

Capacity Reconsidered: Finding Consensus and Clarifying Differences

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EXECUTIVE SUMMARY: In a world where populations and resource demands continue to grow, there is a long history of concern about the “capacity” of the environment to support human uses, including timber, rangelands, fish and wildlife, and recreation. In the context of recreation, work on visitor capacities has evolved considerably since the late 1960s as a result of environmental planning, court proceedings, recreation management practice, and recreation research. This paper documents the “state-of-knowledge” understanding of capacity among our group of long-term professionals, who represent a wide range of experience and perspectives. The paper defines capacity as “the amount and type of use that is compatible with the management prescription for an area,” and elaborates on the elements of that definition. The main body of the paper describes 34 agreements about the larger planning context, the definition of capacity, benefits of capacity, indicators and standards, and the roles of these concepts in resource planning and management. The final section identifies issues needing resolution, including four “differences we resolved” and five “differences that remain”, and also includes our individual perspectives on these issues. This paper is not the “definitive statement,” on visitor capacity, and we trust others will contribute to this on-going dialogue as agencies, the courts, academics, and resource professionals work to resolve capacity issues. We hope our work adds clarity, advances understanding, helps guide application of efforts designed to address capacity, and encourages others to contribute their ideas.

KEYWORDS: Visitor capacity, carrying capacity, recreation planning, use limits

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There is a long history of concern about the “capacity” of the environment to support human uses. Notions of capacity have been applied to the management of such diverse resources as timber, rangelands, and fish and wildlife populations. At a broader scale, this extends to the number of humans the earth can support (e.g., “An essay on the principle of population; a view of its past and present effects on human happiness,” Malthus, 1803), and it includes the social dynamics of how overuse problems develop and the ways they can be resolved (e.g., “The tragedy of the commons,” Hardin, 1968). The capacity issue is driven by recognition that there are limits on the ability of environments to support human use, and that ignoring those limits can have many impacts, ultimately decreasing the quality of life.

Capacity Applied to Recreation

The concept of capacity has been applied to the recreational use of parks, forests, wilderness, and other public lands and waters. In the context of recreation, the term “capacity” has historically been used with several modifiers as described later in this paper. At least two perspectives on capacity have emerged. One perspective was expressed when a 1930’s report on growing recreational use in the mountains of California asked “how large a crowd can be turned loose in a wilderness without destroying its essential qualities,” arguing that recreation use should be kept within the area’s “carrying capacity” (Sumner, 1936). Rapid growth in outdoor recreation following World War II prompted public concern, and many worried that parks, forests, and wildlands were in danger of being “loved to death” (Wagar, 1946; DeVoto, 1953; Clawson & Held, 1957). By helping understand how much and what types of use parks and outdoor recreation areas can accommodate without impairing their important values, capacity was seen as a tool for ensuring the perpetuation of high quality environments and experiences in recreational places.

Another perspective equates capacity to the supply-side metric in traditional recreation demand/supply analysis. For example, the Outdoor Recreation Resources Review Commission (ORRRC, 1958-1962) analyzed the country’s recreation resources by inventorying developed facilities (e.g., number of campgrounds, picnic tables, beds in lodges) as well as historic and archaeological sites, concluding there was not an adequate supply (i.e., capacity) to meet expanding demand. The ORRRC reports helped catalyze national efforts to increase the supply of recreation resources through major land management initiatives such as the Wilderness Act (1964), the Land and Water Conservation Fund Act (1964), the Wild and Scenic Rivers Act (1968), the National Trail System Act (1968), and the National Park and Recreation Area Act (1978).

Both broad perspectives on capacity are common, although individuals debate their importance and applicability in different situations. In some cases, the conceptual emphasis is whether “over-visitation” is causing unacceptable impacts that impair environmental or experiential quality, and how to respond to those impacts. In others, the emphasis is on identifying when the supply of recreation lands and facilities should be expanded to meet demand. Both are important and related. They have also evolved since the late 1960s, influenced by developments in (a) comprehensive environmental planning, (b) recreation management research, (c) recreation management practice, and (d) court proceedings. A detailed review of these influences (or a debate about their importance) is beyond the scope of this paper, but a brief summary provides context for how the field has advanced. Our understanding of the field has been influenced and has found expression in the documents we cite in this paper and others we recommend to readers as follows: Brissette, Haas, and Wells (2001); Haas (2003a, 2003b, 2003c, 2004); Manning (2001, 2004, 2007, 2009, 2011); Shelby (1981); Shelby and Heberlein (1985); Shelby, Vaske, and Donnelley (1996);

Vaske, Donnelley, and Whittaker (2000); Whittaker (1993); Whittaker and Shelby (1992, 2007).

Comprehensive Environmental Planning

The role of capacity in planning changed with the advent of new natural resource decision-making processes in the late 1960s. Management professionals and the public increasingly recognized that resource degradation, resource scarcity, competing demands, changing and conflicting public values, and limited management resources needed to be addressed in a comprehensive and integrated manner, and resource uses might have to be limited to ensure quality. We had moved into an era of resource allocation and trade-offs because not all resource uses, values, and benefits could be accommodated on every acre of public lands. The National Environmental Policy Act (NEPA 1969) defined the fundamental planning framework, ensuring that the multiple uses, values, and benefits were systematically addressed; it contrasted sharply with incremental and “one-resource-at-a-time” planning.

Under this comprehensive planning model, both capacity perspectives were important. Plans needed to ensure that excessive use did not degrade “quality” and impair public land values; they also needed to define the type and amount of recreation opportunities to be provided—an output analogous to and integrated with “quantity” decisions for water, timber, mineral, wildlife, and other resources. Today, each federal resource agency has adopted planning regulations and has established a NEPA-compliant public planning process for their various types of plans.

Recreation Management Research

“Recreational carrying capacity” received considerable research attention starting in the 1960s, leading to the notion that capacity has both environmental and experiential dimensions. Visitor use can affect biophysical resources such as soils, vegetation, water, and wildlife, and it can degrade the quality of visitor experiences through crowding, conflicting uses, and aesthetic impacts on the environment. Research explored many environmental and experiential impacts, and showed that some impacts can occur even with low levels of use. Deciding which conditions are desirable, how much impact is unacceptable, how use levels affect conditions, and how much use should be accommodated became the focus. To answer these questions, researchers recognized the need to define clear management goals and objectives for ecological, cultural, and experiential resources.

Several planning and decision-making frameworks were developed by researchers to help planners and managers address visitor impacts or capacity, including Recreation Opportunity Spectrum (ROS) (Brown, Driver, & McConnell, 1978; Clark & Stankey, 1979); Limits of Acceptable Change (LAC) (Stankey, Lucas, Peterson, Frissell, & Washburne, 1985); Visitor Activity Management Process (VAMP) (Parks Canada, 1985); Carrying Capacity Assessment Process (C-CAP) (Shelby & Heberlein, 1986); Visitor Impact Management (VIM) (Graefe, Kuss, & Vaske, 1990); and Visitor Experience and Resource Protection (VERP) (National Park Service, 1997; Manning, 2001). Each had differences in orientation, emphasis, terminology, and specific steps, but all were built on the same foundation of scientific and professional literature (Manning, 2004), and were more similar than different in their general approach to recreation management.

Recreation Management Practice

Recreation resource planners and managers have also made important contributions to the evolution of capacity concepts. Capacity was arguably first addressed in the early 1900s by fish and wildlife managers addressing massive reductions in game species from

overharvest. By the middle of the century, a developing recreation management profession focused on the design and construction of recreation facilities, which included assessing appropriate facility sizes to handle demand. In the last four decades, managers have directed additional attention toward capacities in backcountry or less developed settings.

Capacities are a common “management tool” used by many local, state, and federal agencies (Brown, 2001) and the topic has been the subject of several national conferences and a Federal Interagency Task Force (2002). Many managers have established capacities or considered them in their short- and long-range planning, even if they did not employ all (or parts) of the researcher-developed planning frameworks described above or used NEPA-compliant planning processes. Capacities have been applied in diverse recreation settings (e.g., rivers, lakes, trails, backcountry areas, mountains, and islands) to protect natural, cultural, and experiential resources; help define the appropriate size and type of facilities (e.g., campgrounds, marinas, boat launches, transportation systems, and visitor centers); shape the size of agency programs (e.g., interpretation, maintenance); and determine appropriate levels of commercial and non-commercial uses.

Court Rulings

More recently, the courts have contributed to the evolution of capacity concepts and practices. Increasing recreation demand and diversity, coupled with a relatively static resource base, has increased competition and resource impacts in many recreation settings. When agencies respond by setting or enforcing capacities, some contention is inevitable, and agencies have occasionally been challenged on how they arrived at their decisions. Recent capacity-related litigation includes snowmobiles in Yellowstone, boating in Grand Canyon, marina size on Arizona’s Lake Pleasant, off-highway vehicles (OHVs) in California’s Imperial Sand Dunes Recreation Area, motorboats in the Boundary Waters Canoe Area, cruise ships in Glacier Bay, airplane overflights in Grand Canyon, and visitation to the Merced Wild and Scenic River in Yosemite National Park. In each case, rulings set precedents, contribute capacity-related judicial doctrine, and help clarify defensible and legally sufficient processes for capacity-related decision making.

Paper History and Purpose

In spite of all this work, differences in the research literature, planning frameworks, “in-the-field” approaches, and court rulings have sometimes led to confusion or debate. The capacity concept has many facets, and different perspectives affect how agencies specifically handle capacity, or more generally approach visitor impact management. To help improve the application of capacity in public resource planning, the authors of this paper worked together to increase clarity and resolve issues.

Our objective is to review the state of knowledge and assess agreements and differences among our group of long-term practitioners. Our collaboration began when we were invited to offer our varied perspectives on capacity at the Yosemite Visitor Capacity Symposium sponsored by the National Park Service in February 2008. The symposium had been convened, in part, by the ongoing challenges associated with Merced Wild and Scenic River research, planning, and litigation (1995 to present), some of which were directly related to capacity. We were participants in the research, litigation, or planning, and on our own accord, agreed to spend time and effort to move forward on this important topic.

The journey has extended over two years. Following the Yosemite symposium, we met at a special session of the 14th International Symposium on Society and Resource Management at the University of Vermont in June 2008, and gathered for an extended and intensive workshop in Portland, Oregon in April, 2009, sponsored in part by the National

Park Service and the U.S. Forest Service. Throughout the effort, we have communicated actively through individual discussions, emails, group conference calls, and drafts of this paper. Although we differ on some important issues (like any field of active inquiry), we also share many similar views, and this effort has helped articulate our agreements and disagreements.

This paper is intended to document our understanding of visitor capacity, developing definitions, describing “points of agreement” (hereafter labeled “agreements”), and explaining differing perspectives when we did not agree (hereafter labeled “differences”). Our goal is to clarify conceptual and practical issues related to capacities in planning, not “rewrite the book” on recreation planning or develop another recreation planning framework. We assume that most capacities will be developed within agency planning/management frameworks and a legal planning process (e.g., for federal areas, the National Environmental Policy Act and related Council on Environmental Quality regulations).

Our “agreements” and “differences” strictly apply to only the five authors of this paper. But collectively we represent a wide range of experience and perspectives on visitor capacity. At one time or another, most of us have critiqued each others’ perspectives in written publications and/or oral presentations, and several of us have given testimony on opposing sides of the same lawsuit. In spite of this, we found common ground on many issues, and clarified our differences (and their meaning for agency planning). With this paper, we hope to illuminate capacity issues and encourage more transparent, intentional decision making. We recognize that many other qualified professionals can and should contribute to this ongoing dialogue. We do not consider this paper the “final answer” on capacity, but we hope it advances understanding and induces others to contribute their ideas.

Paper Organization and Format

The paper is organized into three main sections. The first section on defining capacity develops definition elements with which we all agree, but also identifies five elements where we do not. The “consensus definition elements” are further developed in the section on “agreements,” while the definition issues without consensus are addressed in a section on “issues needing resolution.” The second section focuses on agreements, which describe the larger planning context, expand on the definition of capacity, review indicators and standards, and integrate the roles of these concepts in resource planning. We believe there is broad agreement about these concepts, their place in planning, and how they are used (even when practitioners approach capacity from different perspectives). These agreements are not intended to describe a specific planning process, but collectively offer principles needed to develop and use capacities in plans. The third section focuses on the issues needing resolution, including “Differences We Resolved” and “Differences That Remain.” “Resolved issues” are divergent positions that we reconciled. However, several other conceptual “differences” remain. For these we summarize contrasting views, allowing readers to evaluate their merits and decide for themselves.

Our group has debated whether agreements or differences are more important, but the agreements greatly outnumber the differences. Advocates for different views are likely to continue debating these capacity issues, and agency policies (sometimes with assistance from the courts) may eventually settle some of them. A goal of this paper is to clarify issues in these debates.

Defining Capacity

This section provides a concise capacity definition. We have identified several elements about which we all agree (“Consensus Definition Elements”), but a few elements have

not been reconciled (“Elements of Disagreement”). Consensus elements are discussed in greater detail in the “Agreements” section, while elements without consensus are discussed in “Differences That Remain.”

Consensus Definition Elements

- Capacity is the amount and type of use that is compatible with the management prescription for an area.
- A capacity is a number on a use-level scale such as “trips per day entering Skyline trailhead,” or “people at one time at Hidden Falls.” It has (1) units of use, (2) timing, and (3) location components.
- The basis for any capacity is a management prescription. This includes:
 - Management goals and objectives for all important uses and values, including desired recreation opportunities to be provided.
 - “Desired conditions” and the “mix” of resource uses and values to be managed for.
 - Standards that quantitatively define appropriate levels for goals, objectives, desired conditions, and/or indicators.
 - Planned management program and actions to meet goals and objectives, provide desired conditions, and avoid violating standards.
 - Budget and personnel resources that will be used to implement management actions.

Although it is common to speak of a single capacity for an area, many areas will have multiple capacities—for different types of uses, facilities, programs, sub-areas, times of year, or other managerially relevant situations. In a planning process, capacities will also be specified for each alternative before a “preferred alternative” (and associated capacities) are selected.

Definition Elements without Consensus

Our group identified five disagreements listed simply below and treated at length later; they are important but can be better understood after considering the “Agreements” and “Issues We Resolved.” Those interested in the more detailed treatment are referred to the “Differences That Remain” section.

- Is capacity a “maximum use level?”
- Does capacity focus on the amount and type of use that can be or will be accommodated?
- Are capacities and use limits always the same?
- What commitment should there be to a capacity?
- When has capacity been addressed?

Agreements about Capacity

This section provides 34 “agreements” that we believe are important for understanding and applying capacity in resource planning efforts. Some agreements are more general and describe the larger planning context in which capacities are formulated, while others are specific about what capacity is, how capacities are developed, and how they should be integrated into planning processes. Taken together, the agreements describe the conceptual foundation needed to develop capacities. They do not prescribe a specific process for developing capacities (several processes are available, as noted earlier), which is beyond the scope of this paper. Agreements are organized into three categories (recreation planning, capacities in resource planning, and indicators and standards).

Recreation Planning

1. Public lands and waters provide multiple uses, values, and benefits to the public (e.g., water quality, timber production, wildlife habitat, fisheries, historic preservation, scenery, threatened and endangered wildlife species, recreation, education, economic development). Even land designations with a primary use implicit in their name (e.g., wilderness, national recreation areas) are managed for multiple uses, values, and benefits.
2. Planning refers to a systematic decision-making process by public agencies. A plan is a tool to guide managers about how, when, and where to provide the multiple uses, values, and benefits as outlined above.
3. The management of public lands and waters and their uses, values, and benefits, are codified in a detailed “management prescription” set forth in an approved plan. Different agencies use different names for these plans (e.g., general management plan, integrated resource management plan, comprehensive conservation plan, recreation management plan). Some plans consider larger areas or multiple resource uses and values (e.g., general or resource management plans or a forest plan), while others focus on fewer uses or values (e.g., site plans, backcountry plans, business plans, or commercial use plans). The more general plans typically provide a broad framework from which more specific and detailed plans will be tiered, although general plans may contain specific decisions about significant resource uses and values. For the purposes of this paper, “planning,” and “plans” are used generically to describe all these decision-making processes and documents.
4. A plan is an integrated set of decisions about the resource uses and values that will be provided. Decisions about one resource or value are not made in isolation from the other resources and values to be managed for in an area. In the context of recreation resources, a plan defines what recreation opportunities will be provided and how the important ecological, social, and managerial components of the recreation setting will be managed. The plan specifies goals and objectives (including intended recreation opportunities), desired conditions, indicators and standards, management programs and actions, budget/personnel requirements, intended monitoring, and the basis for adaptive management. Addressing and managing for capacity is often an important component in these plans and it is the focus of this paper.
5. A “comprehensive” planning model typically guides public planning processes, insuring that a plan is comprehensive (considers all major issues, resource uses, and values), integrated (considers the consequences of actions taken together, not in isolation), and transparent (connections between decisions and objectives are publicly disclosed and trackable). Legal or agency regulations and guidelines for these planning efforts (e.g., a NEPA-compliant planning process used on federal lands, although others may apply in other jurisdictions) generally require careful consideration of: (a) best available information and science; (b) public input; (c) a range of reasonable alternatives; (d) positive and negative consequences of proposed alternatives; (f) a rigorous and systematic comparison of alternatives; and (g) potential actions to mitigate negative and enhance positive consequences.

A preferred alternative is selected based on sound professional judgment. When decisions are challenged, we believe courts generally try to determine whether procedural requirements were satisfied (i.e., the planning process was conducted appropriately), and whether the decision is “reasonable” based on the available information.

6. Most “comprehensive planning” occurs through a “planning cycle” with a defined period of “plan development” (typically one to three years, although other time frames are possible) followed by a much longer period of “plan implementation” (typically 10 to 15 years, although these lengths appear to be increasing, and some have been extended indefinitely). During plan implementation, its success is “tracked” through a monitoring program with periodic (typically three- to five-year) evaluations to see if new information or circumstances warrant “mid-course adjustments,” which may include plan amendments, plan supplements, or a new planning process (large-scale revision). The plan development stage is the best time to make major decisions because: (a) time and money have been allocated; (b) the agency has “assembled” professionals and stakeholders; (c) the greatest amount of information, data, and science are available; (d) all components can be considered in an integrated and comprehensive fashion; (e) the process can more easily meet legal requirements; and (f) the public is more likely to be interested and engaged.
7. Plans are “decision documents” that commit agencies to meet the full management prescription, including desired conditions that provide for specified recreation and non-recreational use, values, and benefits. However, they should remain adaptive to new science and information and to changes in technology, uses, or other circumstances. To be adaptive, a plan should include a monitoring program that allows substantial changes in information, assumptions, or circumstances to be considered in light of the plan’s commitments. Any major change to the plan should receive the same careful analysis that went into the original decision, and must meet legal planning requirements.
8. The analytical focus of public planning processes is developing and evaluating a range of management alternatives. Each proposed alternative offers a different combination of management goals, objectives, resource uses and values, management programs and actions, indicators/standards, affected environment, capacities, and budget/personnel requirements which produce different sets of consequences. Because each alternative has a different management prescription, each has a different capacity.
9. In the recreation portion of these planning efforts, recreation professionals detail how specific settings (e.g., zones) will be managed to provide recreation use while protecting environmental attributes and high quality experiences. Setting decisions are made for a specific area and period of time.
10. A recreation setting is comprised of resource, social, and managerial components.
 - Resource components include natural resources such as rivers, vegetation, topography, wildlife, air quality, natural quiet, and cultural resources such as pre-historic or historic sites.
 - Social components include types of recreation activities (e.g., motorized or non-motorized use), spatial arrangements of activities, and amounts of use.
 - Managerial components include rules, regulations, and administrative activities such as interpretation and law enforcement, and developed resources such as trails, campgrounds, or interpretive facilities.

In practice, these components are combined to form each particular recreation setting, so the “lines” between components are sometimes blurred. The recreation setting also influences and is influenced by impacts of non-recreational activities and uses (e.g., extractive activities, adjacent private land uses, roads, scientific studies).

11. Through the planning process, decisions are made about the recreational opportunities to be provided in harmony with other resource values and uses. The overarching goal is to ensure the protection of natural, cultural, and experiential resource values, and this is achieved through a management prescription that links management actions to management objectives, desired conditions, and standards. There are many management actions available to achieve these recreation objectives. General categories of actions include: (a) site development or improvements (e.g., site hardening, toilets, drainage systems to prevent erosion, facility expansion, facility redesign); (b) site restoration and clean-up (e.g., re-vegetation of sites, litter clean-up); (c) information and education (e.g., “minimum impact” programs, information about alternative opportunities); (d) regulation of behavior (e.g., type of use prohibitions, defined areas of use, rules defining specific use practices); and (e) regulation of the amount of use or “use limits” (e.g., reservation and permit systems, closing facilities when full, seasonal closures).
12. Meeting a capacity by managing the type, amount, and location of recreation use may be an effective tool for achieving certain objectives but ineffective for others. Impacts are not always related to the number of users, or may be strongly affected by other factors (e.g., poorly designed or built trails, unauthorized use, inconsistent tourism marketing, lack of regulation enforcement, insufficient personnel). The following options offer guidelines about the potential effectiveness of alternative management actions.
 - If impacts are not related to the type or amount of use, managers should consider other actions besides use limits to address visitor impacts (as outlined in item 11 above).
 - In situations where impacts are related to the type and amount of use but other factors are even more important, use limits may supplement the other management actions outlined above.
 - In situations where impacts are strongly related to amount and type of use, use limits may be particularly effective management actions.

Capacities in Recreation Planning

13. As discussed in the definition, a capacity is a number specified by units of use, time, and location components (e.g., float trips per day leaving the put-in, backpack trips per day entering the backcountry, people at one time using an interpretive center, cars or buses at one time in a parking area). Although many elements of a management prescription are necessary to identify a capacity (e.g., objectives, desired conditions, standards, other actions, budgets, personnel), these elements by themselves are not capacities.
14. Capacities are a fundamental planning and management tool in the recreation profession. Some of the multiple purposes and values to managers, the public, and the private sector include: (a) help ensure that use levels do not degrade ecological, cultural, or experiential resources and values; (b) provide clarity and predictability for concessionaires, local businesses, and communities; (c) enable best-business practice of demand/supply analysis; (d) improve the clarity and comparability of management alternatives in a planning process; (e) help plan and design recreation and administrative facilities, infrastructure (sewer, water, electricity), transportation routes and systems, and other built environments; (f) help allocate management resources across time and settings (e.g., money, personnel, equipment, monitoring tools); (g) help plan and design recreation-related management programs and activities (e.g.,

the size and nature of the interpretation, law enforcement, maintenance programs); (h) help assess public health and safety risks and planning potential management responses (particularly important for high-risk recreation such as mountain climbing, powerboating, off-road sport biking, caving), (i) help with allocation decisions within and between outfitted and non-outfitted sectors; (j) help design potential reservation, timed-entry systems, or other use allocation systems; (k) help assess when recreation demand may warrant an expansion of the current supply of public or private recreation facilities or opportunities. (l) serve as a trigger for increased management attention or action; (m) help justify the need for additional financial and personnel resources to implement management actions.

15. Visitor capacities are not “intrinsic” attributes of a place, solely determined by resource characteristics. Because capacity is the use level compatible with the full management prescription, capacity may change if the value judgments, allocations, or other decisions in the management prescription change.
16. Visitor capacities cannot be developed in isolation. They should be internally consistent (i.e., fit and work together) with all the parts of an alternative’s management prescription, including goals and objectives, other resource uses and values, desired conditions, intended recreation opportunities, and standards defining high quality experiences or ecological conditions. They also should fit with other management actions and personnel/budgets that will be used to implement the alternative, including planned development, education/interpretation programs, use regulations, and use limit actions that might be used to manage for the capacity.
17. As with other resource management issues, visitor capacities cannot be developed without both descriptive and evaluative information.
 - Descriptive information is used to analyze and show “how the system works” (e.g., how different amounts of use produce different levels of encounters, camp competition, waiting to use facilities; or how different types of use produce different levels of soil compaction, vegetation loss, or meadow function).
 - Evaluative information specifies value judgments, including management goals and objectives about the type of opportunity to be provided, and thresholds which define high quality (e.g., “provide a wilderness experience that keeps encounters low and limits the size of bare ground areas at backcountry camps,” “provide a motorized boating experience that minimizes waiting time to use launch areas and limits erosion from boat wakes”).
18. As with general recreation planning, visitor capacities can help ensure regional recreation diversity and a spectrum of recreation opportunities. This is accomplished by considering the supply and range of recreation opportunities in the region when developing and then choosing among alternative management prescriptions.
19. Visitor capacities, like other aspects of recreation planning, can be applied at multiple scales. In some cases a capacity refers to an entire administrative area such as a lake, river, backcountry area, or historic site. In others, a capacity refers to key locations within an area such as a river segment, campground, marina, visitor center, observation point, historic monument, parking lot, trail segment, or trailhead. Meaningful and effective capacities for large or diverse areas will probably require dividing areas into smaller sub-areas, each with separate capacities. Defining appropriate sub-areas for which capacities will be developed is an important planning activity.
20. The “units of use” for a visitor capacity may vary. For example, a capacity may refer to individuals, groups, automobiles, buses, boats, tour groups, overflights, campsites,

marina slips, hotel rooms, educational groups, vendors and other non-recreational visitors. Choosing from among alternative “units of use” for a capacity is an important planning activity.

21. The number of visitor capacities may vary. An area may have one or more capacities for key locations and activities depending on the circumstances (e.g., different capacities on weekends and weekdays, in summer vs. winter, or for hikers vs. boaters). Defining appropriate temporal and activity “boundaries” for capacities is an important planning activity.
22. As with other planning issues, greater effort is warranted where “more is at stake” (e.g., when there is greater controversy, higher risk, greater commitment of resources, or potential for irreversible loss). Applied to capacity, these situations are more likely (and greater effort is warranted) if current use is approaching capacity. When use levels are very low in relation to capacity, certainty and precision aren’t as important (and less effort is warranted). This “sliding scale of analysis” concept applies to many capacity-related planning activities, including scoping, data collection, public involvement, inventory and assessment of the current situation, scientific study, developing management alternatives, evaluating consequences, considering mitigation options, or proposing monitoring.
23. It is important to address capacity proactively before impacts become unacceptable, irreversible change occurs, or conflict and contentiousness develops among stakeholders. If possible, managers should prescribe which management actions they will employ if parts of the management prescription are violated, particularly if direct use limits are contemplated. Restrictions or allocations may be more readily accepted by users or stakeholders if they are prescribed before they need to be implemented. As with all decisions in a plan, capacities should be changed in response to compelling new information (e.g., monitoring or scientific findings), or changes in circumstances, public uses, or unforeseen events. The procedural requirements associated with a change in capacity will vary with what is “at stake,” as described in the paragraph above.

Indicators and Standards in Recreation Planning

24. The concept of “indicators and standards” is commonly used in many fields, including business, medical research, health, and education. In natural resource management, indicators and standards are generally used in two ways:
 - To track the effects of human activity on various resources. These may include standards that define desirable ecological or cultural resource conditions, or standards that define high quality experiential conditions.
 - To track the effects of facility or administrative practices. These may include facility standards that define construction, maintenance, or operational requirements; or managerial standards that define personnel, programmatic, interpretation, or monitoring requirements.

Both types of indicators and standards help measure the success of plan implementation, guide monitoring and adaptive management, and are considered “best management practices.”

25. In the context of visitor capacity, indicators are variables selected to represent natural and cultural resource, experiential, or managerial conditions in a recreation setting. Standards define thresholds for those indicators; they “draw the line” between “acceptable” and “unacceptable,” “desirable” and “undesirable,” “high quality” and “low quality,” depending upon the situation.

26. Like visitor capacities, indicators and standards cannot be developed in isolation. They should be developed within a planning process as described above and be internally consistent with all components of the management prescription. Within a preferred alternative, indicators and standards are selected based on sound professional judgment.
27. Capacity-related indicators are more useful when they are: (a) specific (precise and clearly related to conditions of concern); (b) measurable (efficiently calculable in the field); (c) responsive (related to human-caused changes in conditions) (d) sensitive (able to detect meaningful change at an appropriate level of precision); (e) integrated (reflect a broader set of conditions); (f) time-bounded (describe acceptable conditions for a specific period, and may include “never” or “always”); (g) important (focused on the most salient conditions); and (h) relatively few in number (to reduce management complexity).
28. Standards are thresholds that define the appropriate level or “place” on an indicator’s scale. Standards are more useful when they are: (a) quantitative (although in some cases qualitative measures such as “high, medium, low” may suffice); (b) attainable (if they are too challenging, managers and the public can become frustrated); (c) developed with a good sense of the actions that might be needed to attain them, and (d) output-oriented (focus on the desirable condition, not how it is achieved).
29. Indicators seldom completely represent all objectives and desired conditions. It is important to periodically evaluate whether indicators or standards should be changed to better represent objectives and desired conditions.
30. In each management alternative under consideration in a planning process, the indicators and standards must be presented for effective comparison and evaluation of consequences. This adds clarity for both planners and the public.
31. Standards may vary across alternatives in a planning process. Rationales for standards should be transparent, and they should be presented clearly and encourage comparisons across alternatives. In the preferred alternative, choices of standards are based on sound professional judgment that considers: (a) the legal environment, including laws, policies, and regulations; (b) current resource and social conditions; (c) administrative feasibility such as available personnel and funding (can actions be taken to meet the standard?); (d) public acceptability (will stakeholders or the public support management actions given tradeoffs with other values?); (e) costs and benefits associated with planned management actions; (f) supply and demand of regional opportunities; (h) uniqueness of opportunities; (i) risk of irreversible change, (j) impacts on all resources, including T&E species, fragile cultural or biological resources, and non-recreational uses, and (k) science-based information about the sensitivity of resources and recreation experiences, the relationships between visitor use and impacts, and public values and preferences.
32. As with all decisions associated with a management prescription, setting capacity-related standards typically involves choosing an appropriate balance between competing values. There is often a trade-off between improved conditions and reduced access (e.g., lower use) because standards that minimize biophysical degradation (e.g., no user-created trails in an alpine meadow) or target very high-quality experiential conditions (e.g., users’ preferences for less than two encounters in a wilderness setting) will increase the likelihood of needing to restrict access or behavior. Standards that allow more ecological degradation (e.g., up to 1,000 square feet of bare ground at designated camps) or target “acceptable” definitions of quality (e.g., users’ tolerances for less than five encounters) will be less likely to require such management actions.

In setting standards, as with all aspects of planning, plans should be transparent about different levels of protection and trade-offs with other values.

33. Standards for capacities should be considered “red light” thresholds, sometimes described as “hard” or “strict” standards. If monitoring indicates conditions threaten to violate standards, managers must take action to keep impacts from exceeding defined levels. In contrast, one might also define “yellow light” warnings, sometimes described as “soft” or “cautionary” standards (although we prefer the label “warning” to avoid confusion). Warnings suggest a need to increase monitoring efforts or begin the work to implement the more substantial actions that will be necessary if increasing impacts threaten the “red light standard.” The “red light” and “yellow light” distinction clarifies the level of management response. One must stop at red lights, while yellow lights simply urge caution.
34. Capacities should not be exceeded, and management prescriptions should describe which actions (as outlined earlier) will be applied if that occurs. Because some actions may restrict access and be controversial, it is important to fully understand and verify the “facts” of the situation before implementation. There are at least four issues here: (a) accuracy of use monitoring data (is use really above capacity?); (b) certainty of the relationship between use levels and impacts (is the exceeded capacity really causing impacts to violate standards?); (c) effectiveness of other management prescription elements (have “other actions” been fully implemented and are they working?), and (d) causes of the use increase (is the use increase temporary and due to identifiable circumstances such as weather, a local or outfitter marketing campaign, or substitute resource closures?).

If these issues are satisfactorily understood and use levels are likely to continue increasing and compromise parts of a management prescription, either use must be limited or the capacity must be raised. Raising capacities may be acceptable in some circumstances (but not “just because” an agency wants to avoid limiting use to meet its declared capacity). Two examples are offered below:

- Agencies believe some part of the management prescription (e.g., an objective, desired condition, or standard) has become “too stringent” or “unachievable” and decides to relax it. When that part of the prescription is adjusted, capacities may need to be adjusted too.
- Agencies believe some other management action capable of decreasing the per capita impact of use (e.g., paving trails) could be added to the management prescription. When the prescription changes, capacities may need to be adjusted.

In either case, agencies are changing part of the prescription, which may require a plan amendment to explain the change and how it affects capacity.

Issues Needing Resolution

This section considers several challenging issues related to capacity. For some issues (“Differences We Resolved”), we identified positions and described resolutions that usually involved refining terminology or recognizing alternative (but not incompatible) approaches. For “Differences That Remain,” we have articulated our individual positions so readers can evaluate them for themselves.

Differences We Resolved

Terms for capacity. The term “capacity” has historically been used with several different modifiers. “Carrying capacity” has a long history, but this term originated in the shipping industry (the amount of freight a ship could carry), was adapted to other fields of study (range and wildlife management, global population sustainability), and doesn’t specify the application to recreation settings. “Recreation capacity,” “user capacity,” “visitor capacity,” and “carrying capacity in recreation settings” all accomplish this goal, each with different connotations that work better in different situations. For this document we have chosen to use “visitor capacity” or just “capacity” when the context is clear, but we consider all these terms interchangeable.

Capacity: specific or general concept? Visitor capacity has sometimes been used as a broad “umbrella” concept that refers to a wide range of recreation planning and management issues. Capacity has also been used more specifically to refer to the type and amount of use that will be accommodated within a management prescription (thus referring to one management variable). We believe the more specific definition better distinguishes capacity as one important focus within the broader processes of recreation planning or management, and that is how the term is used in this paper. However, both conceptualizations have adherents and are likely to be used in the future; in either case, resource professionals should clarify which one they are using. The two different conceptualizations are also at the heart of what it means to “address capacity,” an unresolved difference discussed below.

Specifying Capacities “Ahead of Time” or “After Monitoring?”

Some contend that capacities can only be specified with certainty as use levels approach capacity, and monitoring shows how conditions respond to use. Others believe capacities of sufficient certainty can be specified proactively or “ahead of time,” based on available information and reasoned projections developed through a planning process even if monitoring data is unavailable.

This may not require choosing one approach. Scientific information, analysis, and professional judgments can be used to predict what use level will be consistent with a given management prescription, but monitoring and adaptive management increase certainty by tracking changes and adjusting accordingly. In most “real world” situations, both approaches may be needed at different times.

“Limiting Factor” Versus “Holistic” Analyses

We all agree there is no “magic formula” for specifying capacities. But capacities are developed as part of systematic planning processes that have specific steps, requirements, and outcomes that integrate information, analysis, and professional judgment (as described in the agreements outlined earlier). Some contend that a “limiting factor” analysis can be a sound approach. This focuses on identifying a fewer number of objectives or standards in a management prescription that are likely to be “violated” at lower use levels than others. From this perspective, capacities are largely determined by the use level that violates these limiting factors. (Note: these are not necessarily the most important objective/standard(s), but the one(s) that are violated at the lowest use level). Others contend that it is rarely possible to identify limiting factors, and that decision-making should be more “holistic” and consider all aspects of the management prescription together. This approach argues against reliance on a smaller number of objectives or standards when developing capacities.

The science or art of decision making is a complex topic beyond the scope of this paper, and the choice among these approaches may depend upon the characteristics of the situation, the issues at hand, and the style(s) of decision maker(s). Advocates for the two

approaches ultimately “agreed to disagree” about their merits and the situations when each might “work better.” However, regardless of one’s preferred approach, we all agreed:

- Capacities are based on multiple attribute analyses and either approach must consider all components of a management prescription (e.g., objectives, desired conditions, indicators / standards, and management actions) to ensure that none will be violated by the capacity.
- Capacities should be based on a transparent rationale, so either approach needs to document the “logic” used to develop capacities.

Differences That Remain

This final section summarizes positions on five substantive differences that we were unable to reconcile during our discussions. Although some authors share positions on some issues, our different perspectives are best described through individual summaries.

Three of the differences involve the definition of capacity:

- Is capacity a maximum use level (a number at the high end of the scale) or can it refer to any reasonable use level that fits with the management prescription?
- Is capacity an estimate of the amount of use that can be accommodated for a given management prescription, or a decision that defines the amount of use that will be accommodated for a prescription (a part of the prescription).
- Are capacities always the same as use limits, or are these different concepts? A related issue is whether capacities can be based on objectives broader than environmental or experiential values.

The other two differences involve implications of different capacity definitions:

- What commitment should there be to a capacity? We all agree agencies should commit to the objectives, standards, and management actions they specify in a plan, and the actions could include use limits. But because we have different definitions for capacities and use limits, we disagree on the “commitment” to capacities. This difference focuses on what agencies must do if use starts to exceed a capacity.
- What does it mean to address capacity? We all agree there are situations where decisions about use levels are necessary. But are there other situations where a specific use level decision is unnecessary, and an approximate capacity estimate and/or a commitment to standards and monitoring is sufficient?

Robert Manning Perspective

Visitor capacity is the maximum amount of recreation use and resulting impacts that can be accommodated in a park or outdoor recreation area. It is estimated on the basis of management objectives, associated indicators and standards, and related considerations (or the area’s “management prescription” as used in this paper). In some cases, it may be possible or required to express visitor capacity in terms of a maximum use level. For example, relationships between 1) types and amounts of visitor use and 2) indicators and standards may be known, allowing for direct estimation of maximum use levels. Or required management decisions, such as facility development and commercial use contracts, may demand estimates of maximum use levels. However, in other cases, visitor capacity can be expressed in the form of indicators and standards. This approach relies on a more “adaptive” process in which visitor use is managed and use levels are adjusted based on

how resource and experiential conditions compare to indicators and standards. Regardless of which of these approaches is taken, it is important to emphasize that 1) visitor capacity should be guided primarily by resource and experiential objectives (expressed as indicators and standards), and 2) limits on visitor use are one of many options that can be used to manage visitor capacity.

Visitor capacity can be interpreted as the maximum amount of recreation use that can and will be accommodated. Use of the word “can” implies consideration within the management prescription for the area (and is not a theoretical maximum), and this has the same meaning as the word “will.”

Visitor capacities and use limits are not necessarily synonymous. When visitor capacities are expressed in terms of a maximum use level, then the two terms are synonymous. However, when visitor capacities are expressed in terms of indicators and standards, then use limits are one of many potential practices that can be used to manage visitor capacity.

Formulation of a visitor capacity should represent a strong commitment by management agencies. A visitor capacity is based on an explicit statement of the resource and experiential conditions to be provided, and management agencies should maintain these conditions.

Addressing visitor capacity is a long-term and continuing process. Once visitor capacity has been estimated, use levels and indicators and standards must be monitored and management actions taken to ensure that 1) standards are not violated and 2) management actions are effective.

David Cole Perspective

Capacity is the type and amount of visitor use beyond which desired environmental and experiential conditions are adversely affected. This definition differs from those of my colleagues in three ways:

- Capacity is the high end, a maximum or threshold—not any number consistent with a management prescription.
- Capacity is about ensuring sustainability of environmental/experiential values—not attainment of any objectives a manager might have (e.g., more money for concessionaires).
- Capacity is a description of how much use can be accommodated—not a prescriptive decision regarding how much use will be accommodated.

This definition is consistent with the ruling of the 9th Circuit Court in the Merced River case—“the plain meaning of the phrase ‘address...user capacities’ is the Comprehensive Management Plan must deal with and discuss (not decide) the maximum number of people (not any reasonable number) that can be received” and not “adversely impact the Merced Outstandingly Remarkable Values (not any objectives).”

Capacity informs decisions about use limits and can only be defined after decisions about objectives/standards have been made. But capacity itself is not prescriptive. Capacities describe the likely consequences of prescriptive decisions—analogueous to estimates of how elk population size will vary among alternatives. Descriptive estimates of how much use can be accommodated while sustaining environmental/experiential values and prescriptive decisions about how much use to allow are not the same thing. Both are important but they cannot both be labeled capacity. If capacity is about sustainability, capacity must be what can be accommodated—not what will be allowed, because whether we like it or not, deciding to allow more use than is sustainable is an option.

Because capacities and use limits are not the same thing, commitments to capacities and use limits differ. Managers need to be committed to their decisions, the objectives/standards they set, and to use limits. Capacities inform decisions and commitments but are not themselves commitments.

To address capacity, planners/managers must specify objectives for environmental/experiential values, estimate how much use can be accommodated while sustaining these values, and ensure that use does not exceed capacity estimates. Where environmental/experiential values are threatened by excessive use, capacity estimates should be specific. Where values are not threatened, capacity can be addressed effectively, without specific numerical capacities, by developing objectives/standards and rough approximations of capacity. If current use is far below capacity, more rigorous analysis and precise capacities are unwarranted at this time.

Doug Whittaker and Bo Shelby Perspective

We agree that capacity is the type and amount of use compatible with all the elements of a management prescription, but several clarifications are helpful. First, capacity focuses on the highest amount of use compatible with a prescription: “How many is too many?” But we avoid using “maximum,” which may imply an absolute or theoretical rather than practical number.

Second, a capacity should not be exceeded, so a “use limit” action may be needed to “implement” or “enforce” a capacity. With other elements of the prescription specified, the use limit is the same number as the capacity, even though a plan may include several ways (e.g., limited entry systems, facility size adjustments) to meet the “limit.” With this perspective, the use level that “can be” accommodated (capacity) is the same as the number that “will be” accommodated (use limit). Some suggest a use limit could be different from a capacity for reasons such as increasing local economic benefit, easing stakeholder political pressure, or incorporating management actions that reduce impacts without reducing use. We think these considerations change the management prescription (which may have goals, objectives, or management actions that extend beyond the recreation setting). This encourages decision makers to be transparent about all the factors they considered. If the management prescription changes, the capacity and use limit may also change.

Third, agency commitment to capacity cuts across several issues. There may be procedural benefits (e.g., regarding NEPA requirements) to identifying capacities without committing to them, especially if use is unlikely to exceed capacity during the planning cycle. But in situations where use could exceed capacity, commitment is important; why identify a capacity and then ignore it?

Finally, what does it mean to “address capacity” in a plan? A plan chooses a management prescription with several elements, including capacities expressed as use levels (indicators and standards by themselves are insufficient). During planning, capacities evolve from more tentative “estimates” for alternatives to committed “decisions” for the selected plan. One generally starts from goals, objectives, etc. before developing capacities that fit with them. But one can also “work backwards” from a tentative capacity, thinking through implications for other prescription elements. Final plans usually evolve from multiple iterations.

Once chosen, capacities are decisions like other parts of the plan. The agency should be committed to them, and capacity changes require the same consideration one would give to changing other parts of the prescription.

Glenn Haas Perspective

My view of visitor capacity is through the “lens” of administrative decision making, public planning and judicial doctrine, rather than a scientific lens. A capacity is a decision about a reasonable number of recreation opportunities that will be managed for which is consistent with and helps achieve the full management prescription for an area. A capacity is the “supply” of opportunities that will be managed for.

Capacities are administrative decisions arrived at through a legally sufficient public planning process. The resulting prescription (i.e., plan) is a decision document detailing the type and amount of various resource uses and values that will be managed for in an area (e.g., timber, grazing, water, wildlife, educational uses, commercial services, community stability, natural quiet, wetland restoration, and recreation). It is not realistic or necessary for planners to estimate or determine the maximum capacities for each resource use and value, let alone combinations thereof that can be accommodated in an area.

There is no single absolute, maximum, or correct capacity number, or estimate thereof. There is a range of reasonable capacities whose merits are rigorously evaluated across the alternatives during a planning process.

Capacity decisions will be judged on the legal standards of being reasoned and reasonable (i.e., not arbitrary and capricious). Capacity decisions are not judged on standards of accuracy, rightness, or correctness.

The public and managers can understand and accept a reasonable capacity number. Referring to a capacity as the maximum number is inherently debatable and litigious. The latter imposes the legal burden to defend the number itself and the characterization that the number, and only that number, is the maximum.

Capacities are “triggers” for responsive management action. A capacity is one decision; how to manage for the capacity is another decision, often made years apart. Use limits are one of many management responses (as outlined earlier in this paper). Also, visitors may not be the underlying cause of unacceptable conditions, in which case limiting access would be arbitrary and unfair.

Addressing capacity means to specify numeric capacities based on a sliding scale of analysis:

- When, as a result of scoping in a planning process, recreation use or values are found to be a “significant” public issue, management concern, opportunity or threat; or
- When (a) public lands/waters may be allocated to commercial recreation businesses, (b) public health and safety is at-risk, (c) reservation or timed-entry systems are being considered, or (d) for recreation demand/supply analysis.

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