet symbolic warning about mismanaged resources, with a slight recognition that hope and sanctity might exist during the "off-season":

For some, this "special place" provides a discreet symbolic warning about mismanaged resources, with a slight recognition that hope and sanctity might exist during the "off-season."

> Entertainment on peak summer weekends, contemplate, pensive environment in winter, visible and easy access of Class III rapid. (seasons)
>
> …Wonderful waves, big stream washed granite boulders, campsites located left on the river, bunches of people spread out all over the rocks, throwing litter everywhere, destroying vegetation, disturbing the peacefulness and isolation characteristics of the BLM parts of the North Stretch mile 0–4. I feel like some circus animal when I paddle through Troublemaker. I'm not there to be other people's entertainment, especially since they treat that whole area like their personal bathroom. It would be a big disappointment for the areas currently more isolated from such beer swigging day-trippers to become hang-outs of the fat and lazy. This rapid means that commercialism is very visible on the river. I liked the rapids, but hated the photo companies perched on the rocks with their umbrellas, chairs, and signs. (degradation)
>
> The top of the mountain finally gives up at the end of the peninsula that creates the S turn I admire so much. The velocity of the water increases dramatically, the negative ions in the air from the rapids

changes everyone's attitude. As I approach the thunder, my muscles throughout my entire body come to attention—as always, I go through the rocks 100 yards upstream, I call the goal posts, knowing that if I can float my boat through them, I'll be OK in Troublemaker. Approaching the final turn I check out all the people watching my performance, I tense as I grip my oars, I totally relax my mind and go for the flow—punch the hole and slip by the rock. And like magic, another peel off the layers of life, off the old onion, exposing fresh flesh and a new perspective on life. (challenge/growth)

The residents, seasonal (boating community), year-round (homeowners), and natural (deer, otter, hawks, etc.) value the reach, sometimes in harmony and sometimes in competition.

River Miles 6–10: The Coloma-Lotus/Bio Bio Run

Continuing downstream from the excitement and often chaotic Troublemaker Rapid, the river becomes lazy and slow as it meanders through the historic town of Coloma and enters a residential area with associated "Quite Zone" designation. This section of river is where the community or commercial whitewater outfitters have established camps and a place where kayak schools introduce a gentler side of the SFA. Some camps, such as Camp Lotus have provided years of enjoyment and a sense of community to boaters on the SFA.

This section is where the river slows and riparian areas are home to a range of inhabitants. It is also a place where the ecosystem is dotted with human habitation. The residents, seasonal (boating community), year-round (homeowners), and natural (deer, otter, hawks, etc.) value the reach, sometimes in harmony and sometimes in competition. This section of the river is where increasing developmental and recreational pressures often rise to the surface—each valuing some aspect of the river corridor, and for very different reasons. For one boater, this portion of the river symbolized hope, and yet identified a need to protect and preserve:

> …As the sun was sinking low on the horizon the deer made their way to the river to drink, the turkey vultures bathed and hung their wings to dry and a river otter hauled out on one of those cottonwoods that dared to fall to the floods. My spirit was lifted to see that the river corridor continues to provide habitat to El Dorado's wildlife even with 100,000 boaters each season and the free hand of capitalism at work this spring after the floods. Please preserve this educational resource! (protect/preserve)

Whitewater recreationists identified the SFA as a training place; a place that fulfills a functional aspect for people learning a new sport such as kayaking or rafting. The nature of the rapids and the way in which the topography or landscape transforms the river corridor into a valued resource is meaningful for whitewater recreationists of all abilities. As one boater described her special place:

> …Kayakers and rafters share the river. I am learning to kayak on this section of river. It is safe, and offers big eddies and same current. Kayaking is important to me because it's a low impact fun sport in a beautiful area—the river… (challenge/growth)

River Miles 11–12: End of Quiet Zone/Turtle Pond Area

Now free of the "Quiet Zone" restrictions, we float into the start of the lower reach of the SFA. Unlike the upper reach, this portion of the river requires a more calculated approach, and eventually eases into the Gorge, a series of exciting Class III rapids. The river also gradually moves away from residential areas and into more remote public lands. For whitewater recreationists, the lazy flow of the river and surrounding landscape inspired camaraderie, and appreciation of the natural environment, including the fishery. It is also a place where development is encroaching on natural areas—hence, it elicites a concern to protect and preserve the wildness of the corridor and minimize access. A whitewater recreationist selected this area as her special place to emphasize how the resource is valued and to relay concerns for future management decisions:

For whitewater recreationists, the lazy flow of the river and surrounding landscape inspired camaraderie, and appreciation of the natural environment, including the fishery.

> We stopped here for our picnic lunch. While we ate and waited to see if the water releases upstream would increase, my husband and I couldn't help but notice fish jumping in front of us. …We discussed how we could find access other than by raft so that we might return some day. Then we thought about how easy, convenient access to this special place could ruin the environment and experience we were so thoroughly enjoying. Roads and facilities bring people and, unfortunately, not all respect the beauty that surrounds us. They bring noise with their motorized vehicles and boom boxes, they litter, and basically disrespect the rights of others to enjoy a place free of such intrusions. …(natural appreciation)

In its current state, this special place provides solitude and a sense of wildness that is highly valued by a particular whitewater recreationist:

> Beautiful rapid with swirling waters, rocks and beautiful trees on the banks. One place you can be in nature—beautiful sights, roaring sounds—feel the breeze and the water. This place is important to me because it is free from buildings, and free from pressures. (natural appreciation)

River Miles 13–15: Hastings Creek to Fowlers

The SFA continues its transition away from development and flows into a landscape of green serpentine rock boulders and swirling eddies, with an occasional Class II riffle. This section of river houses remnants of people who used the river well before the boaters, Native Americans. The river also begins to descend into the foothills of the Sierra, where shadows dance golden slopes spotted with scrub oaks. For many guides, this section of river is a place to work on getting their passengers to paddle as a team in preparation for the lively Gorge ahead. It is a place to relax, lunch, and practice catching eddies. It represents a place of anticipation of exciting whitewater ahead, and the last of the river calm and peacefulness. Again, this reach is a place of multiple interpretations captured during a moment in time, or through years of experience on the SFA. In some instances, boaters identified "environmental signals"—places where a change in the landscape alerts one to what lies ahead, the past, or symbolic meanings of the present changes in the river. Similar to other sections of the river, we see a range of meanings, from goal-directed, to symbolic, to aesthetic. This place evokes meanings relative to personal challenge and growth.

…Boaters identified "environmental signals"—places where a change in the landscape alerts one to what lies ahead, the past, or symbolic meanings of the present changes in the river.

> Gorilla Rock. I once stopped here in a group of rafts with 15 or so others. The bravest of us climbed the rock and jumped in the river. It was very cool seeing the others experience fear and overcome it. (challenge-growth)

There is also a spiritual or symbolic essence to the giant serpentine boulders, where the water swirls and remnants of the past abound…all are symbolic of a different time and place:

> My special place is the rock at the end of the formation that contains Ronald Reagan Rock. This rock has several grinding holes on it from Native Americans. It is a spiritual thing…to think of life before the gold rush. These people lived in harmony with the river. Now Americans do not know how to live in tune with nature, and thus we try to change things to our liking. What a mistake it is! I

> bring kids here and ask them about life in the area before the gold rush. I try to put myself back in time and hear the same sounds and smell the same smells as they did. (native environments)

River Miles 16–20: The Gorge

Alas, we have now entered into the last of the distinctive reaches before Folsom Reservoir—it is the section of river known as the "Gorge Run." The Gorge Run is fondly remembered as an exciting series of Class III rapids, filled with challenge, chaos, and beauty. The lower section (from the town of Coloma through the Gorge) offers boaters an opportunity to "warm up," as the river presents Class II rapids then changes into an exciting series of Class III challenges moving downstream, commonly referred to as the "Gorge." The Gorge section is lined primarily with public lands that are natural and with limited access managed by the Bureau of Land Management. This section of river is considered a highlight, as it weaves through canyon walls and rushes into rolling waves and fast water. It is time to focus down river, and brace for rolling thunder! Fowler's Rock is steeped in stories of boater wraps, flips, and pins. It is a "signal boulder," which identifies the start of Class III whitewater—its mere presence evokes a sense of excitement for what lies ahead, whether an individual has boated it for the first time or the hundredth time. This spot reminds whitewater recreationists of potential chaos, an interaction between human beings and the forces of nature. In the end, meanings transcended a goal-oriented focus and became symbolic of the learned experience:

In the end, meanings transcended a goal-oriented focus and became symbolic of the learned experience.

> …During my training week to become a guide, I was a paddler in a boat that wrapped on Fowler's Rock. I swam the rapids on the river left side of the rock and was able to eddy out not far downstream. I remember being underwater and just thinking stay calm and sure enough the river spit me out when it realized I wasn't going to put up a fight. Needless to say, the whole experience is imprinted in my mind and I think about what I learned there that day every time I bring a trip down the river. Fowler's is one of my favorite spots on the river. (challenge/growth)

For others, the Gorge or rapids within the Gorge symbolize a sense of wilderness, a sense of remoteness that also was reflected by meanings in the upper reach. There are places that symbolize and perhaps reinforce the value of "wildness" so close to an urbanized metro area:

> Coming out of the Last Chance rapid in the Gorge—if you look river right you will see a figure in the rock. To me it looks like a dancing woman. Her hands stretched out to the sky in celebration. I enjoy sharing this rock with friends. Pointing out something not named gives me the feeling akin to being a wilderness explorer in unchartered territory. It is a wonderful thing to find and feel—especially in "bumper to bumper boat traffic" on a Saturday afternoon. (natural appreciation)

…Respondents used multiple meanings to express a range of values and experiences on the river.

River Mile 20.5: Take-Out

It is the end of our journey on the SFA. Before rolling up the boats and stowing the kayaks, it is useful to communicate how many whitewater recreationists interpreted their special place as the entire river corridor—all 20.5 miles. Once again respondents used multiple meanings to express a range of values and experiences on the river. When considering the entire river, individuals reflected on the symbolic value of "naturalness" and "wildness" of the river corridor …

> The South Fork of the American River. It is hard to describe the feeling the SFA gives me in its unmanaged state. Exhilaration, excitement, satisfaction—a lusty combination of all three. Let nature manage itself—it has more experience. The river symbolizes eternal life, birth and rebirth. Isn't it enough that feeling the earth through the medium of flowing water gives us enough pleasure. There's more to life than trying to manage it. Just accept the South Fork on its own terms and let it manage itself. (natural appreciation)

Whereas some recognized the value of naturalness, others were concerned about encroaching exploitation of the corridor:

> …. The seasons change it, the floods change it, the crowds change it. The mansion-fort we stared at floating by, which seemed to portray sturdiness and constancy, is suddenly another rocked boat. Had the property value gone up or down as a result of the rafting boom? How can river users—commercial, non-commercial—ensure that the changes we effect are positive, and that we don't just abandon the mine after we've plundered away the gold. No more ghost towns—of litter, of algae, of concrete, of noise and traffic, of resource exploitation. (protect/preserve)

And, because the journey along the SFA has primarily focused on rafters and kayakers, it is not surprising that they expressed meanings tied to the instrumental value or utility of the river. The SFA is unique in that the very nature of the rapids and access to particular reaches allow for opportunities for the beginner to advanced whitewater recreationist. In fact, meanings symbolized the importance of many developmental aspects of spending time on the river (e.g., friendships, skill, and camaraderie):

…Meanings symbolized the importance of many developmental aspects of spending time on the river (e.g., friendships, skill, and camaraderie).

> The South Fork of the American River represents hours of satisfaction, challenges, learning, humility, appreciation, and rejuvenation. For me, as well as for many of my friends, the SFA has played a major role in the development of our confidence in whitewater boating and in networking with fellow boaters who share our passion for kayaking. There are very few environments where you can find a comparable overabundance of grins and positive attitudes as on the South Fork of the American. (challenge/growth)

Our mile-by-mile journey of the SFA has ended. If you would like to expand your journey on the SFA, the multitude of special place meanings expressed by over 500 boaters is represented in table 3.

Meanings Attributed to Special Places and Implications for Management

> Rivers are arteries…they are bringing down the whole history of the area through them. They aren't just rapids; I don't run rivers because of rapids. I run rivers because they are such a wonderful highway to inaccessible places. There are so many bits of magic that come from being in that environment.[3]

The river trip has come to a close, and we have learned through a review of special place meanings about boaters values and/or concerns. As Jacob and Schreyer (1980) found, some people were very focused and articulate about important elements of their experience along the river, whereas others were somewhat general or unfocused. In addition, experiences along the river did not appear to affect boaters

[3] Carber, J. 1991. Personal communication. Former Raft Guide, Sobek Expeditions, deceased 1992.

Table 3—Descriptions of place meaning: Complex dimensions and their subdimensions[1]

Dimension categories	Quotation
Natural environment and recreational aspects of special place dimensions (n = 264):	
Aesthetic-recreation— Meanings that combine the natural beauty of an area with descriptions or ideas about the recreational activity taking place.	A place of wilderness (or at least it was 15 years ago) few people see or experience because of lack of access. A section that includes quiet float sections and exciting rapids. The famous Gorge with far more to offer than whitewater.
Protect/preserve— Meanings associated with protecting the environment and recreational experiences.	The whole area around the river was wonderful. I would love for the whole area to be left untouched. I don't think the nature should be disrupted. Everything should be left alone. There was not just one special place, all the land around the river was important.
Seasons— The environment of a recreational experience expressed in the context of seasons or changes in the experience that occur within different seasons.	The entire Gorge in early spring on a rainy day. Peaceful, quiet, green, kingfishers, no yahoos. I can run a Class III river without millions of other people. The rafters just take over in the summer. It destroys the tranquility and sacredness of a river to have thousands of people a day on it.
Access— Access to the recreational experience and/or environment in which the activity takes place (positive and negative associations).	This is my first trip to the area as part of rafting excursion. I probably won't end up rafting again, but I may come back to camp. There is no place that really stood out more than any other spot, but what attracts me to this area is a quiet secluded place that is pretty easily accessible.
Environmental signals— Meanings associated with environmental attributes serving as signals or acknowledgments that something was about to happen or a reminder that something happened within that place.	Gorilla rock area where the water slows and pulls up just before coming to the Gorge. Lower stretch. The quiet of this area just before entering Gorge—and where my anxiety picks up—always stands out in my mind. It is still, bird sounds stand out, the water waits for the next part of its journey.
Power/respect— Place meanings that tied the recreation experience to an appreciation or acknowledgement of the natural forces of the river.	Meat Grinder. A great place to get overconfident and see what the power of nature can do to you if you don't respect it. Absolutely beautiful rock formations in the river.
Degradation— Meanings associated with observations of degradation (experiential or environmental) that have implications for enjoyment and the overall recreational experience itself.	Very beautiful and exciting, but I was VERY upset about the gasoline powered gold retrieved machines. They are loud, ugly, and they appear to be digging up a significant amount of the riverbed (this was determined by the murky water that resulted).

Table 3—Descriptions of place meaning: Complex dimensions and their subdimensions[1] (continued)

Dimension categories	Quotations
The social and recreational aspects of a special place dimension (n = 179):	
The gathering place: Place meanings that recognized the social nature of a place or experience. Recreation is prominent, yet the chance to meet people or others that have similar interests is also present.	Fun rapid with several runable lines. Some people gathered around enjoying the river, watching others run the rapid. Had fun running the rapid and hanging out on shore for a while afterward, socialize with the other river runners and spectators.
Challenge-growth: Place meanings associated with personal growth or witnessing the growth of others within the context of a recreational pursuit.	This is the first big rapid on Chili Bar. I have some good memories of being nervous before it. It was definitely one good confidence boost after running it. It's my favorite rapid on the upper stretch due to its length.
Shared experience/family: Place meanings associated with recreational experiences with special emphasis on sharing the experience with family and friends.	Exciting, wet, exhilarating, swirling water, refreshing. Sharing the thrills with friends and relaxation.
Enjoyment: The enjoyment of watching others engaged in a recreational pursuit.	I like the excitement of the rapids and I also enjoy seeing all the other people just having a good time on the river, fishing, swimming, panning for gold, people of all ages were enjoying themselves.
The natural environment and human aspects of a special place dimension (n = 48):	
Natural appreciation: Meanings associated with sharing an appreciation for the natural heritage with others. An event in a place that is shared and refers to the natural attributes of that environment.	Emily is still a very close friend and occasionally accompanies us. I remember the day we had the beach to ourselves and a squirrel waited anxiously for a hand-out. I tossed a small piece of lettuce which the squirrel ignored and it treated the bread crust the same. But when Emily put down her empty yogurt container, the squirrel snatched it and licked it clean. I cherish the sighting of a golden eagle flying overhead with a snake dangling from its talons, and a hard rain beating the river's surface into a froth. I love its sameness. In an ever-changing world, sameness is comforting.
Native environments: Meanings associated with places that evoked a sense of kinship with humans that lived in the area prior to present day (cultural heritage).	The sense of being part of a long history of different people associated with a river of beauty. The merger of human endeavor and natural habitat.

Table 3—Descriptions of place meaning: Complex dimensions and their subdimensions[1] (continued)

Dimension categories	Quotations
Protect and preserve: Meanings associated with protecting the environment from the impact of humans. Environmental messages shared with others or emphasized within the context of special places.	As the sun was sinking low on the horizon the deer made their way to the river to drink, the turkey vultures bathed and hung their wings to dry and a river otter hauled out on one of those cottonwoods that dared to fall to the floods. My spirit was lifted to see that the river corridor continues to provide habitat to El Dorado's wildlife even within 100,000 boaters each season and the free hand of capitalism at work this spring after the floods. Please preserve this educational resource!

Note: The total response represents the number of comments made within the category described. This number does not necessarily depict the number of individuals who responded; some individuals may have cited one or more places that fit the category.

[1] Adapted from Bricker and Kerstetter (2002: 412–414).

uniformly (Kyle et al. 2003). Regardless, we found that meanings seemed to "eddy" around three complex dimensions depicting the experience and meaning of a self-identified place. The first dimension, the natural environment and recreational aspects of a special place, comprised the following subcategories: aesthetic/recreation, protection, degradation, seasons, access, environmental signals, and power/respect. The social and recreational aspects of a special place also in-cluded several subcategories of meanings: the gathering place, challenge-growth, shared experience, friendship, and enjoyment. These subcategories reflect the com-plexity of this dimension and demonstrate that places combine humans with experiences to produce special places in the minds of rafters and kayakers. And lastly, the natural environment and human aspects of a special place reflected a combination of human and social influences with environmental concerns, appreciation, and appeals to continue to protect the natural resource; three subcategories emerged from individuals' responses: natural appreciation, native environments, and protect and preserve. These subcategories further address the complex interactions between human beings and their environment.

…Some individuals' descriptions of special places included references to seasonal changes and changes that occur based on the type of water year.

Almost all of the boaters sharing their experience and special places on the SFA were from California (see Bricker 1998 for specific information). Some had boated the river once or a couple times, whereas others had spent a lifetime exploring the river and sharing it with their friends and family. As a result, some individuals' descriptions of **special places** included references to seasonal changes and changes that occur based on the type of water year. Some were quite sensitive to degradation, whereas others noted the magic of the river and its changing personality.

According to Williams et al. (1992), there is growing recognition that outdoor recreationists attach meaning to the places in which they recreate. As a result, understanding the meanings they attach to places can help resource managers identify segments of users (Warzecha and Lime 2001) and document who is most likely to respond (positively or negatively) to proposed changes associated with the resource (Moore and Graefe 1994). If management were to allow development along, for example, the "Gorge," a well-known, challenging section of the river, undoubtedly a large segment of the population would respond negatively. Individuals have recognized that the "Gorge" provides challenges for boaters as well as enjoyment associated with having run a Class III rapid successfully. It also engenders a deep respect for all things natural. Thus, allowing development to encroach upon one of nature's masterpieces would raise the ire of many boaters and prove to be a "political nightmare" for management.

The benefits of documenting and responding to users' attachment to outdoor recreation areas include, but are not limited to, improving long-term users' satisfaction with the management of the resource and capitalizing on "attached" user's willingness to volunteer time, energy, and money to important issues facing the resource (Moore and Scott 2003).

The benefits of documenting and responding to users' attachment to outdoor recreation areas include, but are not limited to, improving long-term users' satisfaction with the management of the resource and capitalizing on "attached" user's willingness to volunteer time, energy, and money to important issues facing the resource.

On the SFA, there were boaters that characterized not only the entire river corridor, but also particular reaches, rapids, lunch sites, natural and cultural features, and camping sites. Having respondents identify specific geographic places and meanings associated with these places may provide managers with a better understanding of the nature of respondents' attachment, ultimately informing decisionmaking and the creation or amendment of resource management plans. For example, respondents described the upper reach as an area along the river that allows for shared experiences with family and friends. It also provides exposure to a wilderness unlike any other. In contrast, the Coloma-Lotus/Bio Bio Run is recognized as a place to enjoy challenges and experience a day of camaraderie. According to Williams and Vaske (2003), both areas along the river provide users with "place identity." Assuming this is true, managers must allow users to bond with the river through relationships with other boaters and the resulting emotions associated with being on the river. If, on the other hand, users were found to be more "place dependent," the strategy would be to focus on the facilitation of important activities.

In summary, through an exploration of place meanings of one type of recreation stakeholder on the SFA, we have learned that the symbols and symbolic

images associated with the river have direct impact on individuals' lives and experiences with the river corridor. It was also evident that in some cases, individuals perceived that aspects of the river were already changing (i.e., encroachment, degradation, crowding) and impacting meanings they associate with the SFA. These results support Williams and Patterson's (1999) framework. Meanings were not only instrumental (i.e., the SFA was a good place to learn kayaking), but were tied to places where events occurred and were remembered within the context of a special place. Further, symbolic meanings were framed within various thematic dimensions, from sections of river unaltered by the impacts of humans symbolizing wilderness, to the flow of water symbolizing renewal and continuity, to native grinding stones symbolic of a simpler time. Whitewater recreationists related to the natural and social factors that formed meanings in the context of a recreation experience.

Because the boating community on the SFA described a range of special places, including the entire community, the river corridor, reaches within the corridor, and specific locations, changes to specific places within a resource may have enormous impact on individuals' perceptions of the entire river corridor. For example, if a place is conducive to peace and serenity, and managers decide to build an access area (i.e., put-in, take-out), such change may drastically impact the perceived value and ultimately the entire quality of the recreation experience. Knowing what places are special to a wide range of users, as well as the meanings or values attached to those places, can assist managers in preserving the character of experiences so often endangered by the encroachment of society on natural areas.

Exploring what has often been termed "hard to define values" (e.g., sense of place), resource managers have the opportunity to address the entire ecosystem that includes not only the natural environment, but also human relationships with the environment.

Exploring what has often been termed "hard to define values" (e.g., sense of place), resource managers have the opportunity to address the entire ecosystem that includes not only the natural environment, but also human relationships with the environment. By addressing issues that are emotionally, intellectually, recreationally, and spiritually important, managers increase the likelihood of finding acceptance and support for future plans and perhaps become more sensitized to endangered experiences within the resource they manage.

Metric Equivalents

When you know:	Multiply by:	To get:
1 foot	0.304	Meters
1 mile	1.609	Kilometers
1 cubic foot per second	101.9	Cubic meters per hour

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Chapter 6: People of the River—People of the Salmon
Wana Thlama-Nusuxmí Tanánma

Elizabeth Woody[1]

> *From the time you are born, you are eating salmon. You eat salmon all year round. The salmon is in your bloodstream. Ceremonies are all about the salmon. We talk to the salmon. Salmon are so important to all of our people. Salmon is our life. When the river smells of salmon, you know that is a healthy watershed.*
>
> Billy Frank, Jr. speaking to students at Willamette University (Casper 2006)

We asked the students if they knew what the Boldt Decision meant and what an Indian treaty is.

Nisqually elder Billy Frank, Jr., inaugurated the "Conversations in Indian Country" series in Salem, Oregon, with elder Hank Adams, with the statement above. Both elders have been recognized and honored throughout the years for their contributions to Northwest Native people's political growth. After a bit, we asked the students if they knew what the Boldt Decision meant and what an Indian treaty is. Most of the students openly acknowledged they did not know. This amazed Frank and Adams, as they were deeply involved as strategists and major figures in what the Northwest called the fishing wars of the sixties and seventies that defined our present comanagement of fisheries. Still, it is an era barely recalled for most people of the Pacific Northwest, an era before the Endangered Species Act, the Northwest Power Planning Council, or the International Salmon Treaty.

It is from the perspective of a beneficiary of the work of people like Frank and Adams that I write of the relationship tribal peoples hold with water, specifically water emanating from the Columbia River, and the beings dependent upon it. One of those beings, salmon, is celebrated and respected by tribal peoples and First Nations for its tenacity, mission, and mystery.

My tribal people can no longer enjoy freely drinking the untreated water of the Columbia as the river has become pervasively contaminated. What is more appalling is the obstruction of the river's flow by hydroelectric dams, that often obstruct passage of the nutrient-rich return of salmon to the interior lands, and the havoc wrecked upon plants and animals by industries that depend upon water resources.

[1] Elizabeth Woody is a writer and artist, 2036 SE 11th Ave., Portland, OR 97214.

More than 80,000 coho and chinook salmon perished in 2002, dying prior to spawning in warm waters.

It was only a few years ago that national press covered the protests of Klamath farmers water restrictions imposed by the U.S. Fish and Wildlife Service for preservation of threatened fish species as they opened floodgates to release water to irrigation fields amid cheers. After this, more than 80,000 coho and chinook salmon perished in 2002, dying prior to spawning in warm waters (U.S. Congress 2006). In 2006, Oregon and California commercial fishers pleaded for emergency relief as their fleets lay idle at docks when the fishery was closed. During all of the events, tribal peoples of the Klamath Basin called for decommissioning of the dams on the Klamath River, and the Karuk provided economic benefits for doing so in a report called *Preliminary Economic Assessment of Dam Removal: the Klamath River* (Kruse and Scholz 2006). All a logical chain of events when we look to the policy of overallocation of water in an arid country not well suited for agriculture.

Tribal peoples of the Klamath Basin called for decommissioning of the dams on the Klamath River, and the Karuk provided economic benefits for doing so in a report called *Preliminary Economic Assessment of Dam Removal: the Klamath River*.

With an intimate awareness of the cyclic return of species as dependent on the ocean atmosphere as it is on the headwaters and Cascade snowpacks, tribal people consistently ask for a whole-systems approach to water management. It is evident that aquifers and forests regulate watershed productivity, as do marshlands. It is evident that climactic heating is demanding world-wide attention. All aspects of our water and natural resources are impacted by a century and half of sectional thought processes. There are orange people and apple people, people who think in segmented categories and in degrees of separation, and those who think holistically, from an interdependency perspective.

My tribal ceremonies begin and end with water. The food chiefs are recognized in order from the river to the mountains, and, conversely, in real life, it is the same with water. Water goes from the mountains to the Pacific Ocean as streams, creeks, and rivers, and returns from the Pacific to the mountains, as precipitation. It is our highest medicine and represents the purity of human interaction and respect as we keep it clean and revere its presence in our lives.

My hero, Billy Frank, Jr., demonstrated his lifelong commitment to community and to salmon by his civil disobedience in youth and by his call to action throughout his life. It is said that before the age of 16 he was arrested over 60 times. At 75 years of age, he speaks with the authority of hard-earned respect. He understands that the climate change in our times is the defining factor in our future and our ability to flourish. He understands the absence of salmon portends greater losses. This is more evident in the issue of freshwater and the ocean. It is evident in salmon, as they are one of the oldest keystone species of the Western Pacific States. Their historical range is from Baja, California, to the northernmost reaches of the Yukon Territories and Alaska (State of the Salmon 2007).

Franks' policy experience comes from more than 20 years of service as chairman of the Northwest Indian Fisheries Commission (NWIFC). His authority was his father who lived over a hundred years and served as expert witness during the trials concerning Native people's right to fish in the Pacific Northwest. In the 1970s, the landmark decision called the Boldt decision upheld treaty rights, and from that day forward, the state could not punish Native peoples for fishing, as they were entitled to 50 percent of the salmon's numbers that returned to home spawning grounds. Not only did Native people retain the right to fish in usual and accustomed places in treaty, but they presently insist on comanagement of the resources, and remain to this day vigilant over the fisheries.

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The NWIFC is a nonprofit organization and represents several tribal groups through policy and comanagement of salmon and watersheds in the Puget Sound and western Washington. Its counterpart, the Columbia River Inter-Tribal Fish Commission (CRITFC) mandated by four tribal governments of the middle Columbia River basin does the same. The drastic decline of salmon in the lower 48 States represents the unhealthy effects of industrialization and commercial fisheries on the resource. Conversely, in healthy watersheds, the salmon return in abundance. When obstructed, polluted, diverted for agriculture, heated by lack of tree and vegetation buffers, muddied water produces little of its salmon, trout, or other species of fish that feed the system of eaters. The people, the animals (bears, eagles,) and others suffer from starvation. The soils are bereft of nutrient return from the oceans, as there are no fish returning.

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In Frank's time, he saw the abundance when everything smelled of salmon. To have the ground from the smokehouse to the banks littered with spawned-out salmon carcasses is to have our waters returned to health, and the people rejoice. Billy Frank, Jr., as elder, asks us to remember the magnificence of our natural bounty, the waters of the Pacific Northwest rearing their most defining species, the salmon.

I was a child of a rural community, far from the state and federal policymakers. When decisions were made that affected Native foods most, Native peoples did not even have the right to vote. Like most young people, I did not think of what happened before me as a matter of importance to my present. I ate the salmon, venison, roots, and berries prepared for me at the longhouse I attended with my grandparents without concern for it.

I did not grow up along a river, but along an irrigation ditch at the edge of a town called Madras, Oregon. Later, in my early teens, I lived along the Shi-tike

Creek at the Indian agency on the reservation. Most of my adult life I lived within a mile of the Willamette River, the easternmost part of the Watlala territory of my grandfather's mother's people. The irony of an "East Indian"[2] town bordering the Confederated Tribes of Warm Springs Indians didn't hit me until many years later. I recollect the pronunciation of the ads on Portland TV hyping up the funky little road show movies and the circuses that toured the state. They always pronounced Madras as "Mah-Drahs," not as the locals pronounced it as "Mad Dress." A friend jokingly said, once, "Didn't they know you weren't East Indians?"

The mighty Columbia was over a hundred miles away, and whatever spring time water flowed through a burgeoning Willow Creek, or cold Shi-tike Creek went there, eventually. It met the Pacific to be drawn up by the sun and wind, driven inland to rain. In the high desert, in the rain shadow of the Cascades, we received a bit less than 10 inches of precipitation a year.

The frogs made use of the irrigation ditch for pollywog nurseries shaded by the slight willows and cattail that surrounded what the neighbor kids called ponds. The creek itself was slim and brackish. It offset the delicate and varied chromatic dragonflies. At night, the chorus of frogs reverberated in my dreams. My childhood was spent outside on the land, and a great deal depended on the presence of water in that nameless ditch. It was what invigorated the place with mysterious creatures. More than that, it bred the insects, an important piece of the food chain.

At dusk, I'd sit in the bowl of aromatic willows we made into a maze. In the willows, our human smell was overwhelmed. Our dogs would run the maze sniffing the willow-masked air for us while we hid from them. It was a great old stand of willow. At dusk, the high desert sunset and overpowering presence of stars was magnificent. Dusk was a sliver of neon blue. You could see the silhouettes of bats and swallows crisscross the horizon. You could smell the water in the cooling heat. On summer days of thunderstorm, you inhaled the beating of high desert dust with its rain coming for miles in the sultry decadent heat. The thunderheads held heat close to the land as a down comforter does over one's body.

With my eyes opened wide and night vision sharp, my ears registered the night's calm over the basalt-rimmed hill west of our house. Absent the usual bustle of cars on the highway, tranquility accentuated the crescendo of night's mysterious

[2] East Indian meaning Madras, India, as most people spoke of it before knowing the small county seat of the complex of communities in central Oregon.

sounds. Magical frogs in the frenzy of ecstatic love lured their mates. It was water that made it all possible. As far as the irrigation ditch went, it meant it was a healthy place.

This simple bliss transformed into my first passionate love, the Deschutes River basin. The Crooked River and Metolius River merge into the Deschutes River. The Warm Springs River meets the north-going Deschutes near a red canyon of incredible volcanic soils and rock called the Hot Springs (Milee) or Kah-Nee-Ta Vacation Resort. My great-great-grandmother raised my grandmother Elizabeth Thompson Pitt (Mohalla) here, and this is where she first fished with a simple pin hook and bait. She walked upon this land with her horse and dog, solo. She told me of her childhood and it was like mine. Her grandmother instructed her to take only what they could eat. The rule was let the rest grow.

A few miles upriver, a stretch from the Hot Springs, is a place we call "Dry Creek." This is where her first cousin and her mother's sister lived. I eventually caught my first trout in the area next to my great-uncle's sweat lodge. I pieced together my gear from a left-behind acrylic pole of my mother's, an unclaimed raspy automatic reel, and a loose fly hook that was not in my grandfather's special lot. The lively trout was brought in at dusk; I was alone. I forced my uncle to stop at Rainbow Market to weigh it at their meat counter. The butcher was deeply amused and said it was a "whopper." It weighed 8 pounds and must have been a wild steelhead.

These rivers have been an intimate part of my natural life for generations. It is "storied" by my parents, my grandparents, and my great grandparents, and so on. Today, the vanishing of our Native/traditional salmon runs parallel the absence of our Native languages being spoken along the shores of the rivers and streams. The languages of Kiksht and Ichiskiin sound fluid and lilting as the rivers. Our native languages reflected the flourish and abundance of the lands.

We understand less with each language's absence, as a tribe loses its knowledge as well as the knowledge of the geography itself.

We understand less with each language's absence, as a tribe loses its knowledge as well as the knowledge of the geography itself. This is where the language came from, and the source of the people's beginning as told in story. When I asked my grandmother to translate the words of a Worship (*Waashat*) song I liked, she said, "You would have no questions if you knew the language. This is our teachings." I wrote in a poem an excerpt of what she said, "The Light is Pure./ Our Hearts are pure./ We see God in this light./ We are pure light in ourselves (Woody 1994). My friend, Gloria Bird, said to me in response to these lines and my wonder at their

meaning, “Our ancestors lived along the rivers as center of our life. Maybe the light is the river’s surface and we are the reflection of its light. That is how the song began from light on water.”

As a child, our codes of conduct in the community were embedded in the language and these esoteric worship songs. I did not understand the language, but it is rote in my lyrical memory of language and gifted from its rhythms a different intelligence, the beat of hearts reverberating silence between each pulse. It was a holistic worldview that spoke of unity with the Earth, the sky, waters, and our little relatives upon the land. The law was unwritten, and our responsibility was to be the “voice of the land.” That is our law.

We presently lose our little relatives, the fish, even without extinction as contaminated rivers yield altered progeny. In the Columbia River, the major contaminants impact the genetic material of people and fish alike with radiation and other deadly contaminants from the Hanford nuclear site. This negligence affects what Siletz elder Agnes Pilgrim calls the animals and plants, “the silent majority.” Each species represents a language of its own, given to it from Creation from Nami Anithla or Nami Piyap. **“**Nami Anithla or Nami Piyap is representative of our maker or elder brother [who] placed us here” (Winishut 2006).

Billy Frank, Jr., clearly represents our natural resources as our relative: “We are going to be here. The [U.S.] president is a shorttimer. The administrator is on his way to something better than management of our natural resources, our relatives. We will fight with all our courage and strength to save life!” It is our belief that when one moves and speaks, it affects the world, and that is part of our law. Our power is in song, and in dance. Our thoughts are imbued with love and admiration for the river’s energy. We have no way of pulling segments of this understanding apart for pedantic matters. We live by example thoroughly impassioned, as Billy Frank, Jr., does.

There is no simple way to translate reverence for water and unique beings that share the system with indigenous peoples, particularly the Pacific salmon. Speaking to my tribal friends and relatives, I asked them what they thought nonutilitarian usages of water meant. All balked at the question. Even in waste, water is used. It flushes through the rivers and through the soils, rushing to the mother of all waters, the ocean. There is positively no concept of water as nonutilitarian. My Uncle Louie Pitt, Jr., Director of Intergovernmental Affairs and Planning at the Confederated Tribes of Warm Springs, Oregon (CTWSO), told me, “Water is transitory. It is pervasive. It is our sacrament. That [water] is all there is.”

A simple human being, mostly water, part minerals and electrical charge, is embodiment of the land, and microcosm of the Earth. Water represents indigenous peoples' sovereignty and is the central element we must share with all. No animal hoards water, but man. From the beginning of time, Natural Law, Tamanwit, a spiritual prerogative instructed my people to conserve water, keep it pure, and ask for its return. Water is a sacrament in our religious practices and overarching medicine. It is the central symbol of our cycle of ceremonies. Along the "Big River," the Columbia, we wake with a drink of water, and close out the day with a sip and prayer. Every meal is the same. The steam of our sweathouses purifies the body of toxins. Water equals all life. These laws are not simplistic, but require a life-long commitment as one is born with a voice, a spirit, and purpose. Our individual voice or songs provide us a sense of unity and cohesion despite our individualism. Everyone respects the other.

For us water is alive. What you receive bottled, while pure, requires action of rolling over the land to molecularly remain "alive" and active. No one can argue it is nonessential. Paul Pearsall, in *The Heart's Code* (1998), says water is considered the major source of energy and wealth in Hawaii. He maintains that "lump of water" or life energy is called "pu uwai," "the heart" in Hawaiian. Our "lumps of water" retain their own memory and independence from the brain. Like water, we are subtle for the most part, move toward what is greater, wear through obstacles with tenacity, and evaporate from one form to another in spirit. Like water, our essence is transitory.

In the *River of Memory: The Everlasting Columbia,* I wrote of the Salmon Feast at Celilo Village near the former site of Celilo Falls, or Wyam (Layman 2006). It was an ancient fishing village for over 14,000 years and was destroyed when the falls was inundated by the Dalles Dams in 1957. It illustrates the cycle and instruction in the act of liturgy and metaphor**:**

> Loss of Wyam caused pervasive sadness, even in celebratory events. The old Longhouse is gone. The Wyam, or Celilo Falls, are gone. Still courage, wisdom, strength and belief bring us together each season to speak to all directions the ancient words. There is no physical Celilo, but we have our mothers, fathers, sisters, brothers, and our children bound together for all possible life in the future. We are salmon *(Waykanash).* We are deer (*Winat*). We are roots (*Xnit*). We are berries (*Tmanit*). We are water (*Chuush*). We are the animation of the Creator's wisdom in Worship song (*Waashat Walptaikash*).

> The spirit of the "Place of Echoing Water upon Rocks" is not silent. We care for the river and the life of traditional unity, the humble dignity, and purity in intention—wholeness. Ultimately, we restore life with our attention and devotion. Each hears the echoing water within.
>
> The leader speaks in the ancient language's manner. He speaks to all in Ichiskiin. He says, "We are following our ancestors. We respect the same Creator and the same religion, each in turn of their generation, and conduct the same service and dance to honor our relatives, the roots, and the salmon. The Creator at the beginning of time gave us instruction and the wisdom to live the best life. The Creator made man and woman with independent minds. We must choose to live by the law, as all the others, salmon, trees, water, air, all live by it. We must use all the power of our minds and hearts to bring the salmon back. Our earth needs our commitment. That is our teachings. We are each powerful and necessary."
>
> All lift their hands palms open and upward to acknowledge and recognize the speaker's truth: the presence of the Creator's strength is among us and inside us. The words enter the greater and expansive essence of living earth. We are land. We are water. Our passion is the fire in our home's hearth. We all exchange the same air in exclamation. We are all one.

Negotiations are conducted with agencies of counties, states, and federal administrators, and it can be difficult, as many do not understand the binding agreement between the United States and tribes.

The "People of the Salmon" and "People of the River" speak and care for those who cannot. This includes foods that are on private and public lands. Negotiations are conducted with agencies of counties, states, and federal administrators, and it can be difficult, as many do not understand the binding agreement between the United States and tribes. When one administrator moves on, a new person must learn. Effects of habitat loss and pollution in the rivers are spreading beyond the tribes' concern centered on native diet to impact all who eat within the water and natural food shed.

However, it is tribal peoples who call the first alarm. The tribes possess senior rights, have the right tools, and understand the management of the resources for the protection of health, prosperity, and future for all.

Comanagement agreements start to look beyond short-term planning to ones that look forward through multiple generations. When tribes speak of "holistic" understanding, this means renewal. The whole is the land's animated and less animated beings working within a system of complex exchange for balance in a temporal realm. Warm Springs Chief Delvis Heath said to me, "We are not here long. We work hard in our lives but we work for more than ourselves. Our future is considered many generations ahead, and it includes our little relatives, the salmon and the life we depend on to live well."

In 1992 the Warm Springs people, comprising three distinct groups of people, issued a Declaration of Sovereignty outlining the precepts of self-governance for the tribes in the terms above. It restates that tribal government is the senior government in our area and as a sovereign entity possesses the right to conduct its business by ancient law and languages: "At the time of creation the Creator placed us in this land and He gave us the voice of this land and that is our law" (CTWSO 1992).

My water legacy, and therefore my primary responsibility, comes from my maternal grandparents of the Columbia River plateau of the Warm Springs people, and the Yakama Nation. I am born for the Bitter Water Clan of the Navajo Nation, too. My grandfather's people were the Middle Columbia River Chinookan peoples: Watlala (Cascades), Wasco, and Wishram. My grandmother's father was from Wyampum (Echo of water upon rocks), or Celilo Falls, and he moved to Warm Springs. Many of his relatives went to Yakama Nation. Her mother was from the Hot Springs, the Milithlama along the Warm Springs River. Some called her people Tygh, Walla Walla, Wyampam, Laqw'ik, Yaka'ama, Shitaikthlama, and Axmithlama (Winishut 2006). My sister's father was Clatsop, and as my stepfather for several years, you could say I had the river covered as it went between the present states of Washington and Oregon. The river united us, not separated us.

My maternal ancestors held their place on the river for over 31,000 years, according to the archeological evidence of first human inhabitation of the Columbia River basin (USDA FS 2006). As I have said before, beside the Great River we ate four sacred foods: salmon (*Waykanash*), deer (*Winat*), roots (*Xnit*) and berries (*Tmanit*), and always start and end our ceremonial meals with water (*Chuush*). The foods are religious sacrament. The Creator's wisdom is held in worship song and dance (*Waashat Walptaikash*). This was elemental purity. The treaties reserved the rights of tribes to fish, hunt, and gather in "usual and accustomed places," and this includes the practice of our beliefs.

Sadly, colonial empire destroyed every native religion in Europe and tried to do the same in the Americas. The Columbia River plateau people practiced their

religion from a time beyond memory without break, and did so despite great oppression. The Native American Religious Freedom Act of 1979 finally ensured religious freedom applied to Native peoples.

Jay Minthorn, Umatilla tribal member, and Chair of the CRITFC told me recently, "Our great river is the arterial blood system of a great basin. It used to mean our fish would return to feed the people, and all the life outside of human needs. We cared for it. We drank it right from the river in the fifties. That is how pure it was before all the industrial waste. Our fish indicated its health and the wealth of all that water."

Antone Minthorn, said it from the start: "Clean the water and return the river to health. Get the salmon back and healthy, the rest falls into place naturally. It all adjusts. You take care of the water, and this helps the fish. The fish return, it takes care of the rest. It's as simple and as powerful as that."

I smiled and said, "I drank wild water in Warm Springs without filter or water plant."

Jay sagely smiled, "Then, you know its power."

Jim Lavadour (Walla Walla) spoke to me a few weeks later, "Working in natural resources many years ago, the beginning of recovery was clean water. From this simple rule the entire system restores itself. Antone Minthorn, said it from the start, it all begins with that, simple enough. Clean the water and return the river to health. Get the salmon back and healthy, the rest falls into place naturally. It all adjusts. You take care of the water, and this helps the fish. The fish return, it takes care of the rest. It's as simple and as powerful as that."

Chief Alexander (Dranjik Gwich'in) emphatically reiterates this in discussions on cleanup of their Yukon River system, "We have the utmost respect for Water. The ancestors tell us water is life itself… You know what I want? I want clean water. It's as simple as that." For over 30 years, Chief Alexander has been highly regarded as leader with firm indigenous values, strong coalition-building skills, and extraordinary vision, and he belongs to the life stream of Gwich'in life, the Yukon River. He resolutely advocates for its integrity. He and his coalition of Gwich'in leadership built a tremendous accord whose mission is to have "drinkable water" from the river in 50 years.

"We have the utmost respect for Water. The ancestors tell us water is life itself… You know what I want? I want clean water. It's as simple as that."

People called this system a "subsistence culture." Subsistence makes our lives seem perilous and our economy "barely making it." Subsistence is a word Chief Clarence Alexander protests each time he hears it. Wealthy and wholly bonded with the rivers, we left the water in stream as it produced greater economic benefit for the tribes. Our food stores from it were incredible, as William Clark observed 200 years ago: 107 baskets containing about 10,000 pounds of dried salmon, prepared by Indians at Celilo Falls (Egan 2003). Annual salmon harvest in the early 1800s

before decline was estimated at 42 million pounds with average yearly run sizes of 10 to 16 million fish. The efficiency of the village and business centered on gathering food stores in the proper season.

Young Chief at the 1855 Treaty Council explained how the earth provided all the food the Cayuse, Umatilla, and Walla Walla peoples needed:

> "I wonder if the ground has anything to say? I wonder if the ground is listening to what is said? I wonder if the ground would come alive and what is on it? Though I hear what the ground says. The ground says, it is the great spirit that placed me here. The great spirit tells me to take care of the Indians, to feed them alright. The great spirit appointed the roots to feed the Indians on. The water says the same thing. The great spirit directs me, feed the Indians well. The ground, water and grass say, the great spirit has given us our names. We have these names and hold these names. The ground says, the great spirit has placed me here to produce all that grows on me, trees and fruit. The same way the ground says, it was from me man was made. The great spirit, in placing men on the earth, desired them to take good care of the ground and to do each other no harm.

I must emphasize Native subsistence practices are not rights given to a tribe by the United States, but **rights retained** through previously mentioned treaty negotiations with a tribe. Tribes held senior rights and responsibilities for a large area of territory, marine ecosystems, and waterways. From "Time Immemorial," thousands of years before the present, Indian nations possessed "innate sovereign rights and responsibilities. Our sovereignty is permeated by the spiritual and the sacred, which are, and always have been, inseparable parts of our lives, for the Creator leads us in all aspects of our existence" (CTWSO 1992).

Indian treaties are "Supreme Law of the Land" and guaranteed by the U.S. Constitution. From 1790, under the Articles of Confederation, the Constitution granted Congress the sole right to regulate commerce with the Indian tribes. A series of Trade and Intercourse Acts (1790-1834) established boundaries of Indian land and prohibited non-Indians (including states) from taking/settling on Indian lands (through purchase or treaty, etc.) without federal approval. Indian Agents, appointed by the federal government, acted as liaisons between the federal government and the tribes. Treaties allowed private ownership through settlement. The CTWSO ceded 10.5 million acres in the Treaty of 1855 and in the Columbia River basin the tribes ceded approximately 30 million acres in all.

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Outside these constrictive terms, these specific relationships exist from simultaneously developed streams and time-honed systems of cultural codes, rules of conduct, and plural management for indigenous peoples and the land base. It is not "policy," per se, only the living of tradition as sovereigns. Tribal peoples describe themselves as one and the same with beings like salmon in importance.

People say to eat traditional foods is to return to the purity of the greater system through one's own body.

Natural laws of the Creator are unwritten laws and inescapable. Animals and plants do not break these laws. Only people do. Nez Perce-Tohono O'odham scholar, Cecil Jose quoted Bill Yallup, Sr. (Yakama, now deceased), on natural law, "That is why Indigenous peoples, like the ones I know, and are part of say: We are charged with the decision making powers to protect the **L**and, **A**ir and **W**ater!" What is lived well endures. In tribal culture, with authority of tradition, "we express the voice of the land and law." We reconcile the past with the present framework of working knowledge to unify the responsibility for regeneration. People say to eat traditional foods is to return to the purity of the greater system through one's own body.

We must do so because we **will** die without the knowledge culled from mutual enrichment of coexisting with species on an equal basis. Anishinabe spiritual leader Bawdwayadun told of a prophecy that "in thirty years the abuses of the water will result in severe shortages and only those that can afford it will have water to drink, and if we don't do anything about it, our water will cost the same as a ounce of gold." As in all prophecies there is hope. In this prophecy the hope is in the word, "if." Bawdwayadun, in ending his teaching, hauntingly asked of the audience, "What are you going to do about it?" (Kuckkahn 2006).

As a native person, I grew up noticing the general sadness pervading events, even those that were celebratory. In the somber cloud of memory, omitted events whispered behind our own words hushed by the fear of loss of emotional control in the present. The loss of Celilo Falls, our village, and fishing site is the most painful of memories. People are still hushed in their grief and anger. The people are all those with the memory of the "echo of falling water." The multigenerations of mistrust come from the loss of something cherished, the incremental loss of land, livelihood, and independence. This loss nearly crushed the People. The United States seemed to exalt a few with ample rewards and sacrificed salmon as a whole.

In *Fatal Years: Child Mortality in Late Nineteenth-Century America*, Preston and Haines (1991) stated this condition of becoming weak in terms of what happened on the Yakama Reservation:

> All the elements surrounding mortality on the Yakama Reservation, including the destruction of food resources, are difficult to quantify, but we know they influenced the mortality of the reservation thoughout the twentieth century. As a result of the destruction of food resources, white invasion, treaty making, the Plateau Indian War, political subjugation, Christian conversion, forced removal, relocation, and the reservation system, Indians living on the Yakama reservation suffered a social anomie or depression that contributed to ill health and death. (Preston and Haines, quoted in CRITFC and Meyer Resources 1999: 46)

As the CRITFC relates, I paraphrase here: Wealth went from the hands of the original inhabitants to the settlers who migrated West escaping from poverty themselves. Watson Totus protested the building of The Dalles Dam before the Senate Subcommittee on Civil Functions for the Army on May 12, 1952, with these words:

> My People fished at Celilo and many other tribal fishing places, both above and below the falls. The religion of Washat was the tribal religion. The spiritual teacher told the people that salmon was blessed by the Great Maker who made the sky, divided the waters, made the earth, and from it created man who breathed wind from the sky. The Great Maker blessed the water he drank and that which went to the animals and plant life.
>
> The Salmon was then made a sacred food, second to water in the Yakama tribal Waashat religion… I am one of the leaders of that original religion. I teach my people that 1) water is blessed by God, 2) salmon is blessed by God and it is the first food we partake of in the Waashat church ceremonies on Sunday, fresh fruits festival, and "first salmon-catch" festivals (Dupris et al. 2006: 375).

All of this does not identify the stress and oppression felt by the population in terms of loss of self-reliance. Tribes are attempting to heal themselves after trauma through a process that is their own. In Minow's book *Between Vengeance and Forgiveness: Facing History After Genocide and Mass Violence*, she says, "The language of healing casts the consequence of collective violence in terms of trauma; the paradigm is health, rather than justice (Minow 1998)."

Systemic holistic understanding of a land's resources also means you respect it enough to know your own life is at risk with loss of the resources. The Creator, our ultimate authority, and I paraphrase here, said, "As long as Nature is taken care of, it will take care of you." Traditional wisdom is "systems thinking," being in it and still recognizing patterns, "interrelationships, and learning how to adapt human behavior to accommodate the system in proper timely action" (CRITFC 1995a: 2–5). We can and must change.

"As we are served, we must also serve," that is a basic tenet of tribes who originally lived along the Columbia River. Spirituality is a significant means of health for indigenous peoples. Ceremony restores the whole, no matter where and who is holding it in the world. "That is the Law," as the leaders will often say in the Longhouse.

Tribal concepts of purity include the belief that purity in thought, water, food, and land is an extension of self.

Tribes cannot ignore what is most powerful in these "teachings," particularly, when you look at tribal concepts of purity. Purity in thought, water, and food, and land is an extension of self. It is essential for survival. For many tribes of the Northwest, gathering together to fish or to feast generates a place of spiritual well-being. The Longhouse serves as a physical place for our thoughts to center on the best living we can accomplish. The door faces east, and the drummers are west. Old Longhouses had dirt floors for the feet to touch earth and a smoke hole that carried songs and prayers to the Creator. The woman and men dance on opposite sides around the center that Wyampum Chief Tommy Thompson called the open heart of the Creator. This reminds us of nature's balance, and Waashat songs represent "teachings" from the beginning of time. Our bodies carry the essential messages of belief in our movement. Our courage moves in circles like the salmon demonstrate larger circuits in their drive home.

People need Indian foods. Without the nutritionally rich and easily assimilated wild foods, we weaken and die. In two to three generations, epidemic diabetes and heart disease will wipe out many indigenous peoples around the world.

I emphasize here that people need Indian foods. Without the nutritionally rich and easily assimilated wild foods, we weaken and die. In two to three generations, epidemic diabetes and heart disease will wipe out many indigenous peoples around the world. There were once great quantities and varieties of native food during our longhouse feasts. In the absence of large fish runs, today people receive only a spoonful on their plates for the litany. Salmon is the primary food of the people who eat four times the national average of fish in salmon, trout, and eels. These are powerful foods—you can thrive with all of the four main types dried and stored as long as you have good clean water.

All this I took for granted in childhood. With the many varieties of salmon we were blessed with, I never thought it a matter of ecological preservation "take what

you need and let the rest grow," but rather a means of respect and observance of my maternal family's culture. Today there are diminished and extinct runs of salmon, and only 6 remain of the former 60 edible roots (Foster 2006).

"Take what you need and let the rest grow."

The "Great River" passes through two countries and five states. The Columbia River is not only a phenomenal powerhouse of energy generation and geographical reach, it is a conduit of trade for nutrients from the Pacific to the interior brought inland in the bodies of salmon. Returning anadromous fish ensure the survival of other species' profoundly honed hereditary strength and complex environments. Diversity and cultured integrity of the living beings that accompany and feed upon salmon require much of the same things to live. For example, the relationship of Grizzly bear and salmon create soil enrichment in forests that were previously unacknowledged and restricted. Each bear produces 400 pounds of nitrogen and phosphorus a year (Hunt 2000). Their excrement fertilizes the soil. Without the productivity of the land and water systems, we cannot live here. We cannot prosper. Again, culture defines what productivity means.

Without the productivity of the land and water systems, we cannot live here. We cannot prosper.

Fish arrival was a communal event. My grandfather and great uncles fished at Celilo Falls. They fished (dip-netting) from immense platforms built above the white water on the "fishing rocks" above the falls. It was dangerous. Fishing chiefs conducted the catch and ceremony of first salmon of the season. The swallows led the way and notified the people of the first run of the indigenous calendar that begins with the spring equinox.

Jesse Sampson, (Yakama) a fisher all his life, shared with me his memories of his time at Celilo Falls before the backwaters of The Dalles Dam covered it. His parents stayed in a tent, as they didn't live there all year. Jesse is one of the few fishers pulled into the whitewater of Celilo from a scaffold who lived to tell about it. It happened twice! Living proof of "Safety First," he used a safety rope as a precaution. He was a child, after all. The 90-pound fish pulled him at 70 pounds over into the whitewater. It went deep. It was a strong wild fish.

At Celilo he and a friend fished by invitation on the Big Island. Wilfred Yallup, Sr., watched over them. Jesse's mother worried and this care helped ease her mind. The dangerous cable cars had some you could only pull by rope. You carefully balanced yourself or tip over. He said, "The electric cable cars quit at a certain time. If your camp was on the other side—tough! You stayed there until morning." His mother said each time he left for the island to be mindful. There was no way of letting his parents know he was safe. Being stranded on the other side meant being without electricity or communications.

My uncle Louie spoke of Celilo Village in his work as an Oregon Governor appointee on the Columbia River Gorge Commission. He explained in-lieu sites the U.S. Army Corps of Engineers promised the tribes as compensation for the loss of significant fishing sites. These were places a person could make a living from the catch.

Privately, my uncle told me, in a tired voice, of how mercurial people became after the inundation. Sorrow bled into a barely expressed rage. A rage some turned inward. For all of us, it is not a coincidence that a high instance of spousal and child abuse occurs in down-spiraling economies and towns that depend on the extraction of resources. This is where folks lose their sense of self-reliance and power; they lose themselves, when the industry moves on. These people are the new "natives." The ones who must learn to adapt or perish.

Today the tribal people are "coping with overwhelming poverty. And rates of death are up to twice the rates of other citizens of Washington, Oregon and Idaho" (CRITFC and Meyer Resources 1999). Nathan Jim, Sr. (Warm Springs, now deceased), said, in reaction to the discomfort of "blaming the victim" attitude these statistics often elicit:

> I don't much like this talk of unemployment and poverty. Before the white man came, we had no such thing as poverty. We lived off the land. We fished, we hunted, gathered roots and berries. We worked hard all year round. We had no time for unemployment.

Chief Tommy Thompson went to Congress to stop the inundation of Celilo Falls by The Dalles Dam to say, "The Almighty took a long time to make this place." Oregon journalist, Richard Neuberger in 1947 "rhapsodized, the Columbia might have been designed by the Almighty to create kilowatts" (Clausen 2000: 20). Both men illustrate the difference of values on natural resources, dams, and God's work. Essentially, it is this difference in values that impact management of rivers, forests, and salmon today. Historian Patty Limerick writes in *Something in the Soil* in the relationship between native peoples and settlers there is "a great deal of water under the bridge" and getting to the realization that "even though I thought I could use your presence for my benefit, it is not working out that way" exacerbates strife (Limerick 2000: 37).

What does the misnomer Indian mean? What is a tribe? The rigid preconceptions of the Victorian era condemned the well-being of Native peoples by comparisons to its own society. In 1884, Senator Henry Dawes, after a visit to the Five Civilized Tribes, indicated his attitudinal prelude to the Dawes Act, with this statement:

> The head chief told us that there was not a family in that whole Nation that had not a home of its own. There was not a pauper in that Nation and the Nation did not owe a dollar. It built its own capitol… it built its schools and its hospitals. Yet the defect of the system is apparent. They have not got as far as they can go, because they own their land in common. It is Henry George's system and under that there is no enterprise to make your home any better than that of your neighbors. There is no selfishness, which is at the bottom of civilization. Till these people will consent to give up their lands, and divide them among their citizens so that each can own the land he cultivates they will not make much more progress (USDI 1979: 15).

Indian tribes are basic units of Indian law. They are manifested in organic powers of extreme diversity, with over 500 tribes in the lower 48 States and over 197 entities in Alaska recognized by the federal government. The Indian Reorganization Act of 1934 established federal recognition of 306 tribes and established a myriad of governments with or without constitutions. The landscape is diverse and the holdings ceded by treaty tremendous (Wilkinson 1987: 7).

Throughout the Indian policies of this country is one continuous thread of federal activity. Perhaps the policy of separatism, assimilation, and our modern era of measuring out uniformity (insert conformity here as well) through law has been the constant threads of contrast in the treatment of recognition of the sovereign status of tribes and treaty agreements through 200 years of time. "As long as the Indians believe that the salmon are important and that they have the legal right, the treaties to uphold that, then the salmon will survive, but the non-Indians must honor those treaties in order for that to happen, and when they honor the treaty, it is not only the Indians that benefit, but all people will benefit," Antone Minthorn, Umatilla (CRITFC).

For the tribes in the Pacific Northwest, a major decision occurred in 1974 in United States v. Washington (Boldt decision). Judge Boldt mandated that a "fair share" was 50 percent of the harvestable fish destined to pass the tribes' usual and accustomed fishing places and **reaffirms tribal management powers**. Then in 1984 the District Court and Ninth Circuit in plain language upheld the continuing vitality of tribal water rights to support treaty harvest activities, and recognizing that the rights enjoy a time immemorial priority date. See: United States v. Adair, 478 F. Supp. 336 (D. OR. 1979), aff'd 723 F.2d 1394 (9 Cir. 1984), cert. denied

For the tribes in the Pacific Northwest, a major decision occurred in 1974 in United States v. Washington (Boldt decision). Judge Boldt mandated that a "fair share" was 50 percent of the harvestable fish destined to pass the tribes' usual and accustomed fishing places and reaffirms tribal management powers.

476 U.S 1252 (1984). The Supreme Court has given the governments of our country much to chew on. In many ways, late 19th-century ideas carry more import on how we assign responsibility and how tribes operate within the political climates of today.

From the Marshal Trilogy of 1823–1832, Chief Justice John Marshal conceived of a model that tribes are independent sovereigns, unless Congress expresses limited tribal powers. The tribes are essentially free of state control (Wilkinson 1987: 24):

> These Tribes are the wards of the nation. They are communities dependent on the United States. Dependent largely for their daily food. Dependent for their political rights. They owe no allegiance to the State and receive from them no pro-tection. Because of the local ill feeling, the people of the States where they are found are often their deadliest enemies. From their very weakness and helplessness, so largely due to the course of dealing of the Federal Government with them and the treaties in which it has been promised, there arises the duty of protection, and with it the power. This has always been recognized by the Executive and by Congress, and by this court, whenever the question has arisen.

It is commonly recognized that tribal powers are preconstitutional and supremely supported by the constitution.

Despite the contribution of the Supreme Court's decisions, it is commonly recognized that tribal powers are preconstitutional and supremely supported by the constitution. Indian nations are intact whole governments of significant tenure, are political, can be theocratic, hereditary, and race-based in citizenship. Most Columbia River Plateau Tribes considered the United States as an "infant and unreliable government" at the time of treaty making in the Pacific Northwest. My uncle Louie Pitt frequently reminds me that U.S. democracy is the great experiment. We will live through this cataclysm as we have the past ice ages, floods, and volcanic upheavals.

I recall it shocked tribes in 1995 when only 12,000 salmon passed the dam with its portent of further depletion, and certain runs continue to lessen. Delbert Frank, Sr., (Warm Springs, now deceased), passionately referred to responsibility in fishery management and dams in the Middle Columbia River:

> So there's no question that the people hold you responsible forever to manage the salmon and all of the foods that they have reserved…. And that's a simple answer to the concern of how long you manage. I understand that now some people say, "Why the fisheries resources are getting small, it's so minor now. It isn't

> worth planning for any longer." The industrial and economic people saying, "let's go another direction. To heck with the good rivers, clean rivers and the salmon. Let's go another way." That's a question coming pretty close, I understand. And that is not the case. We're going to be there to say you're going to keep your promise. Forever! (CRITFC and Meyer Resources 1999)

Europe separated science from the spiritual many centuries ago. Western thought separated the body from mind, and our bodies are representative of the land. My grandmother said, "Someday the land will be our eyes and skin, again." The impact of thought upon outcome in our sciences is spiritual and also a technique for remembering our human health. The extinction of species is not loss primarily to the biosphere, but loss to the definition and shape of the human being as a species. Imagine the fade of old black-and-white propaganda, onward to the dams with the salmon leaping resolutely against the dams and "best science." Water will become the next test of our tolerance and policy, as the salmon are today.

Policy and community interactions are paramount to the success of strategies to recover salmon in the rivers, to recapture the prosperity of the salmon's economy for animal and people alike. It is also vital to the issues of dam removals and repairing effects of wasteful practices in water usage. The effect of the Lower Snake dams created desperate conditions for the tribes. Their construction has "transformed the production function of the Snake River, taking Treaty-protected wealth in salmon away from the tribes, while increasing the wealth of non-Indians through enhanced production of electricity, agricultural products, transportation services and other associated benefits. These impacts together with adverse effects from pollution water diversion and other acts" (CRITFC and Meyer Resources 1999: 171). These potential toxins threaten water quality and the health of those who depend on this water.

The EPA's Environmental Justice Standards mean to ensure:

> fair treatment of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear disproportionate share of negative environmental consequences from industrial, municipal and commercial operation or the execution of federal, state, local, and tribal programs and policies (CRITFC and Meyer Resources 1999: 175).

Although the policy is clear, the means for environmental justice goes beyond the removal of dams because they are inherently bad and short-lived machines.

Reporter Kjellstrand of the Spokane Review in 2000 delineated the matter in an evocative manner, describing a set of circumstances, a rubbing of values that could polish the gloss away to the beauty of human reconciliation:

> Indians often set a different tone in the world of natural resource management. Many a policy and science discussion has paused while a tribal leader recounts how fishing and hunting have sustained Indians from time immemorial, and how decisions must be based on how they will affect the next seven generations.
>
> The tribes bring their values to the table, said Arthur. It's not just, Oh, this is an environmentally good thing. It's This is our culture, this is our history, this is our religion.
>
> They bring an authority and a credibility that no one else can match [Kjellstrand 2000].

Martha Minow writes of the "restorative power of truth-telling." She also cites a group of Chilean therapists who concluded, "The person or family needs to recount traumatic experiences in detail and integrate a coherent history of events that were necessarily dissociated… It opens the possibility for grief and mourning, and facilitates the development of a more coherent self image (Minow 1998: 66)."

We require truth to affirm and strengthen actions of reconciliation. We are responsible to care for pervasive environmental suffering and people's resolve weakened through disease, ignorance, and poverty. In a sense, the crime is our passivity and inability to name the emotional experience of persecution, loss, and destruction, in our recent past. Most complain indigenous peoples live in, or for, the past. It may be better to say we live in repression of the facts of the violence endured in the present. This can be through societal demand for self-gratification at the expense of the land and future people. It can be said the matters of the heart are not as important as the matters of the state. Your "lump of water," *pu uwa*i has its own memory and need.

One final resonance from Minow: she quotes Toni Morrison, who encourages us to practice "re-memory." "This is to affirm life in the face of death, to hold onto the feelings of both connection and disconnection, and to stay awake enough to attend to the requirements of just recollection and the work of transforming the future" (Minow 1998: 147). We cannot wager the future by resurgence of the

pattern of removal of living beings and extinction that has occurred on the North American continent. Remember, "As we are served, we must also serve." This is a basic tenet of tribes who originally lived along the Columbia River. Teach your children the importance of respect for the self (their song, place and purpose) and their many selves (species). Acknowledge that policy and legislative doctrines are transitory and can be destructive. The tribes watch all activity with concerns for everyone's future, too. From time immemorial there was natural law, and it is embodied in human spirit, body, and community. We must face who we are and believe in what we are, that each heart is pure water, and we tend to its connection to all beings and its elemental and potent force.

"As we are served, we must also serve."

Metric Equivalents

When you know:	Multiply by:	To get:
1 pound	0.45	Kilograms
1 acre	.40	Hectares

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Chapter 7: Institutional Mechanisms for Managing Water in the West: Implications for Recreation

Sarah Bates Van de Wetering[1]

Introduction

In the arid American West, outdoor recreation revolves around water—from small streams to large rivers, modest waterholes to enormous lakes, and seeping springs to lush meadows. Apart from the obvious attraction for boaters, anglers, and swimmers, water draws recreationists who enjoy scenic drives, birdwatching, picnics, and hikes in the woods. Those managing public resources for recreational benefits already understand the values of water but often lack sufficient understanding of the institutions governing water use—that is, the laws, policies, and traditions that define who owns water, who has a right to use it, and how one interest might be protected from interference by another.

Western water policy is anything but an obscure or academic topic. As this is written, farmers in Oregon's Klamath River basin are wrangling with the U.S. Bureau of Reclamation over water deliveries from a federal project that serves both irrigation and fish and wildlife habitat needs. The farmers have resorted to civil disobedience to draw attention to the federal environmental laws that have reduced (in some cases, eliminated) releases into their irrigation ditches in order to preserve streamflows for endangered fish and wetlands habitat for other protected wildlife species. For its part, the federal government is torn between conflicting obligations—promised deliveries to farmers who settled the lands decades ago with an expectation of irrigation versus overriding congressional mandates to preserve habitat for threatened and endangered species. It is a typical western water conflict, with many interests asserting claims to a resource that simply cannot be engineered to meet every possible demand. Here, as elsewhere, western water institutions lack the necessary flexibility and room for contemplation necessary to resolve such disputes.

This paper provides an overview of western water institutions with an emphasis on the rules that directly influence public recreation management. State water allocation laws in the Eastern United States reflect the relative abundance of water in that region and operate on fundamentally different principles than the

[1] Sarah Bates Van de Wetering writes about western natural resources law and policy; she lives in Missoula, Montana.

Water law often is viewed as a complex topic, but it is based on a small number of simple concepts readily understandable to the layperson.

prior appropriation doctrine. This paper addresses only the Western States, where nearly all of the Nation's public lands are located. Water law often is viewed as a complex topic, but it is based on a small number of simple concepts readily understandable to the layperson. A basic comprehension of these fundamental principles allows one to explore recent legal and policy developments that relate to recreational uses of water. Therefore, this paper begins with an historical discussion of western water institutions, focusing on the traditional means of allocating water, the doctrine known as "prior appropriation."

Historical Development of Western Water Institutions

Modern western water management institutions are the product of approximately 150 years of settlement, development, and growth in the region. It is impossible to understand today's conflicts without understanding their historical roots, as much of water law and policy looks to the past for guidance. Professor Charles Wilkinson describes western water institutions (along with the laws governing other public resources such as mineral deposits, forests, and anadromous fisheries) as "the lords of yesterday, a battery of 19th-century laws, policies, and ideas that arose under wholly different social and economic conditions but that remain in effect owing to inertia, powerful lobbying forces, and lack of public awareness" (Wilkinson 1992). As described below, the lords of yesterday remain influential in western water management today.

Prior Appropriation

Early water-use customs in the western territories of the United States developed without the benefit of formal institutional structure. Opportunistic California miners relied on rules of discovery and appropriation as the basis for their mineral titles and applied the same concepts to the capture of water. This custom—often referred to as "first in time, first in right"—became known as the prior appropriation doctrine, and carried forward as the dominant rule of allocation in the arid West.

Under the prior appropriation doctrine, one's right to use water is based solely on capture and possession (appropriation); if there is not enough water, the earlier (prior) users have better rights than later users. This rule contrasts with the guiding principle for water use in the Eastern States—the riparian doctrine—which ties one's water rights to accompanying ownership of the land along the watercourse and requires that one's use be "reasonable" in relation to the needs of others on the

stream. Western miners did not own the lands on which they sought gold (they established mining claims on the public domain, owned by the U.S. government) and typically needed to move water out of streams and over considerable distances to meet their needs. Farmers requiring irrigation to grow their crops had similar needs, and the rule proved equally useful to aid their settlement, sometimes at a distance from available streams. They were able to claim rights of way to build ditches across public and privately held lands to bring water to where it was needed.

The prior appropriation doctrine represents a utilitarian approach to dividing up a limited resource.

Thus, the prior appropriation doctrine represents a utilitarian approach to dividing up a limited resource. It protects those who have diverted water to productive uses (senior appropriators) against others who claim water later (junior appropriators), regardless of their position upstream or downstream. A water right holder wishing to change his or her water use must prove that the new application will not consume more water or otherwise change the stream conditions upon which other appropriators rely.

Over time, Western States codified the prior appropriation rule in statutes and regulations and added procedural requirements (such as filing for a permit), but the rule's basic foundation remains the same. The basic elements of a valid appropriative water right are (1) **intent** to apply water to a beneficial use, (2) an actual **diversion** of water from a natural source, and (3) application of the water to a **beneficial use** within a reasonable time (Getches 1990). Traditionally, only utilitarian uses such as agricultural, domestic, and industrial applications of water were recognized as "beneficial" under the doctrine (Wilkinson 1989). Other than selected industrial applications, such as navigation and hydroelectric power generation, the rule did not recognize or protect instream uses such as recreational boating, swimming, scenic preservation, or fish and wildlife habitat protection. At the time, neither elected officials nor the powerful economic interests who influenced state policies viewed such instream uses as being worthy of the same level of protection as consumptive—usually extractive—applications of water (Wilkinson 1992).

Water as a Public Resource

Like free-roaming wildlife, water is a quintessentially public resource. Every Western State constitution contains a provision similar to that of Oregon, which declares that "all water within the state from all sources of water supply belongs to the public." As a result, states hold broad jurisdictional and regulatory powers over the water within their boundaries (Bates et al. 1993).

State laws and regulations seek to protect public values through requirements that water uses be consistent with the public interest, recognizing that the state has a duty to supervise private water uses and ensure that they serve public values (Grant 1987). Most state laws set out specific factors to be considered in evaluating the impact of a proposed new water use or change in water use, although the state of Colorado requires no consideration of public interest in such reviews (Van de Wetering and Adler 2000).

State courts have recognized water's public values in a number of ways. Early court decisions emphasized the utilitarian values of water, striking down wasteful uses as not "beneficial" and refusing to recognize speculative claims to water. Early cases focused on such agricultural practices as natural flood irrigation that tied up an entire stream's flow to supply an irrigator's right to a lesser amount of water, pumping water directly from a river for frost protection of vineyards, and irrigating fields during nongrowing seasons for such purposes as eradicating gophers (Meyers et al. 1988).

More recent decisions, however, suggest stronger "public trust" duties on state officials to oversee private water uses and make adjustments if the uses contradict such broad public values as environmental protection. The leading case applying this rule to western water rights is *National Audubon Society v. Superior Court of Alpine County* (33 Cal.3d 419, 1983). That case arose in California's Sierra Nevada Mountains, where the City of Los Angeles had long diverted water from streams feeding Mono Lake, a saline water body whose brine shrimp population and islands provided important food and habitat for migratory birds using the Pacific flyway. Thirty years of diversions depleted the lake level to the point that the brine shrimp population died off and the islands became peninsulas, subjecting birds to predation. Applying the public trust doctrine–a rule derived from Roman and English law, which says that the public has overriding rights on major rivers and lakes—the California Supreme Court ordered that the city's prior appropriation rights be balanced against the public interest (Wilkinson 1992). The case settled with the city agreeing to reduced diversions and restoring a lower, but more stable, water level in the lake.

Following the 1983 Mono Lake decision, many advocates of traditional water institutions feared that public trust review would eviscerate historical water rights, but in fact few Western States followed California's lead. Yet, a recent Hawaii Supreme Court decision (*Waihole Ditch*, Case No. CCH-OA95-1, Aug. 22, 2000) applied the public trust doctrine to require restoration of historical instream flows

when a water right holder proposed converting an irrigation ditch to a new use. Evolving interpretations of the states' powers under public interest review are described in the "State Institutions" section below.

The Continuing Federal Presence

The federal government allowed miners and farmers to move onto the public lands during most of the 19th century in the American West, declining to assert a heavy regulatory hand over those who were carrying out the national policy of manifest destiny. Thus, when these settlers developed practical rules for resolving disputes over their use of water, the federal government deferred to state authority, first by silence and then through language in federal laws and a Supreme Court decision holding that states could select the method they preferred to allocate water on public lands (*California-Oregon Power Co. v. Beaver Portland Cement Co.*, 295 U.S. 142, 1935). Importantly, however, in *United States v. Rio Grande Irrigation Co.* (174 U.S. 690, 1899), the Supreme Court cautioned that state-sanctioned water uses could not interfere with constitutionally mandated federal powers over commerce and public land (Getches 2001). Thus, whereas states assumed a primary role in allocating and regulating private rights to use water, the federal government maintained a position of superior—if largely unexercised—authority.

The scope of this federal authority became more evident over time and has expanded in recent decades. In the early to mid-20th century, large water development projects financed and managed by the federal government expanded the region's irrigated acreage as well as federal agencies' influence. Today, the U.S. Bureau of Reclamation manages the region's largest irrigation projects and controls the flows of major interstate rivers. In another example of federal influence over western water, congressional acts establishing Indian reservations, national forests, and other reservations from the public domain included implicit reservations of water to achieve the purposes for which these lands were set aside. For example, many Indian reservations were established to encourage Native Americans to adopt a more agrarian lifestyle. Thus, according to the "reserved rights" doctrine, the tribes hold rights to sufficient water to irrigate their reservation lands, and their seniority dates to the establishment of their reservations. Because the federal government failed to support Indian irrigation works and subsequently facilitated non-Indian use of the same waters promised through the reservation process, Indian tribes ran into considerable political resistance when they sought to exercise their reserved water rights (Bates et al. 1993). More recently, the federal government

exerted its regulatory powers to protect environmental values through laws such as the Endangered Species Act, Clean Water Act, Wild and Scenic Rivers Act, and various mandates for environmental restoration. The implications of the federal government's role in each of these examples are explored in more detail in the "Federal Institutional Changes" section below.

In summary, the federal government maintained a background role as historical water institutions developed in the Western United States. States established the primary rules for allocation and management, although the federal authority remained present and potentially strong. Only recently has the federal presence become obvious and, some argue, dominant in the region (Getches 2001), shifting the historical focus on utilitarian values of water to a broader emphasis on functioning ecosystems.

Recreation interests and others seeking a place in the legal priority system face numerous barriers.

Consequences of Historical Institutions

This review of institutional development is more than a historical curiosity. Because these laws and policies place such emphasis on protecting existing uses, claims established in the 19th century continue to dominate western waterways. In many areas of the West, streams are fully or overappropriated, and senior water users act fully within their rights when they withdraw a stream's entire flow. Fisheries, riparian plants and animals, and recreational water users all suffer from stream dewatering.

Recreation interests and others seeking a place in the legal priority system face numerous barriers. First, until recently, states did not recognize instream flows and recreational uses of water as "beneficial" and thus worthy of protection. Second, even after state policies changed to recognize such uses, opportunities for acquiring water rights are extremely limited; only the most junior (and thus least protected) water rights are available. Modern approaches to overcome these barriers are the focus of the latter part of this paper.

The large and impressive western water infrastructure—multipurpose dams, reservoirs, pipelines, and canals—represents another legacy of historical water institutions. Over two-thirds of the Nation's 480 million acre-feet of water storage facilities are located in the arid West, and most are managed by the U.S. Bureau of Reclamation (WWPRAC 1998). Other federal agencies with water management authority over dams and water facilities include the U.S. Army Corps of Engineers, Bureau of Indian Affairs, U.S. Fish and Wildlife Service, and the Federal Energy Regulatory Commission.

Most of these large water storage facilities were constructed before federal requirements for review of economic costs or environmental consequences. Agencies justified projects based on their engineering feasibility and their benefits to agriculture, municipal, and industrial purposes; recreation and fish and wildlife impacts were considered incidental and thus not fully evaluated (Getches 2001). In many cases, the developments have favored recreation interests: lakes formed behind dams have created popular boating and camping destinations, and cold-water releases below reservoirs provide habitat for blue-ribbon trout fisheries. Nonetheless, the overall impacts on riverine systems—and thus river-dependent recreation—have been negative.

Dams have flooded valleys and displaced farmers and communities, blocked or disrupted fish migrations, reduced naturally occurring flood frequencies and magnitudes, disrupted natural temperature fluctuations, altered low flows (sometimes increased, sometimes decreased to zero), reduced sediment and nutrient loads, changed channel-sediment characteristics (especially particle size and mobility), narrowed and shrunk river channels, changed channel patterns, and eliminated flood plains (WWPRAC 1998).

In summary, western water institutions have left a powerful legacy, both on the land and in the attitudes of those who put water to use in this arid region. State and federal policies have evolved over time to accommodate changing public values and new scientific information, but they must face the full implications of a well-entrenched system rooted in past eras of national expansion and settlement.

Forces of Change

In the past three decades, public awareness of and concern for the environment have grown dramatically. Although the American conservation movement's roots date back to the mid-19th century, modern environmentalism traces more recently to such important events as the publication of Rachel Carson's book, *Silent Spring* in 1962, the first Earth Day in 1970, and even the first photograph of Earth from space in 1968 (Caldwell 1998). In short, public concerns reflected new comprehension of the relationship between the human condition and the planet's well-being, as well as new scientific understanding of the consequences of past actions. (More recent indications of long-term climate change have demonstrated even more far-reaching human impacts on the global environment.) Congress responded with a host of environmental laws in the 1960s and 1970s, many of which included the opportunity for citizen input and citizen lawsuits challenging agency decisions.

The national environmental consciousness pervaded water policy as well, although its impacts were not as immediately obvious. Throughout the 1960s and 1970s, the federal government continued to plan and build new water projects in the West, with the enthusiastic support of western politicians. Federal budgetary constraints in the 1980s—combined with the heightened public scrutiny guaranteed by new environmental laws such as the National Environmental Policy Act—slowed the approval process and revealed unfavorable cost-benefit ratios of many ambitious projects (Getches 2001). Finally, with the demise of Colorado's Two Forks Dam project in 1990, there was general consensus that the era of dam-building was over. The range of interest groups ready to speak up and act on behalf of free-flowing rivers had grown dramatically and was inciting considerably more opposition to dams and waterworks projects.

In addition to public concerns about the environment, dramatic demographic changes in the Western United States have impacted water policy at both state and federal levels. This region, which has experienced cycles of boom-and-bust development ever since the first non-Indian settlers arrived, has seen rapid and consistent growth since the early 1990s. The West is the fastest growing region in the Nation, with much of the new growth occurring in the arid interior West States between the Rocky Mountains and the Sierra Nevada-Cascade Mountain ranges (WWPRAC 1998). Although Western States' water policies were designed to promote growth, today's leaders are challenged to manage and even limit growth (Tarlock and Van de Wetering 1999, 2006). In addition to their growing demands for domestic and landscaping water—which generally can be met with shifts from existing agricultural uses—the new urban and suburban westerners are demanding access to rivers for recreation and are a force of opposition to projects that may impact river environments.

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Water institutions experience pressures for change from real or perceived water shortages. In some cases, these shortfalls result from past policies and practices, such as overpumping limited groundwater reservoirs. In other instances, limitations result from droughts lasting one or several years. Growing scientific consensus about long-term climate changes reveal the potential for even more dramatic changes in precipitation and river levels in coming decades. Water shortages "have always excited popular and political interest in water problems… open[ing] a window of opportunity for water policy reform" (Getches 2001). Too frequently, however, the response is short-term—such as building a new water delivery system—rather than a longer term adjustment of the system to reflect uncertainty and change.

Evolution of Western State Water Institutions

Western State lawmakers began to respond to the changes described above with a series of policy initiatives in the 1980s and early 1990s. In an important announcement of policy priorities, the Western Governors' Association developed the "Park City Principles" in 1991. Chief among the states' priorities: "to recognize a broader range of interests in water resource values through fuller public involvement, to take a holistic approach to water problems, and to develop a framework responsive to economic, social, and environmental considerations" (Getches 2001). The discussion below describes selected state programs with special significance for recreational uses of water, with an emphasis on those aimed at protecting and enhancing instream flows.

River Designation Programs

When they began to recognize the economic, social, and environmental benefits of unimpeded rivers, some Western State legislatures enacted statutes protecting important river segments from the construction of dams and hydroelectric facilities. Such laws (or similar administrative programs) exist in Alaska, California, Idaho, Montana, Oregon, and Washington (Gillilan and Brown 1997).

Some states' approaches have explicitly recognized the need to protect designated river segments by preventing water diversions that would degrade their instream flows. For example, Oregon's Scenic Waterways Program, enacted by voter initiative in 1970, declares that recreation, fisheries, and wildlife protection are the highest and best use of designated river segments and requires that these rivers' free-flowing character be maintained through protection of sufficient waterflows (Gillilan and Brown 1997). Alaska designated six "recreational" rivers in 1995 and initiated a program to protect the instream flows in these rivers (Gillilan and Brown 1997).

Other state laws, such as Idaho's Protected River Act, prevent damming or impounding designated river segments but do not specify any level of streamflow protection. Similarly, California's Wild and Scenic Rivers Act requires that designated river reaches "be preserved in their free-flowing state, together with their immediate environments . . ." (Covell 1998). The California statute explicitly recognizes recreational values as among "the highest and most beneficial use[s]" of water in designated river segments, and prohibits the State Water Resources Control Board from granting any permits for water development that would submerge or substantially diminish the river flow (Gray 1989).

Like the federal Wild and Scenic Rivers Act of 1968 (discussed in the federal section below), state statutes such as these provide important safeguards for rivers whose values would be diminished by impoundments. Beyond prohibiting dams and similar structures, however, most have not proven to be strong sources of direction for such agencies. In California, for example, state officials interpreted the law to allow a significant diversion project upstream of a designated river segment, concluding that the legislature "did not intend to assure any particular quantity of water in a designated stream" (Gray 1989). Montana's Recreational Waterway Program, created through an administrative rule, provides even less protection—little more than an identification of high-priority rivers that warrant further protection through federal designation or instream flow protection through other state programs (Gillilan and Brown 1997).

Administrative Review of Water Rights Claims

As water is a public resource, states grant rights to its use subject to certain limitations. If a person is proposing a new water use or a change in use, state water officials review the proposed use to determine whether it is a recognized "beneficial use" of water, which is compatible with the state's definition of the "public interest" (except in Colorado, where no public interest review is required). State laws and administrative decisions have evolved over the years to recognize instream uses as beneficial and instream values as worthy of protection in the public interest. This section describes the major changes in these areas of the law as they relate to instream flows and recreational uses of water.

All Western States now acknowledge that protecting fisheries by maintaining instream flows is a beneficial use of their water.

Although the prior appropriation doctrine originally recognized few instream uses of water as beneficial, all Western States now acknowledge that protecting fisheries by maintaining instream flows is a beneficial use of their water. The state of Wyoming stops there, but most other Western States recognize recreation as a beneficial use, and some specify scenic or aesthetic uses as beneficial (Getches 1990). Alaska, for example, counts as beneficial such uses as water quality protection, fish and wildlife habitat maintenance, and recreation (Covell 1998). Acknowledgment of instream uses as "beneficial" under Western State laws was an early and important victory for proponents of instream flow protection. On the other hand, restrictive definitions of "beneficial use" do not serve the many instream values now recognized in western waters. As described in a leading book on the subject, "the needs of fish are not always a sufficient umbrella for other uses, particularly riparian regeneration, channel maintenance, and many forms of recreation. Recreational uses of water, particularly whitewater boating, can require much more water than would be necessary to sustain aquatic species" (Gillilan and Brown 1997).

In recent years, states have begun to recognize specific recreational uses of water, such as kayak courses, as beneficial uses deserving protection through the water allocation system. Colorado, for example, enacted a statute in 2001 designating such uses as "recreational in-channel diversions" (RICDs) associated with some construction aimed at moving water in a particular way for recreational purposes (as opposed to instream flows, which require no structure in the stream). In 2006 the Colorado Legislature imposed strict restrictions on the scope of this water right, which are currently the subject of litigation in the state. Currently at least 14 Colorado municipalities have either filed for RICDs under the new statute or enjoy legal recognition of recreational flow rights established under previous judicial standards (Benson 2006).

The beneficial use test provides a threshold for evaluating a proposed new or changed water right, focusing solely on the proposed use itself. By contrast, the public interest review looks at a larger context to determine how the particular use will impact broader public values. Originally, the prior appropriation doctrine reflected concerns that water not be wasted or claimed speculatively, but in recent decades states have broadened this review. In California, for example, the State Water Resources Control Board considers such factors as the effects of the proposed appropriation on instream uses (including recreation), fish and wildlife habitat, and on water quality standards (Covell 1998, Gray 1989). Utah water administrators must consider anticipated impacts on public recreation and the natural stream environment (Covell 1998). Alaska has one of the most detailed statutes, requiring consideration of eight particular factors (Getches 1990), whereas New Mexico requires merely that the State Engineer consider whether water permit applications will be detrimental to the "public welfare" (Covell 1998).

Public interest review standards provide a powerful tool for protecting instream values within the existing prior appropriation doctrine. Agencies can incorporate new information on instream needs and conditions in their regulations governing appropriative water rights, and can place the burden on applicants to show that proposed uses will not harm instream uses. On the other hand, such administrative review is essentially reactive (coming into play only when new or changed uses are proposed) and often is applied sporadically if at all. Even California—acknowledged as the most aggressive state for applying public interest review to instream values—is required only to consider, not to act upon, recommendations to protect such values (Gillilan and Brown 1997). As one observer noted, this review process "is inherently prejudicial to the protection of instream flows" as contrasted with strong institutional protections for senior appropriative water rights (Gray 1989).

Although the public interest review process is limited by the discretion it places on administrators, the public trust doctrine elevates the state's role of continuing oversight to an enforceable duty. The public trust doctrine declares that states hold title to the beds and banks of navigable waters (defined very broadly to include streams navigable by pleasure boats), which they are to manage in trust for the public and which they may not convey for private uses unless there is an overriding public purpose (Getches 1990). As described above, the leading judicial decision on this issue (*National Audubon Society v. Superior Court of Alpine County*) suggested that state agencies have an ongoing duty to review and adjust existing water uses to ensure the protection of public values including environmental protection. Although that case did not deal with recreational issues, some Western States have interpreted the public trust doctrine to guarantee public recreational access to navigable waterways crossing private lands (Covell 1998).

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In any event, the *National Audubon* decision did not require that the state restrict water diversions (although that was the eventual outcome of the case), but rather that public trust values be balanced with private uses. The court noted that, "the prosperity and habitability of much of this state requires the diversion of great quantities of water from its streams for purposes unconnected to any navigation, commerce, fishing, recreation, or ecological use related to the source stream." Thus, the court proposed "a merging of the public trust and prior appropriation doctrines into a single, cohesive system of allocating water that would recognize both public and private values" (Gillilan and Brown 1997).

Water Quality Protection

Western States historically managed water allocation separately from water quality protection. Increasingly, however, they are recognizing that the two are closely linked. On the one hand, polluted water is less useful for domestic supplies, irrigation, and recreation, so all water users have a clear stake in maintaining safe and sanitary water supplies. On the other hand, water diversions themselves may lead to the concentration of natural salts and chemicals and subsequent water quality problems—a fact that the legal system recognizes poorly if at all (Getches et al. 1991). Despite the physical realities of water use and quality, California is the only Western State with a single administrative body that considers the two together (Van de Wetering and Adler 2000).

In addition to minimizing the discharge of pollutants into surface waters, resource managers may seek to dilute contaminants through streamflow (or lake level) protection measures. "Keeping enough water in streams to assimilate . . .

pollutants allows all appropriators to make reasonable uses of the water" (Getches et al. 1991). Recreationists and other instream users benefit when instream flows are maintained for water quality protection. Conversely, water quality is a benefit not often recognized when justifying instream flow protection programs for fish, wildlife, recreation, and scenic purposes. Alaska, Idaho, Oregon, and Washington are among the few Western States that provide for instream flow protection specifically aimed at water quality protection (Covell 1998).

Instream Flow Protection Programs

Western States have taken various approaches explicitly to protect instream flows. Some recognize appropriative instream flow rights within the same seniority system as traditional offstream water rights. Others allow state agencies to establish minimum streamflows or to reserve unappropriated riverflows—in either case, limiting or prohibiting further appropriations of streams not already fully claimed.

The following discussion summarizes these approaches and provides illustrative examples of their operation. For more detailed reviews of particular states' instream flow strategies, consult the references listed at the end of this paper.

Minimum streamflows and instream reservations—
"Minimum streamflows" or "instream reservations" approaches aim at setting aside a specific quantity of flow for protection of instream values as defined by statute. This water, then, is theoretically unavailable for new offstream appropriations, although a number of states with such measures allow for periodic review and override if such subsequent uses are deemed necessary.

Oregon was the first state to establish minimum streamflows, but it converted to an appropriative rights system (described below) in 1987 (Gillilan and Brown 1997). Other Western States continue to use this approach. For example, Washington statutes allow the Department of Ecology to set minimum streamflow or lake levels to protect fish, wildlife, recreational, or aesthetic values, as well as water quality (Covell 1998).

Minimum streamflows and instream reservations provide a useful administrative approach to protecting streamflows. Because they are promulgated by public rulemaking, diverse stakeholders may participate and urge protection of the values most important to them. This approach can incorporate the recommendations of locally based watershed groups, described in the final section of this paper. On the other hand, minimum streamflows and instream reservations have some significant drawbacks. Because they do not affect senior uses of water, they do not restore

depleted streamflows. As administrative actions, they may be subject to political shifts. Finally, unlike traditional appropriative water rights, they typically are subject to periodic review and reevaluation and thus may be modified and revoked in the future (Gillilan and Brown 1997).

Instream flow water rights—

A stronger form of protecting instream flow rights places them more directly within the appropriative water rights system. An instream water right provides an enforceable right to maintain a specified flow level at specified times—defined by the needs of the instream use—through a particular river reach. Most states that allow such rights restrict their ownership to state agencies, but a few allow (or theoretically allow) individuals to claim them.

Oregon's 1987 instream flow statute allows the Department of Fish and Wildlife to claim instream flow rights for "the conservation, maintenance and enhancement of aquatic and fish life, wildlife, and fish and wildlife habitat." The Department of Environmental Quality may claim such rights to protect water quality, and the Parks and Recreation Department may do so to enhance recreation and scenic values. Once such rights are approved, they are held by the Water Resources Department. Although these rights are enforceable in the appropriative rights seniority system, they may be subordinated by multipurpose storage projects, municipal uses, or hydroelectric projects (Covell 1998), and thus might be considered "second-class" water rights.

As described briefly above, Colorado's legislature amended its instream flow law in 2001 to allow local entities to file for "recreational in-channel diversions" to support recreational instream uses such as whitewater kayak courses, increasingly important tourist draws in mountain towns such as Vail, Breckenridge, and Golden. The statute limits such rights to the minimum streamflow necessary for an objectively reasonable recreation experience in and on the water. In the first case interpreting this law, the Colorado Supreme Court described this as an essentially flexible standard, depending on available streamflow and potential impact on other water users: "Consequently, not all rivers and streams in the state may support worldclass whitewater courses despite a particular appropriator's intent, and some may have so little available flow that only floating a kayak would be reasonable." *Colorado Water Conservation Board v. Upper Gunnison River Water Conservancy Dist.* (March 14, 2005, No. 04SA44).

Arizona goes the furthest in recognizing appropriative instream flow rights, allowing any person or state agency to claim such rights for "stock watering …

recreation, wildlife, including fish …" (Covell 1998). The Nature Conservancy successfully claimed an instream flow right for recreation and wildlife on Ramsay Creek in 1983, prompting the state water agency to issue rules for granting such rights. Today the standard for justifying an instream flow right is exacting, requiring applicants to conduct extensive scientific analyses of streamflows and specific needs (Sterne 1997). Alaska and Nevada also allow for individually held instream flow water rights.

When recognized as property rights, instream flow rights receive strong legal protection and may be more permanent than the other means of protecting streamflows.

When recognized as property rights, instream flow rights receive strong legal protection and may be more permanent than the other means of protecting streamflows described above (Gillilan and Brown 1997). Private conservation groups who invest money in recreation or fisheries protection have the strongest ownership interest if they hold the resulting rights themselves rather than turning them over to state agencies (Sterne 1997). Those resisting such measures argue that private parties might claim speculative instream flow rights, eliminating other productive uses of public water sources. Although protective measures and supervision could eliminate such problems, resistance to new types of water rights is widespread and powerful.

In any case, newly claimed instream flow rights may not be of much value in western rivers, which typically are fully appropriated or very nearly so. A junior instream flow right merely preserves the status quo and thus may "do little to provide optimal or even necessary flows" for valuable fisheries during peak usage periods (Sterne 1997). As one observer noted, "instream water rights can protect existing streamflows but cannot necessarily restore them" (Benson 1996). Thus, advocates of instream water rights naturally look to the possibility of acquiring senior offstream water rights and converting them to instream flows.

Transfers of existing water rights—

Individuals holding appropriative water rights have the ability to transfer these rights to other uses—for example, from irrigation to municipal uses—so long as this change does not enlarge the original use or harm other water users. In fact, western water rights have long been traded, sold, and otherwise transferred from one user to another, sometimes permanently and sometimes on a temporary (lease) basis. But allowing the transfer of an offstream water right to an instream flow right is relatively new and is not yet permitted in every Western State.

California allows existing water rights holders to convert their offstream uses to instream uses such as recreation, wetlands protection, or fish and wildlife habitat

enhancement (Covell 1998). Colorado allows only the Colorado Water Conservation Board to acquire existing water rights for instream flow purposes; as mentioned above, in-channel diversions for recreation are recognized as a separate creature and may only be held by governmental entities (Benson 2006). Arizona, which is a leader in allowing private parties to hold instream flow rights, has not allowed senior offstream rights to be converted to instream flows (Sterne 1997).

Montana enacted a new instream flow leasing statute in 1995, which allows any party to lease others' water rights for up to 10 years "for the benefit of the fishery resource." According to one observer, the leasing program wisely empowers private parties to help protect instream flows: "Many interests in Montana are reticent to deal with the state . . . In addition, private parties frequently have better contacts in the community and are more successful at finding potential leases because they are comfortable operating in the free market" (Sterne 1997). Sometimes leases may be in the form of a "dry year option," in which the purchaser pays the water right holder a sort of insurance fee to maintain the option of leasing water during drought years (Gillilan and Brown 1997). Another temporary option is a state-run "water bank," which helps broker temporary deals among water users, including those willing to finance instream flows (MacDonnell et al. 1994). The state of Idaho allowed temporary lease arrangements to aid salmon migration in the 1990s (Crammond 1996). Although they offer less than permanent protection for recreation and other instream interests, such temporary arrangements may prove least objectionable to senior water rights holders concerned about the impact of instream flow water rights (Gillilan and Brown 1997).

Federal Institutional Changes

In 1987, the Bureau of Reclamation announced its intention to overhaul its policies and redefine its mission. The agency subsequently stated that its new planning goals would address "the role Reclamation can play as the transition is made from the policies and practices of this century to the changing priorities and needs of the next" (Reisner and Bates 1990). In 1994, Bureau of Reclamation Commissioner Dan Beard told writer Marc Reisner that, "the Bureau's future isn't in dams. The era of dams is over" (Reisner 1995), a dramatic shift for the Nation's premier dam-building institution. Indeed, today the Bureau of Reclamation is deeply engaged in reworking its considerable infrastructure to restore or at least reduce harm to river systems.

Evolving federal policies have not necessarily tracked in a straight line, of course. In 1998, a congressionally chartered study of western water institutions

acknowledged that federal water resources programs have evolved from regional project development to resource management, although it concluded that "the federal government's transition from regional developer to resource manager is still incomplete." Despite dramatic shifts in guiding policies, "In actual practice, federal policies and programs related to western water present a far from coherent and integrated approach to sustainable water use." The study observed that the most important impacts of a changing federal role have not been the decline of water projects or the implementation of new initiatives such as pollution control and endangered species protection, but rather "the emergence of efforts across the West to integrate a far broader and more complex set of interests into the governance of western water" (WWPRAC 1998).

The federal government has played an important role throughout western water development and continues to do so, increasingly as an enforcer of environmental regulations and as a source of resources for environmental restoration. The following sections provide an overview of federal laws and programs that help define the government's influence in the region.

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Environmental Protection Laws

National Environmental Policy Act (NEPA)—
The National Environmental Policy Act of 1970 (42 U.S.C. secs. 4321-4370(d)) inaugurated a new era of "sunshine" laws requiring that public decisions be made more openly and with adequate opportunities for public participation. Although NEPA is a very short statute—covering just three pages—it sets out a comprehensive national environmental policy directing all federal agencies "to use all practicable means . . . to create and maintain conditions under which man and nature can exist in productive harmony." The NEPA requires the federal government to establish and follow procedures to assess the environmental impacts of proposed major federal actions, including any private actions requiring federal permits.

The NEPA's requirements resulted in an unprecedented level of public participation in federal resource management decisions, including many that have impacted rivers and recreational river interests. And, although NEPA does not require an agency to make the most environmentally benign final decision, the process of assessing and describing environmental consequences has led to better informed and more environmentally beneficial decisions in many instances.

Professor Lynton Keith Caldwell, one of the principal architects of NEPA, argues that the courts' and agencies' emphasis on NEPA's procedural requirements

ignores the act's more fundamental purpose of integrating environmental policies within and between federal agencies: "NEPA legislated a declaration of broadly conceived principles intended to elevate attitudes and actions relating to the environment to the level of national policy" (Caldwell 1998).

Wild and Scenic Rivers Act—

Congress enacted the Wild and Scenic Rivers Act of 1968 (16 U.S.C. secs. 1271-1287) to protect free-flowing rivers from incompatible development projects and to provide for protective land management along protected river corridors (Meyers et al. 1988). The law allows designation either by Congress or by the Secretary of the Interior's approval of state legislation nominating a river for inclusion. River segments are classified as being "wild," "scenic," or "recreational," depending on the condition and surroundings of the stream at the time of designation. (The "wild" designation affords the highest level of protection, "recreational" the lowest.)

An early and influential commentary on the law concluded that it is more than an effort to limit dam-building programs: "it is also an effort to limit the development of certain rivers and their banks in the name of recreation" (Tarlock and Tippy 1970). The authors went on to note that the Wild and Scenic Rivers Act superimposes its mandates over more general management dictates for river segments running through federal lands. Thus, when a river segment within national forest lands managed under the multiple-use principles of the National Forest Management Act is designated wild and scenic, land managers must abide by the more restrictive provisions of the Wild and Scenic Rivers Act, ensuring the protection of the corridor's "esthetic, scenic, historic, archeologic, and scientific features" (Tarlock and Tippy 1970).

In addition, federal agencies must cooperate with state and local governments in developing corridor management plans, and actual land-use restrictions on private lands are generally governed by local county or municipal ordinances. Some recent designations have authorized creation of citizen advisory boards or other mechanisms for encouraging local participation in developing management plans (WWPRAC 1998).

Clean Water Act—

The Federal Water Pollution Control Act of 1972 (33 U.S.C. secs. 1251-1387), later renamed the Clean Water Act (CWA), required cleanup and protection of the Nation's waterways. In passing the CWA, Congress intended to eliminate the discharge of pollutants by 1985 and to "restore and maintain the chemical, physical

and biological integrity of the Nation's waters," with an interim goal of restoring swimmable, fishable waters by 1983. The law includes two kinds of pollution control standards: effluent standards, limiting concentrations of pollutants at their source; and ambient water quality standards, limiting pollutant concentrations in streams (Getches 1990).

Although many aspects of the CWA have influenced recreational opportunities on rivers, one of the most important is section 404, which requires a person to obtain a permit from Army Corps of Engineers before discharging any dredge or fill materials into waters of the United States. "Discharges" include construction of dams, stabilization projects, and similar structures, which may impact river-dependent recreation. This broad jurisdiction extends beyond navigable waters to include tributaries, and to any waterways used in interstate commerce, including rivers used by interstate travelers for recreation (Getches 1990). Once the Corps has issued a permit, the Environmental Protection Agency has an opportunity to review and veto the permit.

Another important component of the CWA is section 303, which requires states to identify "water quality-limited" segments of streams and to establish "total maximum daily loads" (TMDLs) for each, allocating the total allowable waste load among all river users. The TMDL process now underway in many Western States offers opportunities for a variety of river users to participate in river planning and protection (Pitzer 2001). States are required to prioritize stream segments based on a number of factors, including "recreational, economic, and aesthetic importance," and then develop allowable TMDLs appropriate to these priorities (WWPRAC 1998).

Endangered Species Act (ESA)—

In enacting the Endangered Species Act of 1973 (16 U.S.C. secs. 1531-1544), Congress recognized that endangered wildlife and plants "are of aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people," and declared that the new law would provide "a means whereby the ecosystems upon which [they] depend may be conserved." To achieve this bold objective, the law requires "that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act." The law spells out both affirmative requirements (such as the listing process to designate species as threatened or endangered) and prohibitions on federal actions that may "jeopardize the continued existence of any threatened species or endangered species or result in the destruction or adverse modification of [critical] habitat of such species."

The ESA thus placed a new overlay of restrictions on the land use and resource management activities of agencies such as the U.S. Forest Service and Bureau of Land Management, and vested the U.S. Fish and Wildlife Service with the responsibility to protect and recover species heading toward extinction. Its prohibitions on "takings" (which includes modifying a species' critical habitat) extended further to include private landowners.

The ESA's protection of endangered species' habitat may benefit recreation interests by maintaining streamflows and natural river conditions. In some instances, however, federal efforts to protect and restore endangered species habitat can negatively impact recreationists. For example, a native fish restoration initiative may involve eliminating or reducing populations of nonnative fish that provide a valuable sport fishery. Similarly, a program to increase streamflows for endangered fish may require extra releases from upstream reservoirs, thus lowering water levels and decreasing opportunities for flat-water recreation.

Restoration Laws

In the past decade, Congress enacted several laws calling for large-scale restoration of river environments. The Grand Canyon Protection Act of 1992 (106 Stat. 4600), for example, ordered the U.S. Bureau of Reclamation to change the way it operates the Glen Canyon Dam in order to improve the downstream riparian and aquatic habitats. As a result of the act, the bureau conducted an experimental "flood flow" in 1996—a large release intended to mimic historical spring runoff conditions in which high water levels with heavy sediment loads restored beaches and revitalized backwater native fish-rearing habitats. The act explicitly directed the bureau to manage the Glen Canyon Dam to protect, mitigate, and improve the natural and cultural resources of the river downstream—a dramatic expansion of the project's purposes when compared with the original authorizing legislation (NRLC 1997).

In another example of legislatively mandated habitat restoration, the Central Valley Project Improvement Act of 1992 (106 Stat. 4706-4731) directed the Secretary of the Interior to dedicate and manage annually 800,000 acre-feet of water from the Central Valley Project for the primary purpose of fish, wildlife, and habitat restoration in California's vast and fertile Sacramento-San Joaquin River Valley. Although this water was classified as "surplus," irrigators participating in the large federal project had enjoyed its use during dry years, and thus faced cutbacks as a result of the new emphasis on habitat restoration (MacDonnell 1999). The act also required these water users to pay surcharges on irrigation water to

finance environmental restoration (NRC 1996). The law's enactment culminated a successful lobbying effort by a coalition of diverse interests: environmental groups, commercial and sport fishermen, duck hunters, waterfowl organizations, Native Americans, and urban and business interests (NRLC 1997).

Dam Removal and Reoperation

Western political leaders were outraged when, in 1977, President Jimmy Carter announced a "hit list" targeting 33 federal water projects for elimination from the budget. At that time, the idea of not building new dams and diversion projects seemed radical. Now, a little more than two decades later, a robust dialogue is underway throughout the region about the possibility of removing major dams, and many projects are already being operated in new ways to protect downstream fisheries and riparian and aquatic habitats.

A robust dialogue is underway throughout the region about the possibility of removing major dams, and many projects are already being operated in new ways to protect downstream fisheries and riparian and aquatic habitats.

Four dams constructed on the Lower Snake River in Idaho in the 1960s and 1970s prevent the upstream migration of salmon, although they also provide 5 percent of the Pacific Northwest's electric power supply. The U.S. Army Corps of Engineers recently studied the consequences of breaching these dams in order to restore fish passage and thus fulfill Indian treaty and water rights (Getches 2001), and public discussion on the topic continues (Barringer 2007).

The Elwha River, in Washington state, may soon lose two hydroelectric dams that block salmon migration. Federal legislation enacted in the early 1990s explicitly stated as one of its purposes: "to restore, protect, and enhance the value of the Elwha River anadromous fishery and other resources" for the benefit of local Indian tribes and citizens (Bates et al. 1993). Studies are currently underway to assess the best methods to manage the large quantities of silt backed up behind the two dams.

In Missoula, Montana, federal and local officials recently reached an agreement to remove a small hydroelectric dam at the confluence of the Blackfoot and Clark Fork Rivers. The dam itself, with its minimal revenues from power generation, is less the issue than the toxic mining-waste sediments backed up behind the dam and contaminating local groundwater. Removing the dam and the sediments as part of the Clark Fork River Superfund cleanup process will allow restoration of a natural fishery and riparian ecosystem at the rivers' confluence.

Although few dams have actually been removed, the federal agencies managing the region's largest facilities have made technical and operating changes to protect and restore downstream river environments (NRLC 1997). For example, the Bureau

of Reclamation installed new water intake structures in California's Shasta Dam to release colder water in the summer and fall from deeper in the reservoir to better mimic natural conditions for native salmon living downstream (WWPRAC 1998). Similar changes at Colorado's Flaming Gorge Reservoir have sacrificed hydroelectric power generation flexibility to restore habitat for four endangered fish species, but also benefiting boaters who previously experienced dramatic changes in water levels as dam operators responded to fluctuating power demands (Bates et al. 1993). Changed operations in the Upper Arkansas River in Colorado and the Rio Chama in New Mexico were aimed primarily at benefiting recreational (whitewater rafting) interests (MacDonnell 1996).

Indian Tribes' Reserved Water Rights

Indian tribes hold vested rights to sufficient supplies of water to provide for their reservation homelands, a legal principle first articulated in *Winters v. United States* (207 U.S. 564, 1908), but mostly ignored until the Supreme Court's 1963 decision, *Arizona v. California* (373 U.S. 546). In the last several decades, tribes have asserted these reserved rights against appropriators whose rights postdate the establishment of reservations by treaty or congressional act. Many of the Indian water rights remain unquantified and the water undeveloped, leaving tribes with "paper" rather than "wet" water. The potential size of Indian water claims is enormous. For example, claims of Missouri River basin tribes alone may total more than 19 million acre-feet per year, or approximately 40 percent of the river's average annual flow (WWPRAC 1998).

Indian tribes have pursued both litigation and negotiation in their quest to settle these disputed legal claims. Negotiated settlements offer the means to protect junior water users while still satisfying Indian water claims and avoiding costly litigation expenses for all parties. By the end of 1997, 15 tribes had negotiated water rights settlements, which were ratified by Congress, 1 tribe negotiated a settlement not requiring congressional action, and 19 tribes were actively engaged in settlement discussions (WWPRAC 1998). Since then, few additional claims have settled, and one expert concluded that the process has "stagnated" (Getches 2001).

Significantly for recreation interests, some tribes have proposed to keep their adjudicated water instream for such purposes as fisheries enhancement, habitat protection, and boating opportunities. These efforts have not always been successful, especially as the tribes attempt to enforce their senior rights against subsequent appropriators. For example, the Wyoming Supreme Court refused to enforce the

Wind River Tribes' reserved rights for instream purposes as the court reasoned, the "Indian" water was reserved solely for agricultural purposes (*In Re the General Adjudication of All Rights to Use Water in the Big Horn River System and All Other Sources*, 835 P.2d 273, 1992).

Federal Reserved Water Rights

Under the same principle that underlies Indian tribes' reserved water rights, the Supreme Court held that Congress impliedly reserved quantities of water sufficient to meet the purposes of a national monument in Nevada (*Cappaert v. United States*, 426 U.S. 128, 1976). Importantly for other federal reservations—such as national forests, parks, wildlife refuges, and wilderness areas—the court articulated these principles underlying the federal reserved rights doctrine: (1) congressional intent to reserve water should be inferred whenever water is necessary to accomplish the purposes for which a reservation has been established; (2) the amount of reserved water is limited to the minimum amount of previously unappropriated water necessary to fulfill the purpose of the reservation; (3) federal reserved rights are created at the time that lands are reserved, and are therefore senior to rights arising from uses initiated subsequently; and (4) federal reserved water rights arise under federal law, and thus need not be protected under state law (Gillilan and Brown 1997).

Subsequent decisions restricted the purposes for which reserved rights may be claimed to those identified as "primary" in the authorizing legislation. Thus, for example, the Supreme Court ruled that national forests established "to secur[e] favorable conditions of water flows, and to furnish a continuous supply of timber" did not impliedly reserve water for such instream uses as stockwatering, recreation, fish and wildlife habitat, or aesthetics (*United States v. New Mexico*, 438 U.S. 696, 1978). The Forest Service later sought to claim reserved water rights for "channel maintenance" instream flows, but has been unsuccessful to date (Gillilan 1998).

Other federal reservations with more explicitly protective authorizing legislation—such as national parks and wildlife refuges—have had fewer difficulties establishing reserved water rights and thus are better able to protect instream flows necessary to satisfy their purposes (Weiss 1998). In the prior appropriation scheme of priorities, reserved water rights dating to the establishment of federal reservations in the 19th and early 20th centuries rank relatively high on the ladder of priorities and thus are protected against subsequently claimed water rights on shared waterways.

Emerging Innovations in Western Water Institutions

Although western water institutions have changed slowly, broad public support for new approaches to river protection and water management has resulted in substantial changes on the ground. The two most significant developments, described below, are the rise in watershed management initiatives and the emergence of innovative public-private partnerships aimed at enhancing streamflows for recreational and other instream interests. These are treated separately from the innovations described above in the "state" and "federal" categories, as they suggest the potential for transcending such jurisdictional boundaries.

Public resource managers have made a remarkable shift in their approach to resource management, looking at resources in integrated geographic units.

Watershed Approaches to Resource Management

In the past decade, public resource managers have made a remarkable shift in their approach to resource management, looking at resources in integrated geographic units—generally defined by natural watersheds or river basins—rather than simply in jurisdictional units such as national forests, counties, or the like. Federal, state, tribal, and local agencies, as well as nongovernmental organizations, have supported and participated in place-based efforts to deal with water quality, land use, and endangered species habitat protection.

It is important to note that watershed efforts have not dealt as effectively with water resource management (that is, streamflow levels and stream withdrawals) as they have with other resource issues, although this is beginning to change. As described above, the prior appropriation doctrine locks in older, established water rights and protects the conditions upon which senior appropriators have come to depend. Thus, as one observer noted, "state water law does not fit well within a comprehensive approach to managing resources that considers the interests of all people and all species in maintaining sustainable ecosystems" (Benson 1996). In recent years, however, endangered species declines and enforcement of overriding federal regulations such as the ESA have removed much of the insulation that water rights holders have enjoyed and thus have provided the incentive for more creative, cooperative, and integrated arrangements. Although partnerships based on notions of friendly cooperation may be impossible in many instances, coalitions born of necessity can lead to equally productive outcomes.

A recent survey of watershed initiatives conducted by the Natural Resources Law Center counted more than 400 watershed-based organizations dealing explicitly with water resources, and noted that "only a slightly more liberal definition could potentially double this number" (Kenney 2000). The survey attributed the

rapid growth of such initiatives to (1) the principle of regionalism as a basis for resources management and environmental-human integration, and (2) the growing societal preference for strategies of governance and problemsolving stressing collaborative approaches (Kenney et al. 2000). Other observers noted that the increase in collaborative, place-based initiatives followed federal agencies' shift to ecosystem management, which requires managers to work across jurisdictional boundaries and cooperate with private landowners (Babcock 1996, Cestero 1999). Certainly the budget cuts of the 1980s and 1990s left federal resource agencies short-staffed, leaving little choice but to form outside partnerships to accomplish habitat restoration and public education (Wondolleck and Yaffee 2000). Finally, a strong undercurrent of local watershed initiatives appears to be a desire for local control—protection of existing economic activities and "a desire to reduce the influence of 'outsiders,' such as government agencies, nonresident environmentalists, and federal courts" (Benson 1996).

The watershed phenomenon includes a diverse array of approaches. Larger scale efforts typically involve more government participants, official recognition, and formal procedures for stakeholder participation and decisionmaking. Groups focused on smaller areas often operate outside of official government channels and may demonstrate considerable flexibility in the issues they address. Examples of each type are described briefly below.

Large-scale watershed initiatives—

The idea of comprehensive planning starting with river basins has a long history in the country. In 1907, President Theodore Roosevelt established the Inland Waterways Commission to "evolve a comprehensive plan designed for the benefit of the entire country," and the subsequently created National Waterways Commission concluded that "it will become increasingly necessary to treat every stream with all its tributaries as a unit" (Wilkinson 1989). For the most part, however, national programs incorporating these ideas focused exclusively on water development and not on reaching out to diverse stakeholders or dealing with related issues such as water quality or endangered species habitat protection. This is beginning to change.

One of the best-known large-scale watershed initiatives is a process known as CALFED. A 1994 agreement signed by state and federal officials and representatives of agricultural, business, environmental, and urban interests committed the participants to work together in a collaborative decisionmaking process aimed at increasing freshwater flows in California's crucial link from north to south, the San Francisco Bay-Sacramento River Delta, while ensuring water quality and adequate

water supply (NRLC 1997). The process grew from the state's failure to adopt a satisfactory water quality plan to stem declining fish populations in the Bay-Delta and its tributaries (WWPRAC 1998). As one key public official later observed, "Water users frequently need external incentives to put water on the table for environmental protection—whether those incentives are federal mandates, federal dollars, or something else" (Rieke 1996). The CALFED process effectively identified both the appropriate incentives and the most practical solutions by bringing together a diverse array of regulators, resource users, and other interests.

Another far-reaching initiative deals with conflicts between water users and threatened and endangered species on the North and South Platte Rivers in Colorado, Nebraska, and Wyoming. After 20 years of conflict and litigation, in 1997, these states signed a cooperative agreement with the U.S. Fish and Wildlife Service to embark on a joint program of habitat restoration and improved water management (Getches 2001). As with the CALFED process, a federal agency participant observed that the likelihood of onerous regulation under the ESA provided water users and state agencies with the incentive to come to the table to resolve difficult environmental issues (WWPRAC 1998). Although not signatories to the cooperative agreement, environmental groups participated in the discussions leading up to the Platte River accord and are actively involved in its implementation (Getches 2001).

The Northwest Power Planning and Conservation Act of 1980 created the Northwest Power Planning Council, a multistate water planning agency that seeks to coordinate the management of water, energy production, and fish and wildlife resources in the Columbia River basin. Council members representing each of the basin states (Idaho, Montana, Oregon, and Washington) develop plans, which are implemented by federal agencies and financed by hydropower revenues (Wilkinson 1989). The council adopted an adaptive management approach to protect and enhance salmon and steelhead runs in the Columbia River and its tributaries.

Large-scale water management decisions have opened up to a wider array of interests, often as a result of federal mandates for resource protection and public participation.

In an example more directly related to river recreation, the Glen Canyon Dam's adaptive management program, mentioned earlier, relies on a review team including representatives of states, Indian tribes, electric power purchasers, recreational users, federal agencies, and environmentalists (Getches 2001). The group works to ensure that the Bureau of Reclamation operates the dam not only to provide hydroelectric power, but also to fulfill the recreational, environmental, and cultural purposes mandated in the Grand Canyon Protection Act of 1992.

Each of these examples demonstrates that large-scale water management decisions have opened up to a wider array of interests, often as a result of federal

mandates for resource protection and public participation. Federally funded projects, originally constructed to meet limited objectives—irrigated agriculture, hydroelectric power generation, or domestic water supply—are no longer operated exclusively for the satisfaction of these interests. Instead, managers and policy-makers view these projects in the context of the river systems upon which they are located, and more readily take into account their impacts on riverflows, native species, and water-based recreation interests. The new watershed management approaches offer recreationists and other stakeholders not only enhanced stream-flows but also the important opportunity to participate in decisions that directly affect their river uses. Such an outcome is not guaranteed, of course: the political and economic forces of traditional water interests may continue to dominate the new, large bureaucratic structures and effectively maintain the status quo despite new management labels.

Local watershed initiatives—

In what it deemed a "conservative estimate," the Natural Resources Law Center concluded that local watershed groups grew tenfold in the West in the 1990s (Kenney 2000). Many of these entities grew from citizen frustration with seemingly interminable conflicts and gridlock over public resource management decisions; others arose from local desires to improve nearby streams or other public areas and a recognition that agencies lacked the staff and budgetary resources to do the work themselves. Whatever their genesis, the groups are now widespread and often influential, although they seldom represent formal decisionmaking authority in water management institutions. A few examples of successful watershed groups will illustrate their roles and the benefits they offer for diverse interests.

Recreation and tourism concerns are at the heart of the Henry's Fork Watershed Council of southeastern Idaho, which formed in 1993–94 in response to several incidents that threatened the region's economically important trout fishery. Council participants "reside, recreate, make a living or have legal responsibilities" for managing the land and water within the Henry's Fork basin, and they work together to improve communication among agencies, members of the public, and the scientific community (Cestero 1999). The council established a data-gathering and monitoring program to aid resource managers, and has engaged in stream restoration projects aimed at reducing the impacts of livestock grazing and other land uses on the important recreational values of the watershed. "The council sees itself not simply as a planning body but as the implementer of management plans for the Henry's Fork Watershed" (Benson 1996).

The Deschutes River Basin Conservancy grew from an effort by the Confederated Tribes of the Warm Springs Reservation and the Environmental Defense Fund to improve streamflows and water quality in the Deschutes River, a popular recreation site and important habitat for salmon and steelhead trout. In 1992, these organizers brought together representatives of the major economic sectors in the basin, who then worked to develop incentive-based approaches to deal with basin problems. Among the solutions were pilot projects to improve agricultural water distribution efficiency, with half of the saved water dedicated to instream flows and half to farming operations. The group also leases water for instream flows. The conservancy is now chartered as a private corporation, receiving federal matching funds to support its work. Conservancy board members represent the basin's cattle, agricultural, environmental, recreational, tribal, hydropower, and land development communities (WWPRAC 1998).

A watershed council in the Upper Clark Fork River basin of Montana formed in response to anglers' concerns about low streamflows during irrigation season. Although their senior water rights allow diversion throughout the summer months, farmers participating in facilitated discussions agreed to reduce their withdrawals during critical dry periods to maintain the fishery (Bates et al. 1993) and to a moratorium on new surface water rights from the river (Benson 1996). In return, the state agreed to delay seeking additional instream flow protection through its reservation process. The legislature subsequently adopted the plan developed through a citizen-led collaborative process, and authorized the group to continue its work: "review the progress of management actions, make recommendations to the Montana Legislature, and serve as coordinator and facilitator on water issues in the Upper Clark Fork Basin" (Benson 1996).

Local watershed groups may be, but typically are not, organized by state or federal government officials. Only the states of Oregon and Washington explicitly encourage their formation, although other states authorize their agencies to work cooperatively with such groups (Getches 2001). Financial and in-kind support from federal agencies is often crucial to watershed groups' day-to-day operations, including direct staff assistance, copying and mailing services, and access to other resources. According to the researcher who documented the strong reliance on federal funds, this government support "creates an arguably healthy 'codependency' situation that is crucial to the success of these efforts: The watershed initiatives need Federal resources to survive, while Federal agencies find the initiatives essential to the efficient implementation of their mandates" (Kenney 1997).

Local watershed initiatives offer tremendous potential benefits to recreation interests. Their emphasis on broad participation means that stakeholders without formal water rights can have some influence over water use and management. Moreover, their on-the-ground work typically seeks restoration of fisheries and enhanced recreation opportunities. Local watershed initiatives offer great potential for recreationists seeking both immediate results and potentially long-term beneficial relationships.

Local watershed initiatives offer great potential for recreationists seeking both immediate results and potentially long-term beneficial relationships.

As with the larger initiatives described above, these groups are subject to manipulation and domination by powerful interests. Several prominent environmental groups have announced principled objections to participating in such collaborative approaches. For example, in 1994 the Southern Utah Wilderness Alliance explained that it generally chooses not to participate in advisory committees using collaborative approaches because, the group believes such committees are slanted toward maintaining the status quo; environmentalists' participation is sought in order to co-opt them and distract from their more effective advocacy work; agencies use these processes to shirk their mandated decisionmaking processes; the often-used consensus processes don't work when participants come from diametrically opposing viewpoints; such processes bypass traditional separation of government powers and allow industry interests to "browbeat agencies"; and environmental enforcement is best achieved through enforcement of existing laws with litigation rather than negotiating with agencies shirking their responsibilities (SUWA 1994). Such broad generalizations contradict the direct experiences of many individuals participating in the watershed groups described above, but these concerns do reflect the risks and limitations of collaborative initiatives. Moreover, the objections are useful to keep in mind in considering the willingness of regional or national organizations to participate as stakeholders in a local watershed process.

Public-Private Partnerships to Enhance Streamflows

A number of nongovernmental organizations seek to obtain senior water rights (typically those used for agricultural irrigation) and convert them to instream uses such as fisheries, recreation, and scenic values. In states that do not allow these organizations to hold instream flow rights themselves, the rights are transferred to government resource management agencies authorized to hold and enforce them. Voluntary water transfers facilitated and/or financed by a third party such as a nongovernmental organization can be a mutually beneficial way to reallocate water to socially and ecologically valuable uses.

The Nature Conservancy (TNC) has negotiated many transfers of water rights in the Western United States. As mentioned above in the section on state innovations, the first privately held instream flow right in Arizona was acquired by TNC, arguably the only private party with the financial resources and access to scientific expertise to satisfy the many bureaucratic hurdles in establishing such a right. In states not permitting private parties to hold instream flow rights, such as Colorado, TNC negotiates three-way deals in which the conservation organization pays a senior water rights holder to transfer his or her right to the state board authorized to hold instream flow rights.

Since 1993, the Oregon Water Trust has acquired consumptive water rights from existing users and transferred them to instream uses in the state of Oregon. In some cases, the organization purchases or obtains donations of permanent water rights (donors receive tax benefits for charitable contributions); in other instances it obtains water through leases ranging from 1- to 10-year terms. In one transaction, for example, the trust created a lease agreement by which an irrigator ceased withdrawing water from Buck Hollow Creek, a tributary of the Deschutes River, during the critical late summer when steelhead salmon depend on the flow. In return, the trust purchased hay to replace the pasture hay previously irrigated with the stream water, so the rancher is able to continue his cattle raising operation (NRLC 1997). The trust seeks to hold—not just broker—instream flow rights, and thus is seeking legal changes to allow private parties to hold such rights in Oregon (Sterne 1997).

Often private party intermediaries are not involved in instream-flow acquisitions. State and federal agencies are engaged in a variety of efforts to obtain and convert valuable senior water rights from consumptive uses to instream uses. For example, the Northwest Power Planning Council, described above, seeks to restore declining salmon runs by leasing water through its Columbia River Fish and Wildlife Program. The Bonneville Power Authority, the quasi-federal agency that markets power from the Columbia River basin, leases the greatest amount of water for instream flow in the basin (Crammond 1996).

Several states have established water leasing funds, intended to provide a source of reliable instream flows for state agencies (and sometimes others) while protecting the property rights of senior water rights holders. For example, Washington's Trust Water Rights Program obtains water rights through lease, gift, bequest, purchase, and "net water savings" (water saved through conservation measures). The state Department of Ecology holds and administers trust water rights, applying the water for instream flows, irrigation, municipal, or other beneficial uses (Benson

1996). Private parties may participate by providing the water right or paying for the state's acquisition through the trust program (Crammond 1996).

Montana's water leasing statute, enacted in 1995, authorizes "the temporary use of existing water rights for instream flow to benefit the fishery resource." The law allows individuals, associations, partnerships, and corporations to lease water rights through this program, so long as they can show that the instream flow transfer will benefit fish and will not injure other water rights holders (Crammond 1996).

Conclusion

Recreational and other interests are more viable players in water management than they were just a few decades ago, but they still face obstacles to full participation.

This paper describes evolving institutions governing water use in the Western United States. These institutions, rooted in utilitarian principles emphasizing security and predictability, have been influenced by changing social values, increasingly diverse demands for water resources, and more complete scientific understanding of the consequences of historical water development. Although still generally resistant to change, the system of allocating and managing water rights has transformed in the past 30 years or so and continues to do so.

Recreational and other interests are more viable players in water management than they were just a few decades ago, but they still face obstacles to full participation. According to Crammond (1996), these "new" interests would be well advised to approach the traditional institutions with a sense of partnership. They must, he writes:

> . . .do a better job of selling the benefits of instream flow. Rather than approaching a dewatered stream as an outsider with a hand full of cash bent on reform, [instream flow advocates] should look for opportunities to build coalitions with those in the local community whose interests in instream flow naturally coincide. Fishers, hydropower generators, outdoor recreationists, downstream junior appropriators, local chambers of commerce, whitewater enthusiasts, water supply officials, and even local school children all have a potential stake in increased instream flow. The financial contribution of these various factions is not as important as their participation. When a flowing river becomes a local treasure, a symbol of community unity and a playground, [acquiring] flow to keep it alive will become much easier.

For their part, government officials have little choice but to pay attention to the diverse interests now demanding to be heard on water issues. Recreationists and

others are increasingly willing to pay for adequate instream flows, whether by supporting private litigation challenging historical water distribution or by their contributions to private organizations that acquire water rights for instream flows. Innovative partnerships such as those described near the end of this paper offer encouraging direction for those wishing to work toward common goals for healthy, diverse, and productive rivers. Yet the fundamentally rigid western water institutional structures remain a significant barrier to a full representation of recreational and other "nontraditional" water interests.

Metric Equivalents

When you know:	Multiply by:	To get:
1 acre	0.40	Hectares
1 foot	.3048	Meters

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Chapter 8: Sustaining Water as Symbol: Integrating and Designing Research and Management

Stephen F. McCool, Roger N. Clark, and George H. Stankey[1]

Introduction

At the very point in time that symbolic values of water are being increasingly marginalized in a society that has become more consumer oriented and instrumental in its view of the biophysical world and how humans relate to it, there is an accelerating interest in water as symbol, as aesthetic, and as a recreational attribute.

The exploration of symbolic values in this book has occurred within the context of this collision in perspectives. Our descriptions of nonutilitarian values, using recreation as the shadow measure are, we recognize, inadequate, if only because our language is missing the vocabulary to discuss symbolic values. Water has symbolic value, most fundamentally as representation of life. Although these symbolic values are tightly held by many groups and individuals, they are difficult to identify, measure, and discuss within the classical paradigm of rational comprehensive planning: How does one explain the spiritual values of a waterfall? The meanings of a lake where one was married? Or, the family remembrances triggered by the gurgle of a shadowed stream?

Many conflicts over water surfaces are underlain by differing valuations of those symbolic values.

However, their difficulty of measurement and lack of direct instrumental utility to society does not mean they are unimportant to society, to groups within society, or to specific individuals. Indeed, many conflicts over water surfaces are underlain by differing valuations of those symbolic values.

In this chapter, we synthesize our exploration of symbolic values, discuss the barriers to understanding them, and suggest a way forward. As part of this discussion, we provide a critique of the current institutional environment for considering symbolic values, as it is largely responsible for the inadequate attention given to them in planning and management.

[1] Stephen McCool was a professor (now retired), Wildland Recreation Management, College of Forestry, University of Montana, Missoula, MT 59812. Roger Clark and George Stankey were social scientists (now retired), U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; Clark was at the Pacific Wildland Fire Science Laboratory, 400 N 34th St., Suite 201, Seattle, WA 98103, and Stankey was at the Forestry Sciences Laboratory, 3200 SW Jefferson Way, Corvallis, OR 97331.

The Role of Symbolic Values of Water in Contemporary Western American Society

Our journey has taken several paths, which we briefly summarize here, as general conclusions.

First, water permeates the western land ethic and is a foundation for many conflicts over management of public and private lands in the West. We suspect that similar questions of land ethic and values occur in eastern environments and, we would argue, in other global and cultural contexts too. Although there are competing hypotheses about the relationship between water and settlement, water is the lifeblood that westerners seek, whether for irrigation, manufacturing, domestic uses, recreation, or aesthetics. Population growth in the West is heavily influenced by the presence of environmental amenities, chief among these being water surfaces. A rapidly growing population will only increase demands for these uses and values, accelerating conflict over allocation and management of water. In these conflicts, symbolic values of water are likely to play an increasing role, but may be marginalized because of the lack of a suitable and valid method of measurement and valuation. However, this concern is not just one of inadequate metrics, it is one of understanding cultural values and preferences as well.

Mechanisms to consider and value noninstrumental uses are largely nonexistent.

Second, the institutions to manage water were largely developed in the 19th century to deal with allocation of scarce water supplies to instrumental uses, diverting water away from natural waterways and lakes. These diversions have had tremendous consequences for fish and wildlife, vegetation, and to recreationists and others that view water more symbolically than instrumentally. Dams and reservoirs constructed on water courses have likewise led to negative impacts. Of course, such diversions and dams are important components of the West's agriculture and manufacturing industries, and we do not deny the importance of water to them in suggesting that these impacts have occurred. However, in the process of allocating water, instream uses and values were rarely considered in the past; although these values are given greater attention now, such values considered are largely instrumental ones as well: fish habitat, for example. Mechanisms to consider and value noninstrumental uses are largely nonexistent. Excluding some economic nonmarket valuation techniques—the meaning, use, and validity of which remain controversial—planning processes are largely geared toward instrumental uses and classic valuation processes. The problem of institutional design is a particularly significant one, as it reflects the priorities and viewpoints of society. We will return to this issue later in this chapter.

Third, recreation, as a shadow measure of symbolic values, is growing rapidly. For example, whitewater rafting, canoeing, and cold-water fishing are activities accelerating in popularity, and largely depend on free-flowing streams and unpolluted lakes. Recreation does impact water quality, although when well managed, this impact seems negligible, particularly in face of the benefits accruing from water-related recreation. However, the quality, distribution, and availability of water surfaces has a tremendous impact on recreation and recreationists. These impacts go far beyond the negative ones (such as limited access) or the (allegedly) superficial positive ones (e.g., having fun). As Bricker and Kerstetter noted in chapter 5, people attach meanings to water, and different reaches of the same stream may hold significantly different symbolic values. Removing stream reaches from recreational access may have impacts that reverberate through a social system. Although we can potentially identify these types of impacts, the more subtle impacts of management to other symbolic values may not be so easily addressed.

Barriers to Understanding and Action in Water Management Decisions

Understanding the values society ascribes to water, the intersection of values with uses at different scales, and developing regulatory mechanisms responsive to changing demands are tasks that require different types of knowledge applied at different scales and at different points in decisionmaking. Involving different types of knowledge and disciplines in an **integrative** way is a fundamental prerequisite to addressing water management challenges.

Yet, despite widespread rhetoric regarding integration and its potential for natural resource management (particularly as a means to better link commodity/utilitarian and symbolic uses and values), in practice, few good examples of such efforts exist. There are significant barriers at all levels to integration (Clark and Stankey 2006). Many of these barriers are institutional in character; i.e., they relate to attitudes and belief systems, organizational structures and processes, scientist and manager incentives, and statutory and political constraints. Further, these barriers typically are entrenched in the organizational and sociopolitical culture and context within which resource management occurs. Overcoming them will require fundamental, systemic change, which itself is based on leadership and willingness to take certain risks.

Challenges to integration of symbolic and utilitarian uses and values begin with the inherent ambiguity that characterizes both the management strategy/process of

integration and the conception of symbolic uses and values. Both terms are subject to varying interpretations, and the resulting lack of clarity and consensus make it difficult to assess and evaluate performance or develop strategies and policies.

Current organizational processes and structures often are at odds with integrative approaches. Structures tied to specific resource systems (e.g., wildlife, timber, recreation) and processes such as budgeting systems combine to maintain reductionist, segregated management approaches. This is challenging enough for achieving integration among conventional uses and values of resources and even more so when symbolic uses and values, whose presence and legitimacy is problematic for many, are involved.

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Because managing for an integrated approach and addressing symbolic values and uses involve risk and uncertainty, organizational leadership that provides support, direction and vision, and a sense of legitimacy and importance to such activities are critical. All too often, risk-aversion dominates these situations and aggressive, proactive steps will be required to overcome this tendency. Unfortunately, such leadership typically is lacking, either within the organizational hierarchy or throughout the organizational structure. In the absence of leadership, the natural tendency is to revert to maintaining the status quo and rejecting options that involve risk and uncertainty. Of course, maintaining the status quo is itself an approach containing risks and uncertainty, although perhaps distributed differently.

Implementing integrative approaches to accommodate symbolic uses is also challenged by population changes that lead to new uses and espouse different values (from those held by previous users and by managers) and expectations. These changes are fed by structural shifts in the Nation's population (e.g., aging, ethnicity) and by internal migration. Collectively, they place resource management decisionmaking in a turbulent social milieu where little is constant. The capacity of contemporary organizations to operate effectively in such an environment is limited; again, the propensity to avoid any likelihood of making a mistake accounts for part of the problem. Although such changes require that organizations operate deftly and creatively, bureaucracies are not particularly noted as centers of innovation nor are they adaptable.

However, a number of other issues that require attention are mentioned below:

- There is a lack of venues and opportunities to discuss emerging concerns, interests, values, and uses that require particular management attention in a nonthreatening manner. Venues that focus on learning in the long term are often lacking; most public engagement processes are oriented toward

addressing or resolving specific issues rather than creating broad understanding of ecosystems, landscapes, and the role of water. Such existing processes in a sense isolate issue-oriented decisions from the interests of civil society. More holistic approaches to ecological literacy are needed (Orr 1993). One consequence of these gaps is that managers often are unaware of the nature of emerging values and uses or of their distribution across the population or the strength of the preferences regarding them. The lack of such venues makes it difficult to foster understanding of how different uses and values (utilitarian or symbolic) relate to and impact one another. Under current approaches to water allocations, such relationships are investigated only within the narrow context of a need-to-know basis. Without broad political understanding and support for these uses and values, such uses are typically viewed as secondary, residual activities whose management and provision are of limited importance.

- There is often an inability or lack of capacity in management agencies to be sensitive to or respond effectively to symbolic uses and values. This traces to various sources, including legal and policy constraints, insufficient organizational capacity (education, training, resources, time), or resistance imbedded in professional norms and belief systems.
- The nature of symbolic uses and values means that conventional sources of knowledge and expertise are unlikely to reveal the extent, location, or significance of these values. Under current water management practices, these values may be revealed only within a contentious, time-constrained process as a result of interests identifying them as being ignored or marginalized. Because contemporary planning approaches are dominated by technical experts and expertise, there is a tendency to reject or discount alternative sources and forms of knowledge held by recreationists, subsistence users, or indigenous populations. As a result, not only is key knowledge foregone, but the failure to seek it proactively can be interpreted as evidence of a lack of organizational interest and commitment to a more inclusive management and planning approach.

The absence of appropriate metrics that express the presence and magnitude of symbolic uses and values impedes their inclusion in decisionmaking. There is a tendency to assume that in the absence of objective, quantitative information, such uses and values are of limited relevance to decisionmaking. Because the dominant decisionmaking paradigm is dependent upon such information, in its absence, one

of two things can happen. First, they simply are ignored or discounted. Second, they are taken into account, but their representation is in the form of some approximation, often expressed in quantitative or monetary terms that do little justice to the richness of their meaning.

For example, in early efforts to develop cost/benefit ratios for various water development projects, it was common to assign standardized average perday economic values to water-based recreation participation. However, such measures derived from an implicit assumption that different forms of recreation (e.g., reservoir-based fishing vs. whitewater rafting) were of equivalent value to participants (e.g., one recreation visitor-day was worth $3.00, irrespective of whether it was spent fishing from the shore or whitewater rafting). This contributed to a bias that would, by definition, assign the highest economic value to those activities with the highest levels of participation. Employing such an approach created a decision environment that would disenfranchise certain types of uses and values by establishing systematically biased evaluation processes and criteria. It also manifested the dilemma of evaluating and managing all resource uses and values by using the same models and metrics as used for traditional commodity activities and values. Citizen comments on the limitations of these values and the approaches to identify them were often discounted as emotional, anecdotal, and experiential.

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Institutional Design: A Critical Element in Water Management

A serious challenge to sustaining symbolic values lies in the confounding, often conflicting array of administrative rules and regulations, laws, planning frameworks, and other policies and procedures that govern how society administers the various uses of, and demands for, water resources. In many cases, the institutions that served us well in the past have outlived their intended missions, objectives, and in some cases, usefulness (Wilkinson 1992). Today, they are ill-suited to dealing effectively with many of the contentious, value-based conflicts facing water resource management.

But if existing institutions are inadequate, what would be the characteristics of new, more effective ones? Both scholars and practitioners acknowledge that the concept of institutions is confusing, but they also agree that institutional reform is key to more effective management. In the simplest terms, institutions include the array of means people use to solve social problems. This includes everything from

informal codes of appropriate behavior (e.g., a handshake or a "gentleman's word") to highly formal, legally codified rules (e.g., National Environmental Policy Act, international treaties) and structures (e.g., the U.S. Forest Service, state water resource agencies). Institutions set the standards of expected behavior and provide consequences for compliance or noncompliance.

But institutional change is difficult. Traditional constituencies often hold strong interest in maintaining the status quo; change is threatening, if only because of the uncertainty it brings. Although management agencies often revise or revamp their appearance, organizational structures, or even their name, much of this is cosmetic and nonsubstantive. Fundamental belief systems, organizational priorities, and power relationships often remain unchanged and unchallenged. Consequently, little innovation takes place in how problems are framed, what alternatives are considered, and what solutions are employed. An example is the notion of recreation carrying capacity often applied to wildlands (which has also been applied to water-based recreation). Although the idea that there is an inherent carrying capacity for recreation on wildlands has frequently been challenged, many academics and land management agencies continue to search for the "magic numbers" the concept implies will solve problems.

Resistance to systemic change arises from various sources; a fear of change (often reinforced by a lack of incentives or rewards for doing things differently), a lack of leadership, risk aversion, and a lack of a sense of what a changed institution might look like. In short, organizations can be caught in a self-reinforcing set of beliefs that "There's no reason to change," "We can't change," "We have no guidelines as to how to change." Many resist the argument that change is necessary: "If it ain't broke, don't fix it."

With regard to the contention there is no need for change, a contrary view is that without change, resource management organizations face the risk of losing their constituency and associated political support. Without such support from civil society, the long-term survival of any political entity is problematic. As a host of uses and values that are linked to symbolic conceptions of resources grow in importance to society, a failure on the part of management agencies to recognize and respond to this could lead to the growing conviction among citizens and politicians that such organizations are no longer needed. In short, one important reason for change can be found in terms of organizational survival (Clarke and McCool 1996).

The Way Forward

So where do we go from here? Research, development, and management are all needed to better identify, consider, and manage symbolic values. Here we list several suggestions in each of these categories.

Identify Values

Before values can be measured or managed, they first need to be mapped, and mapping will take time and investment.

Clearly, a program to identify what information is needed in water allocation decisions—that include symbolic values—is needed. Such a program would have several thrusts; for example, research is needed to identify symbolic values of water. This will be difficult because our suspicion is that such values are highly culture- and place-based, nonquantitative, and will be difficult to situate within a synoptic planning system. But before values can be measured or managed, they first need to be mapped, and mapping will take time and investment. Such mapping processes would be driven primarily by the question, "What values exist here and for whom are they values?" Such research would also emphasize mechanisms that everyday managers could use to identify values in specific situations.

In this arena, we would envision research pointed toward such questions as: What values of water exist in a particular place? Why do they exist there? What is the range of public preferences for values? How do they rank? How are such values linked to other uses and values of landscapes, such as quality of life?

Consider Values

Although research to identify values is needed, some mechanism is required to understand the relative significance of these values to the groups affected. This is difficult, and we suggest it goes far beyond reducing such values to the nonmarket economics paradigm that dominates valuation discussion today. Although such economic approaches may be needed, they are not necessarily adequate for the task. And there is much debate about their meaning, applicability, and appropriateness for many water-related decisions.

Here, we would suggest a number of questions that are important for managers: How do various values and uses interact? What are the costs and tradeoffs involved in managing for one use over another? What about the secondary and tertiary consequences of preferring one value over another? How does our current institutional environment elevate some values over others? What is the level of public acceptability for some uses versus other values? How does the public view the legitimacy

of different values of water? What processes or techniques are available for valuation of various uses and values? What are the consequences of using various techniques?

Manage Values

Managing water-based values requires understanding of how such values interact with each other, the preferences of the population served, and processes that make clear the values involved and reflect public preferences and notions of acceptability. Various values and uses of water differ in how much they compete with each other: some are simply zero-sum conflicts, whereas management for some values, such as fisheries habitat, may enhance other values, such as aesthetics.

We noted above the need to develop conceptual frameworks for identifying, measuring, and valuing all uses and values of water. A similar task is needed for management: processes and frameworks that will ensure that all values are considered. These frameworks not only illuminate decisionmaking processes, they help managers "work through" complex and controversial issues. There are few such frameworks for recreation (see McCool et al. 2007), and none that we know of for symbolic values. Because frameworks do not exist, symbolic values are likely to be marginalized, even if they can be identified. Generally speaking, successful frameworks have been those that have been collaboratively developed by managers and scientists. Here, we would advocate an even more inclusive approach, given the character of the values involved, by including informed citizens in the development of these frameworks.

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Several questions arise here: How can more inclusive processes of water management be developed? Who should be involved in such development? How can a process be designed to give equal treatment to utilitarian and symbolic values? Should decisionmaking frameworks give equal treatment? How can processes explicate tradeoffs?

Conclusion

Clearly, people are confronted with growing collisions in the use of water for differing purposes. Not only are these collisions occurring among competing utilitarian uses, but as we have argued here, we anticipate growing conflict with symbolic values. Although utilitarian uses are easily measured and valued, the symbolic ones are not. And although institutions designed to allocate and manage water among utilitarian uses are well developed, most such institutions are not well equipped to address symbolic values.

Because such values are not easily measured and quantified, they tend, at best, to be ignored or forgotten in water allocation and management, and at worst, deliberately marginalized as only values that some people, acting in their self-interest, would like to protect. We have no specific answers to these issues, but as a first step, we have attempted here to provide the reader with some awareness of the dimensionality of this issue. Answers are for other people with an interest in this issue.

Although we have no answers, raising awareness is a critical first step in working through the various challenges posed by the growing social interest in symbolic values. We have attempted to articulate these values by using recreation as a shadow or representation of the symbolic values. We recognize this is problematic in itself as recreation's reliance on water may be largely, but not solely, utilitarian itself. Nevertheless, our discussion of recreation may provide some important clues for further deliberation about symbolic uses of water.

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Web site	http://www.fs.fed.us/pnw
Telephone	(503) 808-2592
Publication requests	(503) 808-2138
FAX	(503) 808-2130
E-mail	pnw_pnwpubs@fs.fed.us
Mailing address	Publications Distribution Pacific Northwest Research Station P.O. Box 3890 Portland, OR 97208-3890

U.S. Department of Agriculture
Pacific Northwest Research Station
333 S.W. First Avenue
P.O. Box 3890
Portland, OR 97208-3890