

## 6. VISITOR USE AND USER CAPACITY

This chapter is divided into three sections to describe how the following user capacity requirement of the Wild and Scenic Rivers Act (WSRA, Section 3(d) (1)) is addressed in the Merced River Plan:

*“...the federal agency charged with the administration of each component of the National Wild and Scenic Rivers System shall prepare a comprehensive management plan for such river segment to provide for the protection of the river values. The plan shall address resource protection, development of lands and facilities, **user capacities**, and other management practices necessary or desirable to achieve the purposes of this Act.”*

**Part I: Introduction and Background to User Capacity** includes definitions and background material for understanding how user capacity has been addressed in the *Merced River Plan/DEIS*. This section includes a list of “Frequently Asked Questions” to address common misunderstandings or assumptions about user capacities and to establish a basis for the technical components of the next two sections.

**Part II: Process to Address User Capacity** provides an overview and explanation of the process used to address user capacity in the *Merced River Plan/DEIS*. Each process step is explained in general terms here while the specific outcomes of each step are discussed in Part III.

**Part III: User Capacities** provides more detail about the specific user capacity decisions in the *Merced River Plan/DEIS*, organized by river segment. The content for each segment includes the relevant management goals and considerations to be addressed, selected indicators and standards, quantitative determinations of user capacities, and specific actions related to managing capacity.

### Road Map to User Capacity Information in the *MERCED RIVER PLAN/DEIS*

User capacity and visitor management information is provided throughout this DEIS. The following is a “road map” to user capacity topics or related information that is contained in the various plan chapters.

**CHAPTER 1: Planning goals** for the *Merced River Plan/DEIS* have been summarized in Chapter 1, the Merced Wild and Scenic River. These include capacity and visitor management goals from the 1980 General Management Plan (GMP) and those developed specifically for the *Merced River Plan/DEIS*. They provide overall direction to protect natural and cultural resource values, provide high quality visitor experiences related to the river, and address crowding and traffic impacts through a visitor management program.

**CHAPTER 2:** The **need for addressing user capacity** and some background on Merced planning litigation is summarized in Chapter 2, the Purpose and Need for the *Merced River Plan/DEIS*. More specific information about the capacity requirement in the WSRA is provided in Part 1 of this chapter. Chapter 2 also includes a summary of public involvement in the planning process, including a description of **public workshops focused on the subject of user capacity**.

**CHAPTER 3:** The *Merced River Plan/DEIS*'s **river segments** are defined in Chapter 3, Merced River Boundaries and Segment Classifications. These define the locations where capacities apply. River classifications help inform the kinds and amounts of use and support facilities that are appropriate for various river segments.

**CHAPTER 4:** The **Section 7 determination process** guides decisions pertaining to development within the bed and banks of the river.

**CHAPTER 5: River values** are defined in Chapter 5, River Values and Their Management. This chapter summarizes the process to protect and enhance the river's values, and then defines the river's free flowing condition, water quality, and segment-specific “outstandingly remarkable values.” For each value, the chapter summarizes **baseline conditions now and at the time of designation** and **management indicators and standards by alternative**.

**CHAPTER 6:** This chapter provides greater detail on the subject of user capacity than is found elsewhere in the document.

**CHAPTER 7:** Contains the **facilities and services analysis** that helped inform decisions in the plan regarding the appropriate types and levels of infrastructure and related visitor services.

**CHAPTER 8:** A **description of current management** or the “no action alternative” is provided in Chapter 8. Current management includes existing user capacities (e.g., for overnight accommodations, campgrounds, and backcountry use).

Management **actions to protect and enhance river values that are “common to all” alternatives** are also provided in Chapter 8. These include several restoration and infrastructure decisions that affect capacities (e.g., overnight accommodation levels, space available for parking, or transportation infrastructure development). Specific measurable limits on use that are common to all action alternatives are included in this section.

**Individual alternative descriptions** are provided in Chapter 8. These include information about user capacities by river segment for overnight, day and administrative uses throughout the corridor. This chapter also includes the various management actions that would be taken in each alternative to protect and enhance river values. Specific measurable limits on use that are unique to a particular action alternative are included in this section.

**CHAPTER 9: The environmental consequences of the alternatives** (which include user capacities) are provided in Volume II of the DEIS. These NEPA-based assessments are largely qualitative descriptions of environmental effects, but include some **quantitative analyses based on capacity decisions** (e.g., local economic impacts, meadow or riparian conditions, peak season densities at recreation attraction sites).

## PART I. INTRODUCTION AND BACKGROUND

The WSRA requires the National Park Service (NPS) to protect river values while allowing for recreational and other public use that does not “substantially interfere” with those values. The WSRA gives “primary emphasis to protecting the river area’s esthetic, scenic, historic, archeological and scientific features.” The *National Wild and Scenic Rivers System: Final Revised Guidelines for Eligibility, Classification and Management of River Areas* (Secretarial Guidelines) define “carrying capacity” in the context of a management plan to mean “the quantity and mixture of recreation and other public use which can be permitted without adverse impact on the resource values of the river area.”<sup>1</sup> Under the Secretarial Guidelines, public use should be regulated and distributed where necessary to protect and enhance river values. Public use may be controlled by limiting public access to the river, by issuing permits, or by other means available to the managing agency through its general statutory authorities.

The U.S. Court of Appeals for the Ninth Circuit has interpreted these mandates to mean that a comprehensive river management plan “must deal with or discuss the maximum number of people that can be received” in the river area, and that the NPS must “adopt specific limits on user capacity” that “describe an actual level of visitor use that will not adversely impact” river values.<sup>2</sup> The *Merced River Plan* has been developed to be consistent with WSRA and the Guidelines, as interpreted by judicial opinions.

As indicated by recent literature (Whittaker, Shelby, Manning, Cole, and Haas, 2010), user capacities have three basic components: units of use, location, and timing.

<sup>1</sup> Guidelines at 39459. WSRA and the Secretaries’ Guidelines use the terms “carrying capacity” and “user capacity” interchangeably.

<sup>2</sup> *Friends of Yosemite Valley v. Kempthorne*, 520 F.3d 1024 (9th Cir. 2008).

## Units of Use

In the *Merced River Plan/DEIS*, user capacities are organized into three major categories: 1) overnight use, 2) day use, and 3) administrative use.

**Overnight use:** This category includes people who stay in a campsite in the Merced River corridor, in one of the Yosemite Lodges or the Merced Lake High Sierra Camp, or who backpack in the Yosemite Wilderness. Overnight use levels are calculated as the maximum occupancy of all camping, lodging, and wilderness zones per night.

**Day use:** This category includes people who come for all or part of a day to sightsee, hike, or pursue other activities, spending the night outside the river corridor. Much of this use is concentrated in the Yosemite Valley and Wawona segments, although day users also visit wilderness segments that can be reached on a day hike from Yosemite Valley or Wawona. This category also includes people passing through on Highway 140 who make a brief stop at the roadside pullouts in the El Portal and Gorge river segments.

**Administrative use:** This category includes NPS, park concessioner, park partner, and volunteer personnel. Specific examples include trail crews, maintenance workers, resource protection staff, scientific research teams, commercial delivery drivers, and campground staff. Specific examples of concessioner uses include employees working at the hotels and lodges, visitor center, store, and food service outlets.

## Location

User capacities are location-specific and defined for specific river segments (and in some cases for smaller areas within segments, such as boating reaches). Areas where use levels are more highly concentrated in the river corridor include the following:

- The Merced River upstream of Nevada Fall, specifically the more concentrated backcountry use and overnight development found in the vicinity of the Merced Lake High Sierra Camp;
- Yosemite Valley, the most developed and high use area in the corridor, which has implications for use in other segments;
- Wawona, a small community with a concentration of use and development; and
- El Portal, a NPS administrative site and community with residential facilities, a hotel under private ownership, and other services that affect use in the Valley and elsewhere in the corridor.

## Timing

Timing for user capacities can also vary. For example, user capacities can be expressed in terms of the number of people per day, or annual visitation, or some other time period. In the *Merced River Plan/DEIS*, user capacities are expressed in terms of the number of “people at one time” (PAOT) during high use periods. This recognizes that peak use conditions for lodging, camping, roads, parking areas, viewing areas, or beaches are particularly important, and are different from total daily visitation (see below). These capacities ensure acceptable conditions during peak use times. By extension, they also ensure that lower use time periods, such as early or late in the day or during shoulder seasons will provide even lower use levels.

## User Capacities and Visitation

The park calculates and reports estimated visitation each year. Visitation estimates are based on traffic volumes, as recorded by automated vehicle counters at entrance stations, and assumptions about the number of people per vehicle. Trends in visitation are of interest to local gateway communities, the park concessionaire, and park managers because the number of people coming to the park each year directly affects local employment, business revenues and park programming. It is important to understand the relationship between user capacities (which are the focus of this plan), annual visitation estimates for a given capacity, and assumptions about the effects of varying use levels on river values. The following sections explain how these different measures are related.

**User Capacities:** Most user capacities for the Merced River Plan/DEIS are expressed as People at One Time (PAOT), defining the maximum number of people that can be received in the corridor at one time without adversely impacting or degrading river values, and without substantially interfering with public use and enjoyment of those values. These at-one-time user capacities have implications for overall visitation; they help determine the total number of people that access different segments throughout the course of a day.

**Visitation:** Visitation is an expected use level over a specified period of time (e.g. 24 hours), given a specified user capacity. Visitation levels are estimated on the basis of several assumptions that are verified by periodic monitoring. These assumptions include: (1) average number of people per vehicle; (2) average occupancy rates of various overnight accommodations; and (3) expected turnover rate of day-use parking spaces as people enter and exit the park during the course of a day.

## Visitor Use Patterns, Behavior and Impacts

User capacities and related visitation are based on assumptions about visitor use patterns and behaviors. These use patterns and behaviors have been studied and documented over a number of years (see for example, Manning et al. 1998; Manning et al. 1999; Lawson et al. 2008). These assumptions relate to whom and how many people visit the park, when they arrive, what activities they participate in, where they go, and how they behave. Because visitor use patterns and behaviors are well documented and generally predictable, each alternative anticipates likely impacts from different levels of visitation and balances facility improvements with other management actions (such as restoration or other mitigation) to protect river values and prevent unacceptable impacts. More intensive actions are generally needed to accommodate higher use levels.

### BACKGROUND ON USER CAPACITY

User capacity, or “carrying capacity” as it has traditionally been referred to, has a long history in natural resource management and has been applied to timber, rangelands, fish and wildlife populations, and recreation use. With philosophical roots that stretch back to Malthus’ population principle (1803) and Hardin’s “tragedy of the commons” (1968), capacities recognize that environments have limits and that ever-increasing use is likely to degrade conditions and become unsustainable. Applications of capacity in park and recreation settings followed rapid growth in outdoor recreation after World War II, prompting public concern over wild lands being “loved to death” (Wagar 1946; DeVoto 1953; Clawson and Held 1957). Focusing on the amount and type of use that recreation areas can accommodate without impairing their values, user capacity continues to play a fundamental role in the effort to protect high quality environments and experiences.

Several natural resource decision-making processes developed in the 1960s and 70s recognized the importance of capacities. The National Environmental Policy Act (NEPA 1969) provided the overarching planning framework for federal lands, ensuring that multiple uses and values were systematically addressed by developing alternatives and evaluating consequences. Several land management initiatives (e.g. 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) also addressed capacity or related issues. These initiatives encouraged increases to the supply of wildland resources for recreation while recognizing the need to manage the type and amount of recreation use to protect experiences and resources.

Research explored many ecological and experiential impacts in these settings, showing that some impacts may 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 importance of clear management goals and specific objectives for ecological, cultural, and experiential resources. Several researcher-developed planning frameworks identified specific terminology and steps that could be used to identify and manage impacts from recreation use. Although there are differences in orientation and emphasis among these processes, they all recognize potential trade-offs between different use levels, conditions, and management actions while providing high quality experiences (Whittaker et al, 2011).

User capacities are a common management tool used by many local, state, and federal agencies (Brown 2001), and the topic has been the focus of several national conferences, recent review papers (Whittaker et al., 2011; Graefe et al, 2011), and federal interagency task forces (Haas et al, 2002; Cahill, et al, 2012). Many managers have established capacities or considered them in their planning, even if they did not employ all of the steps or ideas in the researcher-developed planning frameworks. Capacities have been applied to protect natural, cultural, and experiential resources in diverse recreation settings (e.g., rivers, lakes, trails, backcountry areas, mountains, and islands); to help define the appropriate size and type of facilities (e.g., campgrounds, marinas, boat launches, transportation systems, and visitor centers); to shape the size of agency programs (e.g., interpretation, maintenance); and to determine appropriate levels of commercial and non-commercial uses. Several recent court rulings, including those for the Merced River Plan, have contributed to the evolution of capacity practices. In each case, rulings have set precedents, contributed capacity-related judicial doctrine, and helped clarify defensible and legally sufficient processes for capacity-related decision-making.

Adapted from “Capacity Reconsidered – Finding consensus and clarifying differences”  
by Whittaker, Shelby, Manning, Cole, and Haas (2011).

## Frequently Asked Questions About User Capacity

The following questions and answers address important user capacity issues that are commonly raised by stakeholders and the public. The purpose of this section is to help readers understand the key ideas that drive user capacity decisions in the *Merced River Plan/DEIS*.

### *Is user capacity intrinsic to an area, solely determined by resource characteristics?*

No. User capacities are an outcome of a decision-making process and part of a larger management program. They are the result of a series of judgments in the plan about the desired future environmental and experiential conditions. Capacity is not a single number solely derived from mathematical equations or calculations.

***What are “indicators” and “standards?”***

Indicators are variables selected to represent important ecological, cultural, or experiential conditions in a given setting. Standards define thresholds for those indicators, establishing the benchmark for acceptable conditions.

Establishing indicators and standards is an important step in addressing user capacity. For the WSRA, indicators are typically chosen to evaluate the conditions of specific river values. The *Merced River Plan/DEIS* identifies at least one indicator for each river value, to assess and monitor conditions. Some indicators are more related to visitor use impacts than others. For example, to assess the quality of recreational values in wild segments, park staff members monitor encounter rates, or the number of other people encountered along a trail per hour. This indicator is directly related to the amount of use occurring in this segment. However, water quality is more closely tied to point sources of contaminants, which may be linked to a number of variables other than visitor use. For more on indicators and standards, see Chapter 5.

***Do user capacities involve value judgments?***

Yes, several parts of the user capacity process involve decisions that include value judgments. While scientific inquiry can tell us a lot about the consequences of different choices, research cannot usually tell us what the “right” choices are. Research-informed judgments start at a general level when river values are defined. Other decisions feed into the development of management objectives for the types of visitor experiences to be provided and the development of acceptable standards for river value conditions. Judgments are implicit in the combination of management actions included in each alternative.

***How do biological values relate to user capacities?***

Some biological conditions may be sensitive to the amount of use, in which case they may be the limiting factor in determining capacity. Most often, though, biological conditions are more related to the *type of use occurring* and *how it is managed*. For example, a trail crossing a sensitive meadow could be vulnerable to widening more by stock than by human foot traffic. In this situation, the type of use would have more of an effect on the trail condition—and the associated meadow—than the amount of use. Such a problem could be remedied through trail construction, building a trail that can withstand packstock use. In such cases, the limiting factor for capacity may be some other factor such as kind of use, transportation circulation, parking, or social conditions, not the amount of use.

***What analyses describe how user capacities affect conditions of river values?***

Transportation circulation and parking models, capacity studies and related monitoring, riparian and meadow monitoring, and targeted research are all examples of such analyses. The goal of these use-condition analyses is to show how use levels affect important variables that define high quality conditions. A “road map” to capacity information in the *Merced River Plan/DEIS* is provided in this chapter, and Part III includes the details of the analyses. While this work relies upon knowledge of historical events and current conditions, it also requires predictions about the likely effects of the new management actions proposed in the alternatives.

***Why does the Merced River Plan/DEIS have different user capacities in the alternatives? Do they all protect river values?***

The National Environmental Policy Act requires environmental impact statements to consider a range of alternatives. The *Merced River Plan/DEIS* includes such a range, and all alternatives contained herein protect river values, but they do so in different ways. Alternatives produce different conditions by having different

combinations of user capacities, infrastructure, and related programs of management actions. All protect and enhance river values, as required by WSRA.

*What are the choices inherent in alternatives with higher vs. lower user capacities?*

User capacities, resource conditions, and the infrastructure to support visitation are foundational elements to the alternatives. Changing one of these components often has implications for the others. User capacities in the different alternatives show how higher and lower amounts of use fit with infrastructure and other management actions to produce different resource conditions, protecting river values in different ways. These represent choices for the kind of place the Merced River corridor will be and the visitor experiences available there in the future, all of which must protect river values as required by WSRA.

*Does the Merced River Plan/DEIS consider how user capacities will affect other Park uses?*

Yes. The river values to be protected under WSRA are limited to the river corridor and must be river-related or dependent, and regionally or nationally significant. But NPS also considered how use levels affect other attractions and uses in the park. For example, transportation system modeling and analysis looked at the effect of different parking capacities on the entire roadway network and related traffic conditions outside of the river corridor. The interconnectedness of user capacity and transportation is particularly important in Yosemite. High quality recreation and enjoyment of the river depends on an efficient transportation system that minimizes congestion and time spent traveling on roads, looking for parking, or waiting for shuttles or regional transit.

*What are the limiting factors to user capacity?*

The amount of use an area can sustain depends on its resource characteristics, the type and quantity of use anticipated, and the effectiveness of management actions. Ultimately, the factors that determine how much use is “too much” depend on the conditions being managed for and the type of use being considered. This will vary by river segment, each representing a different type of river area providing different opportunities for use.

*Does a given level of encounters equate to crowding?*

No, as crowding can be subjective. Defined as a negative evaluation of the number of people encountered, crowding involves an individual’s judgment about the number of other people s/he encounters as compared to his/her personal norms or expectations for that particular type of experience. Despite this seeming subjectivity, social norms for encounters are usually lower for more remote, solitary backcountry experiences, and higher for more social frontcountry experiences that involve more interaction with other people.

In setting indicators and standards for the various segments in the Merced River corridor, as well as devising the use levels under the various alternatives, park managers turned to studies done both in Yosemite and in other, similar natural resource areas. Planners then set the standards based on the desired experiences being sought in each segment and in each alternative. For example, one alternative may allow up to four encounters with other parties on a given stretch of trail while another offers half that amount; similarly, one alternative may allow up to 100 people on a given viewpoint in Yosemite Valley while another allows 120.

*How do you analyze the condition of recreational ORVs?*

Yosemite has a wealth of historic and current social science research and related studies that park managers utilized in understanding the condition of Merced River recreational values. These studies include visitor surveys, computer simulation modeling, and resource impact studies. Collectively, this robust body of

research helps describe the Merced recreational river values, and shows how use levels affect the quality of experiences in the Merced River corridor. Much of this information can be found on the park's website ([www.nps.gov/yose/parkmanagement](http://www.nps.gov/yose/parkmanagement)). Chapter 5 also summarizes much of this literature.

***How is transportation system performance and user capacity related to river issues?***

An efficient transportation and parking system is a key part of high quality recreation in the Merced River corridor. The transportation system, including roads, parking, and transit, is the primary means of access for most visitors to the river corridor, so any crowding or delays therein directly affect one's ability to recreate in the Merced River corridor. Moreover, scenic driving is the second most commonly reported recreation activity in Yosemite (64% of all park visitors take a scenic drive).

***Can user capacities be changed after the plan is completed?***

Yes. However, depending on the situation, such changes may be subject to renewed planning and environmental compliance for the National Environmental Policy Act and the Wild and Scenic Rivers Act. The NPS has applied the best available scientific information in the *Merced River Plan/DEIS* to make decisions related to management standards and user capacities. Monitoring and adaptive management allow the NPS to evaluate the success of these decisions and any future changes needed.

## PART II. PROCESS TO ADDRESS USER CAPACITY

The process used to develop the user capacity components of the *Merced River Plan/DEIS* is illustrated in Figure 6-1 and described below. User capacities are not independent of other decisions in the plan; they are embodied within comprehensive management prescriptions that include many other management actions (Haas 2003; Whittaker et al. 2010). For example, decisions about the extent and size of overnight facilities (hotels and campgrounds) to be provided in an alternative will equate to an associated room count and maximum occupancy (to be counted as part of the user capacity).

**FIGURE 6-1: USER CAPACITY PROCESS STEPS**

User Capacity Process Steps
1. Define river values and management goals
2. Document conditions and identify management considerations
3. Analyze kinds of use
4. Develop concepts and themes for alternatives
5. Identify indicators and standards
6. Analyze use and impacts to river values
7. Define draft alternatives and initial capacities
8. Relate capacities to river value conditions
9. Monitor and adjust capacities/management actions



## Step 1. Define River Values and Management Goals

River values (including free-flowing condition, water quality and outstandingly remarkable values) and management goals are the starting point for developing alternatives and associated capacities. River values focus attention on the most important resource conditions and recreation experiences, while goals are a commitment to management actions that will protect or enhance those values while providing for public use. River values and management goals stem from agency mandates and enabling legislation (see Chapter 2). They provide a foundation for the development of specific management standards that guide decisions about user capacity.

Management goals (see Chapter 1) of the Merced River Plan that are related to user capacity include: (1) protecting natural processes; (2) promoting visitor enjoyment; and (3) reducing traffic congestion and crowding. These goals were translated into desired future conditions for key components of river values, such as providing intact meadow or riparian areas and high quality recreation opportunities.

NPS identified segment-specific outstandingly remarkable values (ORVs) using guidance in the Interagency Guidelines (see Chapter 5 for a discussion). Inputs to the identification of river values and their conditions included public input and the best professional judgment of resource specialists and park scientists. Outputs of this process step included detailed descriptions of all river values and their mapped locations.

Not all ORVs are sensitive to variations in the *amount* of visitor or administrative use that occurs. For example, some of the geologic/hydrologic ORVs, like the Upper Merced's glacially carved canyon and the "Giant Staircase" river morphology, are not affected by how many people visit them. In contrast, other ORVs that *are* sensitive to use levels directly or indirectly influence capacity decisions in the *Merced River Plan/DEIS*. These include riparian and meadow conditions in Yosemite Valley, and recreation quality in the Merced River corridor above Nevada Fall and through Yosemite Valley. Although the ORVs are the primary focus of user capacity decision-making, NPS also considered effects of user capacities on other uses and destinations in the corridor (e.g., Bridalveil Fall, Wawona Swinging Bridge, scenic driving on park roads) or adjacent areas outside the river corridor (e.g., Yosemite Falls).

## Step 2. Document Conditions and Identify Management Considerations

For this step, the NPS documented the baseline condition of the river values. This included a comprehensive review of existing research and monitoring information, as well as additional research to fill information gaps. An important component of this assessment was the identification of the extent to which visitor use affects river values. NPS also developed maps of physical site constraints, which helped guide choices about facility locations and infrastructure design such that ORVs, wetlands, flood plains, archeological sites, rare plants, water quantity and quality, and other special resources were protected.

The planning team then used the baseline assessment, understanding of visitor use impacts, and personal observations of field personnel to generate a comprehensive list of management considerations that the Plan needed to address to improve conditions in the river corridor and ensure the protection of river values. A subset of these considerations was directly related to user capacity, or the kinds and amounts of use that could be accommodated.

### Step 3. Analyze Kinds of Use

Recreational use accounts for the greatest amount of public use that occurs in the river corridor (administrative use to support recreational use and resource protection are the other sizable contributors). During plan initiation and scoping, park planners asked the public to describe what they liked to do in the Merced River corridor and which facilities and services these activities would require. The resulting public scoping report (NPS 2006m) provided important feedback to the NPS regarding the level of public interest in different activities. This information gave planners a better sense of the uses that members of the public wanted to keep as well as those they preferred to see reduced or restricted.

Planners also conducted visitor surveys and studies to understand use patterns, and reviewed the findings of social science research completed for similar settings for its relevance to the Merced River (Littlejohn et al. 2005; Le et al. 2008; Blotkamp et al. 2010). This effort provided additional insight into the types of activities and experiences visitors preferred. Finally, NPS planners compiled information on the historic, current, and projected levels of visitor use along the Merced River (DEA 2007; NPS 2008d; NPS 2008e; NPS 2009c; and NPS 2009e).

Recreational and other public uses that do not meet the definition of an ORV (river related or dependent and rare, unique, or exemplary) are permitted under the Wild and Scenic Rivers Act and Guidelines as long as those uses do not “substantially interfere” with the use and enjoyment of ORVs and other river values.<sup>3</sup>

### Step 4. Develop Concepts and Themes for Alternatives

This step packaged management actions around themes to develop a reasonable range of preliminary alternative concepts, as required by NEPA. As discussed in Chapter 5 and shown in the descriptions of alternatives in Chapter 8, management actions include infrastructure changes (e.g., roads, parking, boardwalks, fences, or trails), restoration, and education/regulation programs that affect user capacities and work with them to protect and enhance river values. Several principles guided the development of alternative concepts:

- User capacities should vary across alternative concepts.
- Alternative concepts should represent a reasonable range of different futures (as required by NEPA), but all must protect ORVs by ensuring that river values are maintained at a management standard well above adverse impact (see Chapter 5).
- Some restoration actions, new developments, or infrastructure changes would be common to all alternative concepts, but others would vary across them.
- Similar management actions would be combined within alternative concepts to create conceptually meaningful and distinct themes.

At this stage, alternative concepts were not full management prescriptions, but were sufficient for more detailed analyses (see next steps) to assess the different choices related to the level of infrastructure, river value conditions, and user capacities (as discussed in the FAQ’s earlier in this chapter) inherent in each alternative.

---

<sup>3</sup> WSRA Section 10(a); Guidelines, at 39456.

## Step 5. Identify Indicators and Standards

The next step established the desired conditions for all river values in terms of quantifiable indicators and standards. Indicators are variables selected to represent important resource or experiential conditions; standards define the line between “acceptable” and “unacceptable” conditions. For each indicator, park scientists identified management standards that would maintain conditions far above the critical levels of “adverse impact” and “degradation” specified for each river value (see Chapter 5). This step also included the identification of indicators that would be most sensitive to the effects of visitor use, particularly use levels. This subset of indicators was used in subsequent steps to further determine the amounts of use that could be received while maintaining conditions at or above management standards.

## Step 6. Analyze Use and Impacts to River Values

With indicators and potential standards developed, analyses shifted to further analyzing and understanding the relationships between use and the condition of each river value. This step built upon the foundational descriptive information developed in steps 2 and 3. Analyses applied the best available scientific data and included predictive modeling where available. A summary of the specific use-impact analyses for each segment is provided in Part III of this chapter. Examples of these analyses include:

- Correlations between use densities at Valley attraction sites and overall park visitation (based on various studies conducted in 1998, 1999, and 2007-2010).
- Correlations between Valley beach and boating use densities and overall use levels (Whittaker and Shelby, 2011).
- Transportation system modeling, including traffic circulation and parking supply and demand analyses (DEA and NPS, 2007-2011).
- NPS resource monitoring data (NPS 2005 – 2011).
- Professional judgments about relationships between use and riparian and meadow conditions.

## Step 7. Define Draft Alternatives and Initial User Capacities

This step took the alternatives concepts developed under step four and more fully articulated them as draft alternatives. Park planners fully integrated the suite of management actions for each alternative, connecting indicators and standards to river values and determining the user capacities that would meet those standards and protect river values. Planners based initial user capacities on river value conditions, related mapping of resource site constraints, analysis of transportation system performance and the limitations therein. Park planners developed the draft alternatives to provide different visitor experiences and use levels within these constraints.

## Step 8. Relate Capacities to River Value Conditions

Park planners reviewed the initial user capacities developed in step 8 to ensure that proposed capacities in each alternative would be consistent with the protection and enhancement of river values. Using the same literature from previous steps, as well as any new information that had been generated in completing earlier steps, park planners re-analyzed the capacities to confirm that they would not adversely impact river values. Part III of this chapter summarizes user capacity information across alternatives for each segment.

## Step 9. Monitor and Adapt Management

As part of the plan, park planners designed a monitoring program to ensure that use and conditions remain at predicted levels, such that river values are protected and enhanced. As indicated in Chapter 5, each indicator also specified management actions that would be taken should resource conditions fall below the management standard (the “triggers” in Chapter 5). This step recognizes that predictions made during planning may change, new uses or impacts may arise, or unanticipated consequences may produce unacceptable impacts to river values. The Secretarial Guidelines encourage such monitoring and adaptive management, as does the visitor use management literature (see Cole 1990; Cole and Stankey 1997; Marion 1998; Hammit and Cole 1998; Cole et al. 2005, Manning 2007, McCool et al. 2007; Manning, 2011; Whittaker et al., 2011).

## PART III. USER CAPACITIES

This part of Chapter 6 provides a summary of the user capacities established for each alternative in the plan by river segment. The discussion of the capacities under each segment is further divided into the following sections:

### Management Goals and Considerations

This section discusses the river values, management goals, and capacity considerations relevant to each river segment.

### Indicators and Standards

This section summarizes the specific indicators and management standards that are incorporated into the user capacities established for each river segment. The section also includes a discussion of how the amount of use affects the condition of river values.

### Overview of Capacities

This section summarizes the user capacities established for each river segment, along with related management actions and other implications. These capacity figures are organized by the overall types of use that occur in the river corridor: visitor overnight capacity, visitor day-use capacity, and administrative capacity.

### Capacity Management

This section summarizes user capacity management actions for each segment. It describes the key infrastructure, forms of education and regulation, and other management actions that ensure the kinds and amounts of use allowed in each segment do not exceed stipulated levels or adversely affect river values. Each alternative is a complete management prescription that includes user capacities and a variety of other management actions.

### Conclusion

This section summarizes the key choices inherent in the capacities that have been established for each river segment across the alternatives.

## Segment 1: Merced River Above Nevada Fall

### *Management Goals and Considerations*

Management goals related to user capacity in this segment include: (1) protecting natural processes; (2) promoting visitor enjoyment; and (3) reducing crowding.

The outstandingly remarkable value in this segment most sensitive to user capacities is river-related recreation in an iconic high Sierra setting. This river value features “opportunities for primitive and unconfined recreation, self-reliance, and solitude which are intimately tied to the corridor’s wilderness character.” The entire segment is also in designated Wilderness (with the exception of the Merced Lake High Sierra Camp area). The associated management objective is to “provide for high quality river-related recreation opportunities oriented toward wilderness values,” including “unconfined, self-reliant, and solitude experiences.”

The corridor above Nevada Fall has other biological, geologic/hydrologic, and scenic outstandingly remarkable values, but none are substantially affected by the amount of current or potential visitor or administrative use. Although trails, dispersed campsites, designated camping areas, and the Merced Lake High Sierra Camp have site-specific impacts, these are due more to type and location of use than the amount of use. In addition, most site impacts can be adequately addressed by good trail design, appropriate campsite location, and “Leave No Trace” behavior encouraged by existing and largely effective education or regulation programs. Similarly, the scenic impacts associated with development at those camps and associated ranger/trail crew facilities can be addressed via design guidelines employed within processes that are independent of user capacity.

A review of baseline and existing conditions, studies, monitoring, and public involvement information identified several specific user capacity-related issues for the recreation ORV, including:

- Solitude vs. crowding on trails.
- Densities of campers at designated camping areas.
- Level of development at Merced Lake and effects on wilderness character.
- Level of development at Little Yosemite Valley (LYV) and effects on wilderness character.

Other management considerations that affected the determination of capacities in this segment were as follows:

***Level of development.*** The Wilderness Act states that a wilderness is “an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation” (16 U.S.C. 1131-1136, Section 2c). Similarly, the river classifications contained in the Wild and Scenic Rivers Act guide the level of development appropriate in river segments. According to the WSRA, ‘wild’ river segments are generally inaccessible except by trail, with watersheds and shorelines essentially primitive and waters unpolluted.” Wild river segments represent “vestiges of primitive America.” A “wild” classification suggests limited development and infrastructure, thereby limiting the kinds and amounts of use that are appropriate for the segment.

***Resource constraints and site suitability.*** These constraints include topography, meadow and riparian areas, rare and sensitive plant and animal populations, scenic vista points, and cultural resource sites

Generally, plans for visitor use and access to the river corridor will identify and avoid these sensitive resource areas to minimize the risk of unacceptable impacts.

**Wilderness experience.** As described by the recreational outstandingly remarkable values and the Wilderness Act, outdoor recreation in the Merced River’s wild segments are primarily oriented toward “outstanding opportunities for solitude or a primitive and unconfined type of recreation.” Therefore, for the wilderness segments of the Merced, the key constraint for user capacity is the recreational outstandingly remarkable value where wilderness-related recreation and opportunities for solitude are emphasized.

### ***Indicators and Standards***

The primary indicator that affects capacity determinations in this segment is trail encounters. Encounters have a long history of management application in backcountry areas (Vaske et al, 1986; Shelby et al, 1996; Manning, 2010). In lower-density backcountry areas, most studies address encounters per day, with considerable research suggesting standards of about five encounters per day or less for “wilderness experiences” (Vaske et al, 1986). In higher density settings (including Tioga Road backcountry, several national forest wildernesses in Oregon and Washington) encounters have been measured and managed per hour. As discussed in Chapter 5, trail encounters are measured as the number of encounters per hour during the middle of the day (10 to 4 pm) in the high-use summer season. Table 6-1 shows the encounter standards for this segment across the different alternatives in the *Merced River Plan/DEIS*:

**TABLE 6-1: SUMMARY OF KEY USER CAPACITY INFORMATION: MERCED CORRIDOR ABOVE NEVADA FALL**

Alternatives	1	2	3	4	5	6
	Existing situation	Self-reliant experiences and extensive floodplain restoration	Dispersed experiences and extensive riverbank restoration	Resource-based experiences and targeted restoration	Enhanced experiences and essential riverbank restoration	Diversified experiences and selective riverbank restoration
<b>Indicators/standards: Encounters with other groups per hour on trail segments</b>						
LYV to Lewis Creek	-	2	3	3	3	4
Lewis Creek to Lyell Fork	-	1	1	1	1	1

As shown, the indicator is delineated by trail segments (LYV to Lewis Creek, and Lewis Creek to Lyell Fork); this is because use levels in this segment vary widely on different parts of the trail system. The relationship between use and *trail encounters* appears to be direct and linear, with lower use and encounters on trail segments farther from trailheads and developed areas, such as Lewis Creek to Lyell Fork (Newburger et al. 2009-2011).

Most stock use in the corridor is associated with supply of, and visitor transport to, the Merced Lake High Sierra Camp. Alternatives that reduce or eliminate the camp will equate to less stock use in this segment.

The one-mile segment of the corridor from Nevada Fall to LYV experiences high density use dominated by Half Dome climbers. To address user capacity on this trail segment, the *Merced River Plan/DEIS* adopts the day-use permit system recently established through management planning for Half Dome, which limits ascents to 300 users per day. Although this results in higher encounter rate than is allowed elsewhere in the segment, this is a short trail section, Half Dome use levels are limited to a third of historical peak use levels, and many Half Dome users (knowing what the daily limit is) probably expect a higher-density experience.

## Overview of Capacities

A summary of user capacities by alternative for this segment is presented in Table 6-2. All user capacities in this table refer to people spending the night in the segment (overnight use); using it for part of one day (day use); or administrative overnight and day use.

**TABLE 6-2: SUMMARY OF USER CAPACITIES BY ALTERNATIVE: MERCED CORRIDOR ABOVE NEVADA FALL**

Alternatives	1	2	3	4	5	6
	Current management or "No action"	Self-reliant experiences and extensive floodplain restoration	Dispersed experiences and extensive riverbank restoration	Resource-based experiences and targeted restoration	Enhanced experiences and essential riverbank restoration	Diversified experiences and selective riverbank restoration
Visitor overnight capacity						
Wilderness zone user capacities						
LYV Zone	150	25	75	100	150	150
Merced Lake Zone	50					
Washburn Lake Zone	100					
Mount Lyell Zone	10					
Clark Range Zone	10					
Merced Lake HSC	60	0	15	0	42	60
Total	380	195	260	270	362	380
Visitor day-use capacity						
Half Dome "pass through" use	300					
Other day use	50					
Total	350					
Administrative capacity						
Employee housing	15	5	10	10	15	15
Administrative day patrols	5					
Total	20	10	15	15	20	20
TOTAL SEGMENT CAPACITY	750	555	625	635	732	750

## Visitor Overnight Capacity

The overnight capacities for this segment are expressed in terms of the maximum number of people that can camp in a given wilderness zone each night. These zone capacities are part of the wilderness overnight permit system, which is described in the "affected environment" section of this plan. Most overnight use in this river segment occurs in the LYV wilderness zone, which has a maximum capacity of 150 people. Due to the higher amounts of use allowed in this zone, overnight camping is focused in designated camping areas at LYV, Moraine Dome, Echo Valley and Merced Lake. These designated areas allow for consolidation of overnight use to minimize the geographic extent of impacts. The other zones allow for dispersed overnight use because use levels are lower and impacts can be mitigated by allowing campsite locations to vary by individual preference.

The *Merced River Plan/DEIS* proposes changes in the wilderness zone capacities for the LYV zone to allow for a range of visitor experiences in this segment. Alternatives 2, 3, and 4 reduce the LYV zone capacities from 150 to 25, 75, and 100 respectively. These changes offer visitors the opportunity to camp in a dispersed manner out of sight and sound of others. In all other wilderness zones, capacities remain at current levels, ranging from a maximum of 50 to 150 people per night, depending on location.

The Merced Lake High Sierra Camp is a designated camp area operated by the primary park concessioner. The camp is located within a potential wilderness addition. The camp contains a number of tent cabins, which accommodate 2-4 persons per tent. The *Merced River Plan/DEIS* includes several options for the camp, including its removal (capacity of zero) to reduced capacities of 15 people per night in Alternative 3 (in the form of a temporary outfitter camp, which would have a reduced level of service over today's camp) and 42 people per night in Alternative 5. Alternative 6 proposes retaining the camp at its current capacity of 60 people per night.

### **Visitor Day-use Capacity**

Day use along this segment is low compared to the three segments downstream on the Merced River. Most day use occurs on the trail between the top of Nevada Fall and LYV, and is primarily associated with climbing Half Dome. As noted previously, day use on Half Dome is limited by a hiking permit and reservation system to a maximum of 300 people per day. The small amount of other day hiking that occurs in this segment is estimated at 50 people per day, bringing the total maximum daily capacity for day use in this segment to 350 people.

### **Administrative Capacity**

Administrative use along this segment is primarily associated with wilderness patrols, trail crews, utility and maintenance crews, and search and rescue operations. An overnight administrative camp is maintained at LYV during the summer. The camp and its operation are located away from the river and have been shown to have no adverse effect on river values. The camp currently accommodates up to fifteen employees. The *Merced River Plan/DEIS* alternatives propose reducing the administrative capacity of the camp consistent with the reductions proposed in the wilderness zone capacities discussed above. These options range from five employees in Alternative 2, to 10 in Alternatives 3 and 4, and 15 in Alternatives 5 and 6.

Minimal administrative day use occurs along this segment, estimated at no more than five employees on day patrols originating from the Valley or passing through. This level is consistent across alternatives.

### ***Capacity Management***

This section provides an overview of the key capacity management actions for this segment: the infrastructure decisions and policy and regulation measures to enforce the user capacity numbers and ensure the kinds and amounts of use proposed in the different alternatives do not adversely affect river values. Table 6-3 provides a summary of the user capacity management actions across the plan alternatives for this segment.

### **Infrastructure**

The LYV designated camping area would be removed in Alternatives 2 & 3, whereas the other alternatives retain the area. The composting toilet facility is removed in Alternative 2 to improve wilderness character but retained in all the other action alternatives to accommodate both day and overnight use. The LYV ranger camp is retained in all alternatives, though the size of the camp is reduced in Alternatives 2, 3 and 4 commensurate with reductions in zone capacity. Similarly, the alternatives consider different options for the Merced Lake High Sierra Camp, including elimination, conversion to a temporary outfitter camp, downsizing, and retaining it in its present form.



**TABLE 6-3: SUMMARY OF KEY USER CAPACITY-RELEVANT INFORMATION: SEGMENT 1**

Alternatives	1	2	3	4	5	6
	Existing situation	Self-reliant experiences and extensive floodplain restoration	Dispersed experiences and extensive riverbank restoration	Resource-based experiences and targeted restoration	Enhanced experiences and essential riverbank restoration	Diversified experiences and selective riverbank restoration
Infrastructure						
LYV Backpackers camping area structures	Toilet	Removed	Toilet retained			
LYV ranger camp	3 tent cabins	Reduced	Reduced	Reduced	Retained	
Merced Lake HSC (structures and beds)	22 units 60 beds	Removed	Temp camp 15 beds	Removed	11 units 42 beds	22 units 60 beds
Policy and Regulation						
Overnight permits	Continue use of wilderness permit system					
Overnight group size limits	15 on trails, 8 off trails					
Camping restrictions	Camping in designated areas at ML and LYV Camp 100 feet from water	Dispersed camping in LYV and ML zones Camp 100 feet from water		Camping in designated areas at ML and LYV Camp 100 feet from water		
Stock use management	Maximum 25 head of stock per group on trail and 12 on other routes Travel in single file line whenever possible Use weed-free feed Must be picketed at least 100 feet from any stream, lake or spring Watering facilities must be used when provided					
Leave-No-Trace regulations	No fires above 9,600 feet Fires in fire rings only otherwise Mandatory bear-resistant food canisters Carry out all trash Bury human waste No bicycles/strollers No mechanized / motorized travel					
Half Dome use limits	None	300 per day				
Other day use on trails in river corridor	50	50				

## Policy and Regulation

The *Merced River Plan/DEIS* proposes the continued use of the wilderness overnight permit and trailhead quota system with numeric adjustments in certain alternatives. Overnight use of the wilderness in Yosemite National Park, including the river segment above Nevada Fall, has been managed for about 30 years using a zoning and trailhead quota system. The entire wilderness area within the park has been split into zones and each has been assigned a maximum daily capacity for the number of people that can stay overnight in each zone. The zone capacities are allocated to the relevant trailheads and managed by permit. Permits are available on a mixed first come-first served and advanced reservation basis.

This system has been in place for many years and effectively limits the number of people starting from each trailhead and spending the night in different parts of the wilderness. It protects recreation values in this segment by spreading use over a wide area to keep trail encounters and camping concentrations low (with exceptions for areas like Little Yosemite Valley). Other regulations and education programs address other ORVs to mitigate visitor use impacts (e.g., site impacts, ecological impacts) in combination with use limits, including:

- Camping restrictions (designated areas at Merced Lake and LYV; 100 feet from water otherwise);
- Stock use regulations (maximum group size limits, and others);
- Fire restrictions (none above 9,600 feet; in fire rings otherwise);
- Food storage restrictions (mandatory bear-resistant food canisters);
- Carry out trash regulations;
- Human waste disposal regulations and education;
- Regular trail and camping area maintenance addressing site impacts (e.g., trail cutting, campsite boundary encroachment, etc.),
- Half Dome hiking permits

### ***Conclusion***

The primary choices related to user capacities above Nevada Fall were driven by the management standards and goals for the recreational river values in this segment. These include choices between the amount of access to be provided, the level of infrastructure, and the amount of relative solitude that could be experienced along this segment as measured by encounter rates. For example, in the higher-use alternatives, encounter levels in the LYV to Lewis Creek trail segment are double those of the lower-use alternatives. The higher-use alternatives also maintain LYV, Lake Merced camping, and the Merced Lake High Sierra Camp at use levels similar to recent management, requiring more infrastructure (LYV toilet, HSC facilities) and yielding higher encounter rates with other users.

## **Segment 2: Yosemite Valley**

### ***Management Goals and Considerations***

Management goals related to user capacity in Yosemite Valley include: 1) protecting natural processes; 2) promoting visitor enjoyment; and 3) reducing traffic congestion and crowding.

The two outstandingly remarkable values in this segment that are most sensitive to user capacities are the meadows and riparian communities of Yosemite Valley and the outstanding opportunity for frontcountry river recreation. The management objective for the meadow/riparian ORV is “to manage human use within the corridor to minimize habitat fragmentation in meadows, maintain high ecological condition, and protect the integrity of riverbanks to conserve ecosystem processes.” The management objective for the recreation ORV is to “provide for a diversity of high quality river-related recreation opportunities that allow visitors to directly connect with the river and its environs.”

Yosemite Valley’s other categories of outstandingly remarkable values (including geologic/hydrologic, cultural and scenic), are not substantially affected by the current or projected levels of visitor or administrative use. For example, use does not affect the large scale geological/hydrological features such as the “Giant Staircase” (Nevada and Vernal Falls). However, some of these values clearly interact with user capacity decision-making by limiting choices about infrastructure placement and design.

Other considerations affecting the kinds and amounts of use that can be accommodated in the Valley segment include the following:

**Resource constraints and site suitability.** These constraints include floodplains, rock fall hazard areas, meadow and riparian areas, rare and sensitive plant and animal populations, scenic vista points, and cultural resource sites. Maps of river values and resource constraints show that there is limited space in the Valley that is available for visitor or administrative activities and related infrastructure. Bridges and river bank revetments (riprap) impact the river's free-flowing condition from Happy Isles to the Gorge, and improvements to allow for river migration will limit the range of transportation options available to handle additional use (e.g., bridge removals, road realignments).

**Transportation system performance.** Most visitors (64%) report "taking a scenic drive" during their trips to Yosemite, and riverside travel routes provide views that contribute to the Valley's scenic and recreation outstandingly remarkable values (Blotkamp et al. 2010). Congested roads reduce the quality of viewing and limit visitor access to recreation sites. Therefore, an efficient transportation and parking system is a prerequisite for a quality recreation experience in this segment.

Park planners used transportation modeling to determine how the levels of vehicle use allowed in each alternative would affect traffic circulation (DEA 2012). Transportation models also allowed planners to explore the relationships between improved circulation and changes to infrastructure, such as pedestrian underpasses, roundabouts, and additional parking. The use-impact relationships described below helped shape infrastructure choices in the alternatives.

**Visitor experience and crowding.** Providing outstandingly remarkable recreation opportunities requires managing user densities to avoid congestion and crowding as visitors hike, bike, relax, picnic, swim, and fish along the Merced River or while visiting attractions in or near the corridor. Several social science studies have documented crowding and congestion problems in Yosemite Valley during peak use periods (Gramann 1992; Manning 1998 and 1999; Newman 2002; NPS 2005 and 2009, Whittaker and Shelby, 2012). Further research has demonstrated the link between visitation, densities at popular attraction sites, and the quality of visitor experience (DeGroot and Meldrum, in review). These relationships have been explicitly considered in the development of user capacities for the *Merced River Plan/DEIS*.

## **Indicators and Standards**

Table 6-4 summarizes the key indicators and standards used to monitor the condition of the Segment 2 ORVs that are most vulnerable to user effects (Chapter 5 provides more detail on all of these indicators and standards). Capacities that limit use are needed to ensure that standards are not exceeded and ORVs are protected.

### **Meadow Conditions**

As explained in Chapter 5 (under ORV 2), the Largest Patch Index Five or LPI<sub>5</sub> measure is sensitive to the size of intact areas and the amount of informal trails, and indicates impacts related to meadow hydrology, soil moisture, non-native species, habitat quality, and barriers to small mammals (see Chapter 5 for a more detailed discussion). The standard for this indicator is common to all alternatives, so alternatives vary the amount of infrastructure (boardwalks, trails, and split rail fencing) used to manage the amount, location, and type of use associated with the range of user capacities across alternatives.

**TABLE 6-4: SUMMARY OF USER CAPACITY-RELEVANT INDICATORS AND STANDARDS**

Alternatives	1	2	3	4	5	6
	Current condition	Self-reliant experiences and extensive floodplain restoration	Dispersed experiences and extensive riverbank restoration	Resource-based experiences and targeted restoration	Enhanced experiences and essential riverbank restoration	Diversified experiences and selective riverbank restoration
Biological indicators and other management actions						
Meadow fragmentation – average		> 93% average for all; > 90% for individual				
Riparian condition -- % of reaches in high classification		> 20%				
Riparian condition -- % of reaches in moderate or high classification		90%		80%		
Densities at attraction sites or on trails (square feet per person; higher number means less dense/more space) <sup>1</sup>						
Primary viewing areas	50	70		60	50	40
Vernal Fall trail	40	60		50	40	35
East Valley multi-use and hiking trails	40	60		50	40	35
West Valley hiking trails	100	140	120	100	80	80
Waterfront per person at beaches (linear waterfront per person; higher number means less dense/more space) <sup>1</sup>						
East Valley high use shore areas	10	10	20		10	5
East Valley medium use shore areas	10	10	20		10	5
West Valley low use shore areas	10	10				
Boating densities (Boats per 400 feet; higher number means more dense/less space) <sup>1</sup>						
Stoneman Bridge to Sentinel Beach	6	1	2	6	3	9
Transportation indicators (Vehicles on the ground at one time - VAOT)						
Parking occupancy (VAOT)		< 90% of parking supply occupied				
1. Standard: average cannot violate standard more than 10% of time between 10 am and 4 pm.						

Lower fragmentation scores are associated with meadows containing more informal trails. Informal trails are more likely when visitors have multiple access points, allowing them to spread out throughout meadow areas, creating more trails. Higher fragmentation scores, by contrast, are associated with meadows having few informal trails. As shown in Chapter 5, such meadows may have high levels of use on formal trails, with nearby formalized parking. For example, Stoneman Meadow used to have a fragmentation index of only about 40 percent, but NPS improved this score to over 99 percent by developing a single formal trail with a boardwalk, even though park visitation increased by more than 50 percent during the same time period. Fencing can also be used to funnel use into more resistant areas.

The types of measures described above address impacts by changing human behavior or by employing more intensive action where use levels are greater. New designs would remove most roadside parking in all alternatives, and trails and fencing would be used to control impacts from development (new or expanded campgrounds) in higher use alternatives (5 and 6).

## Riparian Conditions

Riparian conditions will be assessed through the *California Rapid Assessment Method (CRAM)*, as discussed in Chapter 5, ORV 2. As with the fragmentation indicator, standards for this indicator would vary across alternatives, as shown in Table 6-4. Baseline assessments using this evaluation tool show that lower condition classes were generally associated with higher use areas near campgrounds and accommodations,

although riverbank development (especially revetments) also appears to be important. Riparian recovery is slower when informal trails are allowed to proliferate between camps/developed areas and the river, and this may be related to use levels. However, the problem is not primarily the amount of use. The number of people who camp or hike in a riparian area is unlikely to have a direct or linear relationship with total CRAM scores because the type, location, and behavior of users have substantial effects. Directing visitors to appropriate locations and closing sensitive areas, in combination with the availability of hardened or designated trails, can substantially reduce impacts.

A riparian development buffer (no development within 150 feet of the river's edge) is common to all alternatives. It is designed to substantially improve riparian condition throughout the Valley by removing facilities and associated use concentrations from riparian areas. Some alternatives further reduce riparian-proximate development (e.g., campsites or Housekeeping units) or identify additional riparian restoration efforts to further enhance this ORV.

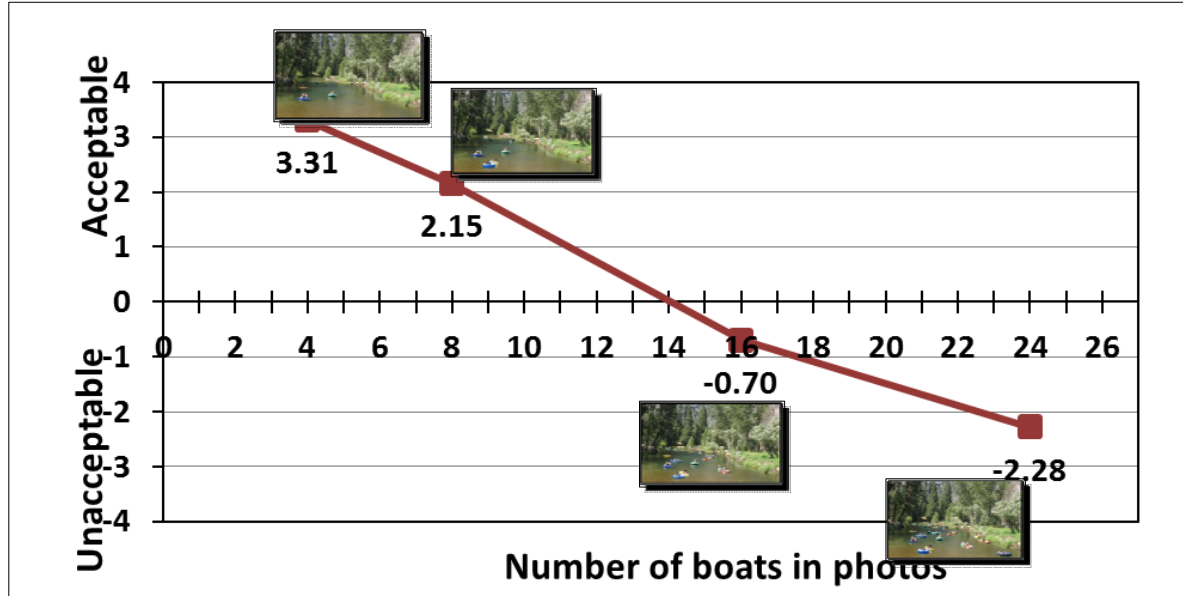
Neither the riparian development buffer nor restoration actions directly limit numbers of visitors in Valley riparian areas. They affect total Valley user capacities only to the extent that they change the number of camping sites, lodging units, and day use parking spaces. Riparian conditions are most directly addressed through more intensive management of the location and type of use in site-specific areas. The major management actions involve designating formal trails (with boardwalks or other hardening as needed) and fencing to direct use away from sensitive areas. These actions are most effective to reduce existing impacts, prevent new ones, and allow rehabilitation.

Planners used information about CRAM scores, baseline conditions, transportation modeling results, available research results, and professional judgment to estimate linear feet of new fencing and boardwalks needed for each alternative. Alternatives with higher capacities (and associated higher levels of development closer to riparian areas) have higher levels of infrastructure (boardwalks and fences) to mitigate the impacts of higher use. This appropriately-sited trail infrastructure would keep visitor impacts to acceptable levels (standards) while directing visitors to more resistant riparian areas that can handle higher use (e.g., beaches and bedrock banks). Because these mitigation measures have been incorporated, riparian condition does not act as a limiting factor for user capacities in Valley segments.

## Social Conditions

The primary indicators selected to represent social conditions were visitor densities at ORV-related attractions or on the way to them (e.g., beaches, boating, and the trail to Vernal Fall), as shown in Table 6-4 above. The focus on attraction site densities follows from research in many frontcountry settings (Manning, 2011), and is the higher density analogue of encounters in backcountry settings. Information about these indicators comes from studies at popular high-use sites (Manning et al. 1998; Manning et al. 1999; Lawson et al. 2008), as well as research on shore and boating use in East Yosemite Valley (Whittaker and Shelby 2012).

In these studies visitors are asked to evaluate the “acceptability” of a series of photographs depicting different levels of use or social conditions by identifying the photograph that best represents the level of use that they expected (*expectation*); prefer to see (*preference*); represent a condition where they feel the NPS should take action (*management action*); or represented a condition that would cause them not to visit the site again in the future (*displacement*). When plotted on a graph, average ratings show visitors’ acceptability evaluations (or norms) for use levels and related social conditions (Figure 6-2).

**FIGURE 6-2: VISITOR'S' ACCEPTABILITY EVALUATIONS FOR USE LEVELS**

All densities in these studies can be translated into people at one time, people per viewscape, or boats at one time (PAOT, PPV, or BAOT) in a specific photo, as evaluated in the studies. They can also be translated into daily use in an area, as discussed later in this chapter in a sidebar on “How Capacities Were Calculated: Assumptions and Protocols.”

For trail segments and viewing areas with defined boundaries, densities were measured as square feet per person. For beaches, densities were represented as linear feet of waterfront per person. For boating, densities refer to boats per 400 feet (a typical viewshed). All density indicators refer to the average for five-hour daily peak use periods measured during the high-use summer season. Standards can be exceeded by 10 percent at any given site to account for random but infrequent spikes in use. If use during these peak times is managed to meet standards at the highest-use attractions (e.g., Yosemite Falls, Vernal Fall, high-use beaches in East Valley), observed use patterns suggest that lower use will occur at these same sites during other times of the day, week, or season. These off-peak periods will provide higher quality experiences for visitors who are sensitive to crowding. Even on the days with highest use levels, when some beaches approach density standards, nearby beaches (sometimes within a few hundred feet) usually have densities closer to “preference” levels (Whittaker and Shelby 2012). Overall, user capacities that manage use to meet standards for the highest-use places will also provide a diversity of lower-use paces with better conditions.

## How Capacities Were Calculated for the Valley: Example Assumptions and Protocols

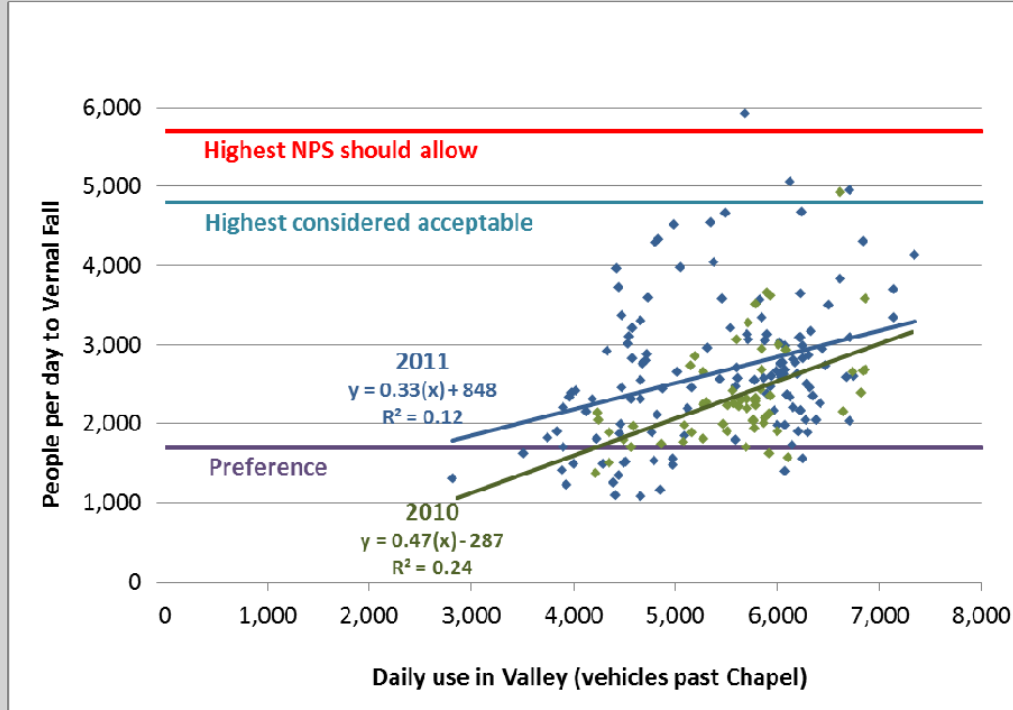
There were many calculations involved in developing capacities for each alternative. Some involve “translations” between use levels for different locations, times, or units of use (see capacity definition in Part I of this chapter), while others document or predict use-condition effects. This sidebar provides a few examples of capacity calculations or assumptions. The goal is to allow readers to understand these issues without all the details from research, modeling, or analyses.

### Translating densities at attraction sites to Valley use levels

#### Vernal Fall Example

- Surveys of visitors identified evaluations for preference, acceptability, and NPS action, based on photos of at-one-time densities on the Mist Trail (Manning et al., 1998).
- Trail counters identified hourly use levels (in each direction and total) along the trail.
- Simulations estimated total daily use on the trail to meet the preference, acceptability, or NPS action evaluations (assuming evaluations were exceeded no more than 10% of the time).
- Additional analyses correlated site use with daily traffic levels into East Yosemite Valley (measured at the Chapel on Southside Drive).
- Figure 6-3 (below) shows the relationship between 2010 and 2011 daily use levels on the Vernal Fall trail (vertical axis) vs. daily traffic levels into East Yosemite Valley (horizontal axis). Evaluation levels for preference, acceptability, and NPS action are also shown.
- Relationships between use and densities were generally direct, linear, and moderately strong. Explained variance ( $R^2$ ) for the number of vehicles arriving in East Valley and site use was higher for iconic roadside attractions (e.g., 0.81 for Bridalveil Fall and 0.64 for Yosemite Falls) than for activities or sites farther from the road (e.g., Vernal Fall; 0.12 and 0.24 in different years) or that require more time to experience (e.g., river rafting; 0.11).

FIGURE 6-3: RELATIONSHIP BETWEEN DAILY USE LEVELS IN EAST YOSEMITE VALLEY



The standards for these density indicators vary by type of site and alternative, as discussed in Chapter 5. Higher use sites and alternatives have higher density standards, and range from 35 to 70 square feet per person at moderate to higher-use areas (e.g., the trail to Vernal Fall, several popular trails in East Yosemite Valley) and 80 to 140 square feet per person on low-density trails in the West Valley. Moderate to high-use beaches ranged from five to 20 linear feet of waterfront per person, while lower use beaches were set at 20 linear feet per person for all alternatives. Boating standards focus on boats per viewshed and range from one to nine boats per 400 feet. In all cases, standards are “better” than current visitors say they will “accept” or are the highest use they want the “NPS to allow” in studies, while more stringent standards (for lower-use sites or alternatives) are closer to visitors’ preference evaluations.

In addition to standards for densities at ORV-related recreation attractions, park planners assessed the effects of capacities for Bridalveil Fall and Yosemite Falls, two other locations that were the focus of recent social science research. Even the highest-capacity alternatives would not produce densities higher than acceptability evaluations at Yosemite Falls. At Bridalveil Fall, however, all alternatives would continue to produce densities higher than visitors consider acceptable; accordingly, all alternatives include redesign options or other actions to reduce congestion in the vicinity of Bridalveil Fall.

**Vernal Fall:** The number of people present at any one time at this location is directly related to the number of vehicles, and therefore people, that enter the park each day. Relationships between Vernal Falls trail densities and overall Valley use (measured by vehicles per day passing the Chapel on Southside Drive) are direct, linear, and moderately strong. Variables that affect this relationship include river flows (more water over the falls improves aesthetics), the Half Dome permit system (which controls some portion of use on the trail associated with Half Dome), and the higher proportion of overnight visitors on the trail (relatively stable through the peak season when all accommodation is typically filled). Only a few high-use days had use levels greater than *management action* or *acceptability* evaluations (about 5,000 to 6,000 visitors per day on the trail), and most were between preference and acceptability evaluations (Manning et al. 1998; Manning et al. 1999; Lawson et al. 2008). Some of the highest days were artificially high (when the trail reopened after a search and rescue incident).

Park planners further used these relationships to predict trail densities associated with different capacities in the alternatives, with some adjustments for proportion of new use that would be overnight vs. day use (overnight visitors are more likely to hike to Vernal Falls).

**East Valley Beaches:** Relationships between peak densities at East Valley beaches and overall Valley use (vehicles passing the Chapel on Southside Drive per day) are direct and linear, but somewhat lower than the use-condition relationship for Vernal Fall (see discussion in Whittaker and Shelby 2012). Whittaker and Shelby also showed how existing densities on several beaches compare to “management action,” “acceptability,” and “preference” evaluations. Only a few high-use days and high-use beaches had existing densities greater than “what NPS should allow” or what river visitors consider “acceptable” (about 3 feet of beachfront per person). Average beach densities ranged from six to 12 feet of beachfront per person during afternoon peak-use periods, and many of these were better than “preference” evaluations at about 10 feet per person.

Using these relationships, park planners predicted beach densities for the alternatives, with some adjustments based on other variables. For example, additional campground or lodge use will probably have larger effects on beach densities because overnight visitors are more likely to use river beaches.



**West Valley Beaches:** The 2012 river study did not assess use levels downstream of El Capitan Bridge. Use is low and sporadic in these areas and most beaches attract only one to two small groups at a time. Using this information, park planners predicted relationships between use and densities at these beaches, finding that alternatives with higher use are not expected to substantially change existing use patterns because the alternatives would not provide additional access or infrastructure to promote or support greater use in these areas.

**Boating:** Relationships between boating use (between Stoneman Bridge and Sentinel Beach) and overall Valley use (measured by vehicles passing the Chapel on Southside Drive per day) are direct, linear, and relatively strong for commercial boating use, although weaker for total boating use (Whittaker and Shelby 2012). As for East Valley beaches, Whittaker and Shelby (2012) also showed how existing boating densities compare to “management action,” “acceptability,” and “preference” evaluations of visitors. In general, existing densities were not greater than visitors’ evaluations of “what NPS should allow” or “what they consider acceptable.”

Using these relationships, park planners predicted boating densities for the alternatives, with some adjustments based on other variables in the alternatives. For example, additional campgrounds or lodges proposed near the boating segment would probably have larger effects on boating densities because overnight visitors are more likely to participate in this activity.

**Yosemite Falls:** Relationships between daily Yosemite Falls trail use and overall Valley use (measured by vehicles per day passing the Chapel on Southside Drive) are direct, linear, and moderately strong. Water level also affects this relationship, with higher use observed when the falls are running at their peak flows.

By translating PAOT evaluations from several earlier studies into daily visits, park planners were able to see how daily use levels compare to “management action,” “acceptability,” and “preference” evaluations at this site (Manning et al. 1999, Lawson et al. 2007). This exercise and recent visitor count data show only a few days with use levels greater than visitor evaluations of “what NPS should allow” or “what they consider acceptable” (about 12,000 to 13,000 visitors per day), and many days were closer to the mid-point between these “acceptable” levels and “preference” levels (about 5,000 per day).

Park planners used general relationships between overall Valley use and use at Yosemite Falls to estimate densities with different capacities in the alternatives, with some adjustments based on proportion of use expected to come from overnight versus day users.

**Bridalveil Fall:** Relationships between daily Bridalveil Fall trail use and overall Valley use (measured by vehicles per day passing the Chapel on Southside Drive) are direct, linear, and moderately strong. Again comparing daily use levels to “management action,” “acceptability,” and “preference” evaluations, park planners found that many days had daily use levels greater than what visitors evaluated as “what NPS should allow” or “what they consider acceptable” (about 2,500 to 3,000 per day), and very few were near “preference” levels about 700 to 800 per day (Manning et al. 1999, Lawson et al., 2007). Consequently, redesign of this site’s parking, circulation, trails, and viewing areas is common to all alternatives, to bring this site’s visitor experience within acceptable levels for each alternative. These changes, coupled with the user capacity measures in each alternative, would resolve the levels of crowding associated with existing use patterns at this site.

**Summary:** Taken together, social indicators and standards define “how much impact is too much” at several important recreation areas and attractions in the Valley. With known relationships between use and these impacts, park planners designed alternatives with user capacities that provide for a range of density conditions.

### **Transportation System Performance**

Transportation modeling was an integral part of the capacity analysis because vehicle congestion has a direct relationship to visitor densities and related experiences at attraction sites as described above. Each alternative assessed how levels of vehicle use (associated with overnight accommodation and day-use parking decisions) would affect traffic circulation (DEA 2012). Modeling also explored the relationships between circulation and infrastructure choices such as pedestrian underpasses, intersection improvements, and additional parking. An understanding of the relationship between use and impacts to river values (see below) helped shape infrastructure choices in the alternatives.

Park planners selected day-use parking availability as the indicator for transportation system performance. This indicator addresses one of the most important parts of the transportation system. The parking supply (number of parking spaces) varies by alternative as a result of interrelated decisions about amount of restoration, removal or repurposing of existing facilities, and amount of camping and lodging (with associated parking requirements). Circulation, the other major part of transportation, is related to parking availability in Yosemite Valley, as traffic circulation significantly slows when parking lots fill. Circulation problems also arise from the location and design of key intersections and conflicts between pedestrian crossings and vehicle throughways.

East Yosemite Valley currently has approximately 5,000 parking spaces, with about 4,000 available to visitors (the rest are in areas generally designated for administrative or employee/resident use). Transportation models examined parking supply options from 4,000 spaces (3,000 for visitors) to 6,500 spaces (5,500 for visitors). Urban transportation planners generally assume 85% of a parking supply can be utilized efficiently; parking filled at higher levels makes it difficult for drivers to find, enter, or leave spaces without creating bottlenecks. In East Yosemite Valley, where most visitor parking occurs in a few larger lots that can be managed more efficiently (particularly during the peak-use times), 90% occupancy is assumed in all alternatives.

**Summary:** Taken together, transportation performance indicators and standards define “how much congestion is too much” on the Valley’s roads and in its parking areas. Transportation modeling shows how these standards can be met with different levels of use and amounts of infrastructure, all while protecting river values. This approach provides NPS, stakeholders, and the public with an opportunity to make an informed decision about the different use levels presented in the alternatives in Chapter 8.

### ***Overview of Capacities***

Table 6-5 summarizes the capacities for the Valley segment across alternatives. These are expressed in terms of the maximum number of people at one time that can be received. Following the table is an explanation of the assumptions.

**TABLE 6-5: SUMMARY OF USER CAPACITIES BY ALTERNATIVE: YOSEMITE VALLEY**

Alternatives	1	2	3	4	5	6
	Current management or "No action"	Self-reliant experiences and extensive floodplain restoration	Dispersed experiences and extensive riverbank restoration	Resource-based experiences and targeted restoration	Enhanced experiences and essential riverbank restoration	Diversified experiences and selective riverbank restoration
<b>Visitor overnight capacity</b>						
Camping	2,892	2,916	2,958	4,398	4,032	4,626
Lodging	3,672	1,842	2,069	2,826	3,697	4,380
<b>Total</b>	<b>6,564</b>	<b>4,758</b>	<b>5,027</b>	<b>7,224</b>	<b>7,729</b>	<b>9,006</b>
<b>Visitor day-use capacity</b>						
Day parking	7,260	5,858	5,328	6,497	7,549	7,941
Regional transit	293	241	241	337	684	788
Tour buses	720	720	720	720	720	720
<b>Total</b>	<b>8,272</b>	<b>6,819</b>	<b>6,289</b>	<b>7,554</b>	<b>8,954</b>	<b>9,449</b>
<b>Administrative capacity</b>						
Employee housing	1,315	658	1,086	1,087	1,136	1,136
Employee day parking	332	332	332	332	332	332
<b>Total</b>	<b>1,647</b>	<b>990</b>	<b>1,418</b>	<b>1,419</b>	<b>1,468</b>	<b>1,468</b>
<b>TOTAL SEGMENT CAPACITY</b>	<b>16,483</b>	<b>12,567</b>	<b>12,734</b>	<b>16,197</b>	<b>18,151</b>	<b>19,923</b>

### Visitor Overnight Capacity

Overnight user capacities are calculated differently depending on the type of accommodations provided. For lodging, overnight capacities are based on the "pillow count" (the capacity) of the rooms comprising the four properties in Yosemite Valley (the Ahwahnee, Housekeeping Camp, Curry Village, and Yosemite Lodge). Pillow count at the Ahwahnee is 326 people across all alternatives (the same as at present); all cabins at Housekeeping Camp have a capacity of four; and at both Curry Village and Yosemite Lodge, rooms average 3.5 pillows. Overnight capacity for campgrounds is calculated by multiplying the number of campsites by the maximum number of people per site. For individual campsites the maximum number of people per individual site is six, for group sites it is 30.

For Alternative 5, 326 people would be at the Ahwahnee + 928 at Housekeeping Camp (232 rooms x 4) + 1,586 at Curry Village (453 rooms or cabins x 3.5) + 857 at Yosemite (245 rooms x 3.5), for a combined total of 3,697. Camping capacities would be a 3,792 overnight visitors in the individual campsites (632 sites x 6 people/site), plus 240 in group sites (8 group sites x 30 people/site), for a combined total of 4,032.

The combined overnight capacity of Alternative 5, therefore, equals **7,729** people at one time: 4,032 campers plus 3,697 persons in lodging.

### Visitor Day-use Capacity

Visitor day-use capacity is a combination of people arriving by private vehicle, those arriving by transit buses (public transportation), and those arriving by tour buses.

Private vehicle numbers include both parked vehicles and those in circulation. This analysis assumes an average occupancy rate of 2.9 people per vehicle. For parked cars, the total number of day-use parking spaces is computed and then multiplied by 90 percent, because not all spots are filled at any one time (as explained above, this is the percent of spaces that can feasibly be occupied for efficient utilization). The

assumption for vehicle circulation is that 400 vehicles are on Valley roads at any one point in time which is consistent with transportation models depicting unimpeded traffic flow.

Alternative 5 features 2,448 day-use parking spots for visitors. This number multiplied by 2.9 people per vehicle and a 90 percent utilization rate provides capacity for 6,389 people at one time. Additionally, 400 cars are assumed to be in circulation under all alternatives, providing capacity for an additional 1,160 people ( $400 \times 2.9$ ). Together, parking and circulating vehicles yield a capacity of 7,549 people at one time for day-use.

Transit buses both arrive and depart Yosemite Valley, with arrivals primarily in the morning hours and departures in the afternoon hours. Some passengers are employees, who are not included in visitor counts. More commuting employees travel via Highway 140 than Highway 41. To estimate the visitor component of this bus capacity, maximum transit counts for the Highway 140 and 41 runs were multiplied by 80 percent for the Highway 140 runs and 90 percent for the Highway 41 runs. There is also overlap between arrivals and departures, with some buses arriving after the first few have left. To account for this overlap, the maximum number of people that can arrive by transit bus is multiplied by 60 percent. Only 90 percent of these visitors are *day users*, however; an estimated 10 percent are overnight guests are already included in the overnight capacities reported above.

For the Alternative 5, the above transit bus visitor calculations yield the following results: Highway 140 yields 276 visitors at maximum ( $12 \text{ roundtrips} \times 48 \text{ people per bus} \times 80\% \text{ visitors} \times 60\% \text{ inbound accumulation}$ ); Highway 41 yields 311 visitors at maximum ( $12 \text{ roundtrips} \times 48 \text{ people per bus} \times 90\% \text{ visitors} \times 60\% \text{ inbound accumulation}$ ); and the two Highway 120 routes (6 runs combined) yield 173 visitors at maximum ( $6 \text{ roundtrips} \times 48 \text{ people per bus} \times 100\% \text{ visitors} \times 60\% \text{ inbound accumulation}$ ). Collectively, these numbers yield a combined transit capacity of 760. Multiplying 760 by 90 % to account for overnight guests, yields a final day-use transit bus capacity of 684.

Tour bus visitor numbers are computed by multiplying the maximum number of buses that can be accommodated at one time by the maximum number of people per bus (48 people). For all alternatives, the maximum number of buses that can be parked in the Valley is 15, for a total capacity of 720 people at one time.

Again, visitor day-use capacity is the sum of the maximum number of visitors at one time arriving by private vehicle, regional transit, and tour bus. For Alternative 5, adding 7,549 people in private vehicles to 684 in transit buses and 720 in tour buses gives a total day-use capacity of **8,954** (rounding adds one person to the combined number).

### Administrative Capacity

Administrative capacity is calculated by summing the total number of employee beds provided within each segment and adding the number commuting into the segment. The additional day parking capacity for administrative use is calculated by multiplying the number of administrative parking spaces by an average of two people per vehicle (reflecting the fact that employees are usually not traveling with their families or friends, but other coworkers going to the same duty station).

For Alternative 5, a total of 1,136 employees reside in the segment, including NPS (164) and concessioner (972) employees. There are an additional 166 employee commuter parking spots; multiplying that number by 2 yields an additional 332 employees, for a total administrative capacity of 1,468 people at one time.

## Capacity Management

Use and development in Yosemite Valley are multifaceted, and user capacities to manage them are similarly complex. Information related to user capacities is provided in Table 6-6. For each alternative, this table and the following sections of explanation summarize key infrastructure metrics that are highly correlated with user capacities, as well as regulations or other management actions that work with user capacities to protect and enhance river values.

**TABLE 6-6: SUMMARY OF KEY USER CAPACITY MANAGEMENT ACTIONS: YOSEMITE VALLEY**

Alternatives		1	2	3	4	5	6
		Current conditions	Self-reliant experiences and extensive floodplain restoration	Dispersed experiences and extensive riverbank restoration	Resource-based experiences and targeted restoration	Enhanced experiences and essential riverbank restoration	Diversified experiences and selective riverbank restoration
<b>Infrastructure</b>							
Lodging units		1,034	556	621	823	1,053	1,248
Camping		466	450	477	701	640	739
Roads and bridges		6 total	3 removed	3 removed	2 removed	1 removed	0 removed
Intersections		4-way	4-way	4-way	4-way	1 Round-about	2 Roundabouts
Pedestrian crossings	Yosemite Lodge	On grade	On grade	On grade	On grade	Underpass	Underpass
	Yosemite Village	On grade	On grade	On grade	On grade	On grade	Underpass
Length of fencing to protect sensitive areas (ft)		33,570	Same as Alt 1	Same as Alt 1	17,765 additional	17,765 additional	21,560 additional
<b>Policy and Regulation</b>							
Lodging capacities		Concession operated, available by reservation					
Camping capacities		NPS operated by combination of reservation system and first come-first served					
East Valley traffic diversion		Yes	No	No	No	In future if needed	In future if needed
East Valley day-use parking permit system		None	Yes	Yes	Yes	In future if needed	In future if needed
Food storage regulations		Food storage regulations at campgrounds and other areas in the Valley would continue.					

### Infrastructure

The number of lodging and camping units across the alternatives varies, providing a different mix of overnight accommodations in each. Lodging varies according to proposed reductions in units at Curry Village, Housekeeping Camp, and Yosemite Lodge. Similarly, campsites are removed or relocated away from the river to varying degrees. Some camping areas are restored and campsite numbers increased in the Valley, depending on the theme of the alternative. Other key infrastructure options include the consideration of roundabouts and pedestrian underpasses at the Yosemite Lodge and Yosemite Village Day-use Parking Lot areas. These developments are proposed to mitigate impacts to the recreational ORV associated with crowding and congestion. Finally, to further protect river values from pedestrian foot traffic, additional fencing is proposed in Alternatives 4, 5, and 6.

## Policy and Regulation

**Lodging reservation system.** Overnight lodging use in Yosemite Valley is limited to the maximum occupancy of each lodging unit. Lodging units are managed by a concessioner and are available with advanced reservations. The concessioner operates the system as follows:

- Limited numbers of rooms of different configurations (numbers/sizes of beds).
- Maximum numbers of occupants for different types of rooms.
- No “minimum” number of occupants; some groups may not use the full capacity.
- Reservations can be made up to one year in advance.
- Maximum stay per reservation is seven nights.
- Variable pricing for different rooms and locations.
- Limit of two vehicles per room at Housekeeping; no explicit limits for other accommodations.

**Campground reservation system.** Campgrounds in Yosemite Valley are limited and available on a reservation system. The system includes:

- Specified numbers of campsites in different campgrounds.
- Maximum of six campers and two vehicles allowed per drive-in site (all of the Pines Campgrounds) and six campers allowed at walk-in sites (Camp 4 and Backpackers Camp).
- At walk-in camps, NPS may combine smaller groups to efficiently utilize space in a campground.
- Reservations can be made up to six months in advance.
- Maximum stay per reservation is seven nights.

**Day-use traffic diversions.** On high-use days in recent years, the park traffic operations team has periodically instituted a traffic diversion at the El Capitan Crossover (the mid-point of the Valley) to re-direct incoming traffic away from the East Valley. The diversion is currently triggered by full day-use parking lots or very long queues at East Valley intersections, especially those at the Yosemite Village Day-Use Parking Area entrance and the Lodge pedestrian crossing. Rangers meet additional vehicles entering the Valley at the junction of Southside Drive and El Capitan Crossover and guide them to other destinations in the park before returning to the El Capitan Crossover. Rangers give drivers a time-stamped card when first met; drivers who show the card after spending time elsewhere in the park are allowed to enter the traffic queue into the East Valley later in the day.

This is a first-come/first-served, on-site limit, with a delay component. Anecdotal data suggest it is currently used when daily inbound traffic levels to the East Valley exceed approximately 6,500 vehicles. These diversions are not formally announced or tracked and implementation is at the discretion of the traffic manager, with the goal being to avoid gridlock so that emergency vehicles can move quickly. The alternatives presented in Chapter 8 offer different approaches to addressing day-use traffic. The lower-use alternatives (2, 3, and 4) include a day-use parking reservation system for East Yosemite Valley that would eliminate the need for on-site East Valley traffic diversions. In Alternatives 5 and 6, infrastructure changes (e.g., better intersections, more parking, improved pedestrian crossings, better wayfinding) will reduce the need to rely on ad hoc measures, although demand may exceed supply on some days and eventually necessitate implementation of a formal system.

**East Valley Day-use Parking Permit System.** The need for a permit system depends on the amount of day-use parking each alternative provides in relation to the peak visitation levels in those alternatives. Alternatives 2, 3, and 4 would immediately require a system to manage day-use levels in the East Valley because at-one-time visitation demand would be substantially higher than parking availability in these alternatives. In contrast, Alternatives 5 and 6 would provide sufficient day-use parking supply to accommodate some increase beyond current peak day-use levels. In these higher-use alternatives a day-use parking permit system would be implemented in the future if conditions become “unacceptable,” as defined below. Emphasis would be placed on instituting indirect management of day-use traffic first, before moving to a parking permit system. Such indirect management includes information sharing, transit incentives, and transportation system mode sharing to redistribute traffic away from the congested areas of East Yosemite Valley.

For Alternatives 5 and 6, an East Valley Day-use Parking Permit System will be implemented when conditions reach the point where: (1) day-use visitation to the East Yosemite Valley from private vehicles exceeds the parking availability; and (2) formal traffic diversions at El Capitan Crossover have been implemented for at least 14 days during the summer season for two consecutive years.

In general, a day-use parking permit system for East Yosemite Valley will take into account the following:

- **Seasonality** – The permit system would be instituted during the peak-use summer season and daylight hours only.
- **Allocation** - The system would ensure fair and equitable allocation of permits to all visitors on a mixed first-come, first-served and advanced reservation basis.
- **Distribution** – Permits would be available by multiple means including through the Internet, by telephone, and in person.
- **Permit Compliance** – Permits may be checked at park entrance stations and/or on-site at day-use parking areas in the Valley.
- **Costs and Fees** – The permit system will need to address the costs of administration and whether fees would be required.
- **Thru Traffic and other Considerations** - The permit system would need to take into account the various types of day users to the Valley including administrative traffic, pass-thru travelers, special events and groups, etc. Similarly, development of the permit system will also need to address the economic implications (both positive and negative) for gateway communities.

**Other Management Actions.** Several other management actions in this segment would also address visitor impact issues in concert with user capacities. Many are already in place, however education and regulation enforcement will need to be emphasized in higher use alternatives. Actions common to all alternatives include:

- Proactive on-site management program for day-visitor traffic and parking.
- Camping restrictions (in designated areas only).
- Fire restrictions (hours of the day) to reduce smoke.
- Food storage restrictions (mandatory bear-resistant storage rather than in cars or rooms).
- Regular trail and camping area maintenance to mitigate site impacts (e.g., trail cutting, camp boundary encroachment, etc.).
- Split rail fencing, boardwalks, and defined trails as needed to minimize informal trails and other site impacts.

- Improved signage and wayfinding.

Several other management actions to address user capacity-related issues vary across alternatives. These include:

- Additional split-rail fencing, boardwalks, and defined trails to minimize informal trails and other site impacts.
- Eliminating pack stock stables and commercial day rides from the Valley.
- Eliminating commercial rafting from the Valley.
- Changes to the number and location of parking spaces.
- New intersection improvements (e.g., roundabouts).
- Adding below-grade pedestrian crossings.
- Extending the Valley shuttle to Bridalveil Fall.

These actions address many biophysical, scenic, or transportation impacts from the amount of use, while adjustments to capacities more directly responds to desired social conditions at attraction sites or beaches.

## ***Conclusion***

Primary user capacity decisions in Yosemite Valley involve choices among the amount of use, infrastructure to support that use (especially lodging, campground, and day-use parking lots), and social conditions as to what use levels are acceptable (densities at attraction sites, roadway travel times, and parking availability). There are also choices between levels of facility development and meadow and riparian restoration.

Tradeoff examples include:

- In the lower-use alternatives, densities at attractions are closer to “preference evaluations” than “acceptability” evaluations. Higher-use alternatives allow more access, but conditions may be less desirable, though still within the acceptable range.
- Alternative 2 eliminates the Lodge and Housekeeping Camp as overnight destinations. This allows greater restoration (improves riparian or meadow conditions), but reduces overnight capacity (the number of people who can stay overnight in those types of lodging). It also changes the type of use in those areas to lower density day-use. Alternatives 5 and 6, meanwhile, provide for a level of accommodations similar to today’s, with less (but still significant) restoration than Alternative 2.
- Overnight vs. day-use. More parking or development for one type of use may mean less for another (if the amount of total developed area is held constant). The largest contrasts are between Alternatives 2 (much lower overnight and day use) and Alternative 6 (higher overnight use; roughly static day use).

## **Segment 3: Merced Gorge**

### ***Management Goals and Considerations***

Management goals with capacity implications for the Merced Gorge include: (1) protecting natural processes; (2) promoting visitor enjoyment; and (3) reducing crowding and congestion. The single ORV in this segment is scenery (ORV 18), which features views of “towering cliffs and peaks. . .near continuous cascades. . .and a narrow gorge. . .littered with massive boulders.” These scenic features are not affected by the amount of visitor use, although infrastructure in support of recreation use (e.g., the El Portal Road and



Arch Rock entrance gate) could have some effects on scenic quality. In the absence of ORVs that are sensitive to use levels, capacities are based on standards for high-quality recreation and transportation system performance that are appropriate to this scenic corridor and National Park frontcountry settings.

A review of baseline and existing conditions, monitoring reports, information from staff, and public involvement information identified three user capacity-related issues for this segment:

- Traffic congestion at the Arch Rock entrance gate.
- Crowding and parking availability at specific turnouts popular for: (1) climbing in spring and fall; and (2) relaxing, swimming, and fishing during low water periods.
- Bank trampling and erosion at specific turnouts.

The primary constraints to the kinds and amounts of use in the Gorge segment are the roadway that parallels the river, the number of pull-outs that provide access to it, and the condition of the riverbanks. Most road traffic passes through the segment *en route* to other destinations within or outside the park (depending on the direction of travel). Two-way traffic volumes along this road (not including the entrance gate queues) have not created noticeable congestion, even during peak-use periods.

A limited number of pull-outs and two larger parking lots (13 and 23 spaces per lot, respectively) provide access to the river along this segment. Use in this area is primarily made up of short duration stops by passing vehicles. However, some visitors engage in longer visits that include more immersive recreational activities (e.g., climbing, relaxing, swimming, or fishing). For example, the pull-outs near Arch Rock, Cookie Cliff, and Ribbon Falls are popular for climbing.

Most pull-outs in this segment have been redeveloped and properly designed to reduce impacts to river values. A few popular swimming-related pull-outs, however, have some parking and bank trampling impacts. The *Merced River Plan/DEIS* proposes actions to provide appropriate access, restore trampled vegetation, reduce erosion, and protect river banks.

### ***Indicators and Standards***

The transportation indicator for Yosemite Valley (Segment 2) helped inform user capacity decisions for this segment; it is designed to monitor the ease of access to scenic viewing and other recreation opportunities. This indicator measures parking availability and congestion at turnouts and parking areas. The segment has approximately 180 spaces, depending on size of vehicles and how efficiently unmarked turnouts are used. All alternatives keep this number static and assume 90 percent of spaces can be used efficiently (parking filled at higher levels makes it difficult for drivers to find, enter, or leave spaces without creating bottlenecks).

Relationships between use levels and crowding are direct and linear: more vehicles stopping in the segment will fill the available parking spaces, while more vehicles on the road will decrease average space per vehicle and increase chances of congestion (traffic jams). Using these relationships, park planners assessed the number of vehicles that can be accommodated at one time while meeting identified standards. Based on analyses of traffic levels associated with capacities in the Valley and the proportion of use that is likely to arrive via the Gorge, even the highest use alternatives in the DEIS do not approach “pass through” capacities in this segment (DEA 2012).

The limiting factor for capacity in this segment is parking availability, which constrains the number of visitors that can “stop and stay” in the segment at one time (about 600 visitors). Much higher use levels can

pass through the segment on the El Portal Road, while adhering to a “free-flow” standard. Current peak use averages over 300 vehicles and about 1,000 people per hour, while the “free-flow” standard would allow nearly double this level without unacceptable congestion (DEA 2012).

### *Overview of Capacities*

Table 6-7 provides a summary of the capacities for the Gorge segment. Because no overnight use occurs in this segment, only day-use capacity is reported below.

**TABLE 6-7: SUMMARY OF USER CAPACITIES BY ALTERNATIVE: MERCED GORGE**

Alternatives	1	2	3	4	5	6
	Current management	Self-reliant experiences and extensive floodplain restoration	Dispersed experiences and extensive riverbank restoration	Resource-based experiences and targeted restoration	Enhanced experiences and essential riverbank restoration	Diversified experiences and selective riverbank restoration
<b>Visitor day-use capacity</b>						
People at one time from parking areas	470			470		
People at one time on roadway	399			399		
<b>Total</b>	<b>869</b>			<b>869</b>		
<b>Administrative capacity</b>						
Employee housing	9			9		
Administrative day parking	4			4		
<b>Total</b>	<b>13</b>			<b>13</b>		
<b>TOTAL SEGMENT CAPACITY</b>	<b>882</b>			<b>882</b>		

Most administrative capacities refer to people spending the night or working at the Arch Rock entrance gate during the day. All user capacities and administrative use on roads are expressed as people at one time. Parking availability assumed 90% occupancy and 2.9 people per vehicle. It was also assumed that transit and tour buses do not stop at turnouts (transit does not stop due to schedule constraints and tour buses are prohibited from stopping). Road circulation calculations assume 20 vehicles per mile over a 6.9 mile segment to maintain the free flow of traffic.

Administrative use levels at the Arch Rock entrance station were associated with the existing employee room and bed configurations (nine beds) and day-use parking availability (two spaces for four staff).

### *Capacity Management*

This seven-mile segment has no history of established user capacities. User capacities and management actions are the same for all alternatives. Existing parking is sufficient for likely future demand and will not cause unacceptable impacts to river values, even with use in the Valley as high as that proposed in Alternative 6. Proposed actions common to all alternatives include:

- Addressing bank erosion at specific turnouts popular for swimming and relaxing; these involve designating specific parking spaces and trail redesign to minimize riparian trampling impacts.
- Organizing paved turnouts with designated spaces to improve efficiencies and avoid congestion at parking areas.

No alternative examined user capacities higher than present use.

## ***Conclusion***

There are no major user capacity choices in the Gorge segment across the alternatives. As reflected in Chapter 8, the NPS has determined the existing roadway, parking areas, and entrance gate facilities are causing no adverse impacts to river values. Similarly, the use levels that fit with those facilities occur without unacceptable congestion or other impacts on river values. Other management actions address the site-specific visitor use impacts that can be controlled by improved parking and trail design.

## **Segment 4: El Portal**

### ***Management Goals and Considerations***

Use of the El Portal Segment is primarily focused on administrative functions and community activities. The vast majority of this activity occurs in upland developed areas that are set back from the river, although some recreation use occurs in the river or along its banks. Similar to the Gorge segment, several roadside pull-outs provide access to the river for recreational activities. Primary activities are swimming, fishing, and boating, all of which are seasonal in nature.

Management goals related to capacity for El Portal include: (1) protecting natural processes; (2) promoting visitor enjoyment; and (3) reducing crowding and congestion. The only ORVs in this segment are the El Portal Archeological District and the El Portal boulder bar. Neither is affected by the amount of visitor or administrative use, although cultural values are affected by the location of visitor facilities as discussed in Chapter 5. In the absence of ORVs that are sensitive to use levels, capacities were based on standards for high-quality recreation appropriate to National Park frontcountry settings.

The primary constraints to the kinds and amounts of use in the El Portal segment are resource constraints and site suitability. These include topography, floodplains and riparian areas, cultural resource sites, and rare or sensitive plant and animal populations. Similar to Yosemite Valley, these resource issues limit the amount of land available for visitor or administrative activities and related structures. Areas that would accommodate additional use have been identified and included in the plan alternatives.

### ***Indicators and Standards***

The parking availability indicator for Yosemite Valley (Segment 2) helped inform user capacity decisions for this segment. The El Portal segment has approximately 290 spaces, depending on size of vehicles and how efficiently unmarked turnouts are used. All alternatives keep this number static and assume 90 percent of spaces can be used efficiently (parking filled at higher levels makes it difficult for drivers to find, enter, or leave spaces without creating bottlenecks).

Administrative use capacities in residential areas were based on staffing needs and available housing, which vary by alternative and typically derive from decisions about employee numbers and housing in Yosemite Valley. Full occupancy of the employee housing in this segment is assumed.

Relationships between use levels and crowding are direct and linear. More vehicles stopping in the segment will fill the available parking spaces, while more vehicles on the road will decrease average space per vehicle and increase chances of congestion. Using these relationships, park planners assessed the number of vehicles that can be accommodated at one time and meet standards (see assumptions below). Based on

analyses of traffic levels associated with capacities in the Valley and the proportion of use that is likely to arrive via El Portal, even the highest use alternatives in the DEIS will not approach pass-through capacities in this segment (DEA 2012).

Although park planners considered all river values and related site constraints in this segment in developing capacities, the limiting factor is parking availability, which constrains the number of visitors that can “stop and stay” in the segment at one time (about 500 visitors). Much higher use levels can pass through the segment on the El Portal Road, even at a “free-flow” standard (current high-user periods average over 300 vehicles and about 1,000 people per hour, but the “free-flow” standard would allow nearly twice this level without unacceptable congestion).

### *Overview of Capacities*

There is no visitor overnight use in this segment (Yosemite View Lodge is private land outside the scope of this planning effort), and most visitors pass through the segment on their way into or out of the park. For most, the recreation experience is scenic driving, but some make short stops at turnouts, and others make longer stops to relax, swim, or fish (especially during low water periods in mid- to late summer). There is some commercial use associated with the store, gas station, and Yosemite View Lodge restaurants. There is considerable administrative use associated with NPS housing, NPS administration facilities, and “commuters” living in El Portal who work in other parts of the park.

For this segment, the *Merced River Plan/DEIS* proposes common-to-all user capacities for people in vehicles for scenic driving or administrative purposes, and for out-of-vehicle recreation opportunities. However, administrative residential and day-use capacities vary by alternatives. A summary of user capacities by alternative is provided in Table 6-8. All visitor capacities refer to people at one time. Administrative capacities refer to number of people spending the night in residential housing or working at NPS facilities during the day. All user capacities for circulating on roads include visitor and administrative use and are expressed as people at one time.

**TABLE 6-8: SUMMARY OF USER CAPACITIES BY ALTERNATIVE: EL PORTAL**

Alternatives	1	2	3	4	5	6
	Current management	Self-reliant experiences and extensive floodplain restoration	Dispersed experiences and extensive riverbank restoration	Resource-based experiences and targeted restoration	Enhanced experiences and essential riverbank restoration	Diversified experiences and selective riverbank restoration
Visitor day-use capacity						
People at one time from parking areas	559	559				
People at one time on roadways	181	181				
Total	740	740				
Administrative capacity						
People in residential housing	192	618	223	300	288	506
Administrative staff PAOT	1,220	1,220				
TOTAL SEGMENT CAPACITY	2,152	2,578	2,183	2,260	2,248	2,466

Specific calculation assumptions include:

- Parking availability assumed 90 percent occupancy, 2.9 people per vehicle and that transit and tour buses do not stop at turnouts in this segment.

- Road circulation calculations assume 20 vehicles per mile over a 3.1 mile segment to meet the “free-flow” standard.
- Use levels at various employee residential areas were associated with the existing or proposed room and bed configurations, or administrative day-use parking availability (2 people per vehicle/parking space).

### ***Capacity Management***

This short segment has no history of established user capacities. Day-use capacities are the same for all alternatives. Existing parking is sufficient for likely future demand and will not cause unacceptable impacts to river values, even with use increases in the Valley as proposed in Alternative 6. Proposed actions common to all alternatives include:

- An additional public restroom would be built in Old El Portal to accommodate visitors recreating in this segment.
- NPS would construct duplexes (as infill) in El Portal Village Center to house up to 12 employees.

No alternative examined visitor user capacities higher than present use; all alternatives consider increasing the amount of employee housing. Also, some alternatives consider a day-use parking area at Abbieville. This parking area would provide overflow parking and transit service to the Valley. Otherwise, this segment would continue to serve as the park’s administrative site.

### ***Conclusion***

There are no major user capacity tradeoffs in El Portal. NPS has identified acceptable visitor infrastructure levels (current roadway and parking area configuration), and has identified use levels that fit with those facilities without unacceptable congestion or other impacts on river values. The only differences in alternatives are the amount of employee housing, which are driven by Valley housing availability (in higher use alternatives, more Valley employees will commute from housing in El Portal).

## **Segment 5: South Fork Merced River Above Wawona**

### ***Management Goals and Considerations***

Management goals related to user capacity in this segment include: (1) protecting natural processes; and (2) promoting visitor enjoyment. There is no recreation ORV in this segment, and use-related impacts that might affect the segment’s biological, archeological, and scenic outstandingly remarkable values (see Chapter 2) are localized and site-specific and more likely to be caused by the type rather than the amount of use.

The entire reach is in designated Wilderness. As with other Yosemite backcountry areas, NPS manages for solitude-oriented recreation experiences. Overnight visitor use is currently limited through a trailhead quota and permit system.

A review of baseline and existing conditions, studies, monitoring results and public comment identified few specific visitor or administrative use issues for the corridor. Designated trails cross the corridor in only three

places, there are very few commonly used dispersed camps, and none are likely to have substantial site-specific impacts at current or proposed use levels.

Other management considerations that affected user capacity decisions in this segment include wilderness encounters and related recreational experiences. As described by the Wilderness Act, outdoor recreation in the Merced River's wild segments is primarily oriented toward "outstanding opportunities for solitude or a primitive and unconfined type of recreation." Therefore, the degree of interaction with other visitors can be a constraint on the amount of use that may be accommodated in this segment.

### *Indicators and Standards*

Capacities in this segment were based on trail encounters with other groups. Encounters have a long history of management and research attention in backcountry areas (Vaske et al. 1986; Shelby et al. 1996; Manning 2010). In higher density settings (including above Nevada Fall), the measure has focused on encounters *per hour*. In lower density backcountry areas such as the South Fork above Wawona, considerable research suggests standards for "wilderness experiences" should be less than five encounters *per day* (Vaske et al. 1986).

Based on research from several locations, relationships between use and trail encounters in this segment are likely to be direct and linear. Trail encounter standards have been set at five or less per day for all alternatives; these standards are unlikely to be exceeded with current overnight and day-use levels.

### *Overview of Capacities*

The *Merced River Plan/DEIS* proposes no changes in overnight visitor capacities for this segment, but considers day use and administrative use for completeness. A summary of user capacities is provided in Table 6-9. Visitor capacities in this table refer to people spending the night in or near the segment (overnight use), or using it for part of one day (day-use); encounters between these groups would most likely occur while traveling during the day.

Administrative use up to five people per day is associated with wilderness patrols, trail crews, or search and rescue operations. All capacities for visitor and administrative use are the same across alternatives, and they will protect or enhance visitor experiences by ensuring that trail encounters will not exceed the standards set for the corridor.

**TABLE 6-9: SUMMARY OF USER CAPACITIES FOR ALL ALTERNATIVES: MERCED CORRIDOR ABOVE WAWONA**

Wilderness Capacities		Comments
<b>Wilderness zone capacities</b>		
Zone 50, South Fork	15	Trail crosses corridor. Very little, if any cross-country use. Corridor is less than 15% of zone. Most camping is outside river corridor. Zone overnight capacity is 150 people per night.
Zone 51, Johnson Creek	5	No designated trails in corridor. Some rare cross-country use. Corridor is less than 5% of zone. Zone capacity is 50 people per night.
Zone 52, Chilnualna Creek	0	No designated trails in corridor. No known use. Corridor is less than 10% of zone. No camping allowed in corridor (within 4 miles of Wawona).
<b>Total</b>	<b>20</b>	
<b>Administrative capacity</b>	<b>5</b>	Estimated based on a limited number of wilderness patrols.
<b>TOTAL SEGMENT CAPACITY</b>	<b>25</b>	

## ***Capacity Management***

Proposed capacities would be managed through the backcountry permit system, which limits people per day using different trailheads; the capacities are the same for all alternatives. Other details about the permit system are provided earlier in this chapter under the section pertaining to the Merced River above Nevada Fall.

Plan alternatives propose no changes to infrastructure (trails, bridges, or related development). However, similar to the Merced above Nevada Fall, several Wilderness management actions work with capacities to protect and enhance river values. These are common across all alternatives:

- Overnight group size limits: 15 for backpacking groups on trails, 8 cross-country; 25 stock + people for stock groups on trails.
- Camping restrictions: Camp farther than 100 feet from water; no camping within 4 miles of Wawona.
- Day use group size limit of 35 people
- Leave-No-Trace regulations:
  - No fires above 9,600 feet; fires must be in designated fire rings
  - Mandatory bear-resistant food canisters
  - Carry out all trash
  - Bury human waste
  - No bicycles/strollers
  - No mechanized or motorized travel
- Regular trail and camping area maintenance addressing site impacts (e.g., trail cutting, campsite boundary encroachment, etc.).

## ***Conclusion***

There are no user capacity tradeoffs in the segment above Wawona; all alternatives maintain the same encounter standards and existing low-use levels. This part of the corridor provides very low density, solitude-oriented recreation experiences and minimal visitor-related impacts, and no stakeholder or public input has advocated higher-use alternatives.

## **Segments 6 and 7: Wawona and Wawona Impoundment**

### ***Management Goals and Considerations***

Management goals related to user capacity in this segment include: (1) protecting natural processes; and (2) promoting visitor enjoyment.

The pertinent outstandingly remarkable values in this segment are biological and cultural. The biological ORV includes the Sierra sweet bay (*Myrica hartwegii*), a rare plant found on river banks of the South Fork Merced River. Uses proposed in the plan alternatives are diverted away from sensitive areas, and fencing, signing, and education are proposed to further protect this ORV.

For the cultural ORV, remains of the U.S. Army Cavalry Camp A.E. Wood document the Yosemite legacy of the African-American buffalo soldiers and the strategic placement of their camp near the Merced River. Campsites currently within this historic area would be removed in some *Merced River Plan/DEIS* alternatives, affecting the overnight capacity of the campground.

Other factors that limit the kinds and amounts of use that can be accommodated in the Wawona segment include the following:

***Resource constraints and site suitability.*** As with the other developed areas in the corridor (Yosemite Valley and El Portal), resource constraints and overall site suitability factor into the constraints on the maximum amounts of use that may be accommodated in the Wawona segment. In this segment, these constraints include topography, floodplains and riparian areas, rare and sensitive plant and animal populations, and cultural resource sites. Collectively, the various resource constraints and limited availability of land in the river corridor in Wawona are a limiting factor for visitor and administrative uses in this area.

***Water consumption.*** Water use and treatment are a limiting factor to the overall kinds and amounts of use in the Wawona segment. Currently the water supply for the Wawona area is drawn from four potable water systems and multiple private wells. One distribution system is operated by the National Park Service and involves drawing surface water from an impoundment on the South Fork Merced. Under its Regional Water Quality Control Board permit, this system is designed to draw a maximum of 480 gallons per minute or 1.1 cubic feet per second. To protect in-stream flows for aquatic habitat, mandatory water conservation measure are implemented whenever the river reaches flows of less than 6 cubic feet per second. At flows of less than 6 cubic feet per second, diversions are limited to 10 percent of the river flow.

### ***Indicators and Standards***

The parking availability indicator for Yosemite Valley (Segment 2) helped inform user capacity decisions for this segment. The segment has approximately 290 spaces, depending on size of vehicles and how efficiently unmarked turnouts are used. All alternatives keep this number static and assume 90 percent of spaces can be used efficiently (parking filled at higher levels makes it difficult for drivers to find, enter, or leave spaces without creating bottlenecks).

Administrative use capacities in residential areas were based on staffing needs and available housing, which are the same across the alternatives for this segment. Full occupancy of the available employee housing is assumed.

Relationships between use levels and crowding are direct and linear. More vehicles stopping in the segment will fill the available parking spaces, while more vehicles on the road will decrease average space per vehicle and increase chances of congestion. Using these relationships, park planners assessed the number of vehicles that can be accommodated at one time and meet standards (see assumptions below) (DEA 2012).

Although park planners considered all river values and related site constraints in this segment in developing capacities, the limiting factor is parking availability, which constrains the number of visitors that can stop and recreate in the segment at one time (about 911 visitors).

### ***Overview of Capacities***

Table 6-10 presents an overview of the capacities proposed for the Wawona segment across the alternatives.



**TABLE 6-10: SUMMARY OF USER CAPACITIES BY ALTERNATIVE: WAWONA**

Alternatives	1	2	3	4	5	6
	Current management	Self-reliant experiences and extensive floodplain restoration	Dispersed experiences and extensive riverbank restoration	Resource-based experiences and targeted restoration	Enhanced experiences and essential riverbank restoration	Diversified experiences and selective riverbank restoration
Visitor overnight capacity						
Wawona Hotel	247	247				
Wawona Campgrounds	618	426	456	456	540	540
Visitor day-use capacity						
Day parking	911	911				
Regional transit	0	26	26	104	311	311
Tour buses	384	384				
Administrative capacity						
Employee housing	121	121				
Administrative day use	60	60				
TOTAL SEGMENT CAPACITY	2,368	2,175	2,205	2,205	2,574	2,574

### Visitor Overnight Capacity

All alternatives would retain the Wawona Hotel at its current capacity of 104 rooms, accommodating a maximum of 247 people per night. The Wawona campground has different user capacities in different alternatives, depending on the number of sites moved away from both the river and the A.E. Wood cultural site. Maximum capacities of the campground are 384, 414, and 498 people per night, compared to the current capacity of 576 people per night. Campground user capacity is calculated by multiplying the number of sites times the maximum of six people per site. Additionally, each action alternative includes one 30-person group site at the Wawona Campground. Segment 7 also has two stock camps that accommodate up to six people per night at each.

### Visitor Day-use Capacity

Day-use capacity in Wawona varies according to the amount of regional transit provided along this corridor in each alternative. Based on the number of inbound bus runs through this segment each day, the maximum number of people at one time from regional transit in Wawona varies from zero in Alternative 1 to 311 in Alternative 6 (the calculations are similar to those in Segment 2, above, with no employees assumed as riders; for example, the preferred alternative has 12 roundtrips per day, with 48 passengers per bus, multiplied by the 60 percent turnover rate and 90 percent day-use factor, for 311 total). The maximum day-use associated with private vehicle parking remains the same across all alternatives, at approximately 911 people at one time (290 parking spaces multiplied by an average of 2.9 people per vehicle, then by 90 percent, with 154 people in circulating cars added to reach 911). The maximum number of people at one time arriving from tour buses is consistent across the alternatives at 384 people (8 tour bus parking spaces multiplied by a maximum of 48 people per bus).

## Administrative Capacity

Administrative use is broken down between employees residing in housing within the corridor and those that use day-use parking not associated with residential areas or visitor parking. Residential capacity for all of the alternatives is 121 employees. Day parking for administrative use would accommodate an additional 60 employees (30 parking spaces multiplied by an average of two people per vehicle, reflecting the fact that employees are usually not traveling with their families or friends, but other coworkers going to the same duty station).

## Capacity Management

This section provides an overview of the key capacity management actions for the Wawona segment. It focuses on infrastructure decisions along with policy and regulation measures that will be taken to ensure the kinds and amounts of use proposed do not adversely affect river values. Again, these are a subset of the full suite of actions being taken in each alternative to protect river values (see Chapters 5 and 8, for example). Table 6-11 presents a summary by alternative of the key capacity management actions for the Wawona segment.

**TABLE 6-11: SUMMARY OF KEY USER CAPACITY MANAGEMENT INFORMATION: WAWONA**

Alternatives	1	2	3	4	5	6
	Existing situation	Self-reliant experiences and extensive floodplain restoration	Dispersed experiences and extensive riverbank restoration	Resource-based experiences and targeted restoration	Enhanced experiences and essential riverbank restoration	Diversified experiences and selective riverbank restoration
Infrastructure						
Wawona Hotel	104 rooms					
Wawona Campgrounds	99 sites	Reduced to 67 sites	Reduced to 72 sites	Reduced to 72 sites	Reduced to 86 sites	Reduced to 86 sites
Wawona stock camp	Located near river	Relocated to Wawona Stables	Relocated to Wawona Stables	Relocated to Wawona Stables	Relocated to Maintenance Yard	Relocated to Wawona Stables
Fencing and boardwalks	Used to denote closed areas and/or divert human foot traffic or parking away from sensitive areas.					
Policy and Regulation						
Lodging management	Concession operated, available by reservation					
Campground regulations	<ul style="list-style-type: none"><li>NPS operated by combination of reservation system first come-first served availability.</li><li>Length of stay limited to not more than a total of 7 days, and camping within all other portions of the park, during the same period, is limited to not more than a total of 14 days.</li><li>Maximum of 6 people per individual site and 30 people per group site.</li><li>Maximum of 2 vehicles per site.</li><li>Food storage regulations apply.</li></ul>					
Boating regulations	Allowed downstream of swinging bridge					
Fishing regulations	<ul style="list-style-type: none"><li>State regulations apply</li><li>No fishing from bridges, including Swinging Bridge</li></ul>					
Swimming regulations	<ul style="list-style-type: none"><li>No jumping or diving from bridges</li><li>No swimming within Wawona water intake or 100 yards upstream</li><li>No use of soaps, shampoos or detergents (biodegradable or otherwise) in any waters of the park.</li></ul>					

## Infrastructure

Under all alternatives, the Wawona Hotel, a National Historic Landmark, is retained at its current capacity of 104 rooms. The Wawona campground configuration varies across alternatives, depending on the number of sites removed from river or cultural resource areas. In Alternative 2 the campground is reduced to 67

sites, in Alternatives 3 and 4 to 72 sites, and in Alternatives 5 and 6 to 86 sites. Fencing and signs help delineate parking areas and paths, guiding use away from steep riverbanks or meadow and riparian areas.

### **Policy and Regulation**

As in the other river segments, overnight lodging at the Wawona Hotel would continue to be managed by the primary park concessioner, with rooms available by reservation. The Wawona campground would continue to be managed by the National Park Service with a mix of an advanced reservation and first-come-first-served system. All current camping, boating, fishing, and swimming regulations would continue, as summarized in the table above.

### **Conclusion**

The primary user capacity choices in the Wawona segment are related to the sites in the current Wawona campground that encroach on sensitive areas and cultural values. Sites have been pulled away from these areas reducing the overnight capacity in this segment to varying degrees.

## **Segment 8: South Fork Merced River Below Wawona**

### ***Management Goals and Considerations***

Management goals related to user capacity in this two-mile segment include: (1) protecting natural processes; and (2) promoting visitor enjoyment. The only identified outstandingly remarkable value is the rare plant Sierra sweet bay, which is more likely to be affected by the type or location of use than by amount of use.

The segment is also rarely visited, so describing potential recreation impacts, defining standards, and determining user capacities is largely conjectural. Nevertheless, some day users hike along the river to fish (leaving from the campground), but this use and its impact are minimal. Similarly, a few highly skilled whitewater boating groups (typically kayakers) may descend the Class V+ South Fork in the narrow range of boatable flows in early summer, but the primary focus of such trips is downstream of the park boundary. Similarly, a few users each year may hike into the corridor seeking places to fish or relax in near-complete solitude, but the reach is short, the terrain is steep and challenging, and there are no known trails. For boating and hiking, management goals focus on wilderness-like settings and very low density recreation opportunities.

### ***Indicators and Standards***

User capacities in this segment are based on encounters with other groups per day; a measure of solitude (similar to the trail-less areas in the South Fork above Wawona segment). Research suggests standards for low density wilderness experiences should be set at less than five encounters per day (Vaske et al, 1986), which has been chosen as the standard across all alternatives.

Based on research from other rivers, relationships between use and encounters in this segment are likely to be direct and linear. With encounter standards set at five per day, use levels of three or less groups per day are unlikely to violate this standard.

### ***Overview of Capacities***

The *Merced River Plan/DEIS* proposes a visitor capacity of three groups per day (with maximum group size of five). Based on NPS estimates, this level of use has rarely, if ever, been exceeded. Administrative use in this segment is also low, but the *Merced River Plan/DEIS* adds administrative use of one group (up to five people) per day for patrols or search and rescue. All capacities for visitor and administrative use are the same across alternatives, and they will protect or enhance visitor experiences by ensuring that encounters will not exceed standards in the corridor.

### ***Capacity Management***

Overnight use in this segment is prohibited (because it is within 4 miles of Wawona), so the backcountry permit system does not apply. Although boaters have not requested permission to run this reach in the past, they would be required to register under all new alternatives. Proposed capacities would be managed through self-registration at Wawona Campground or other access points.

The *Merced River Plan/DEIS* alternatives propose no changes to the undeveloped nature of the segment (no trails, bridges, or related development). As in other wilderness areas that overlap with the corridor, management actions work with capacities to protect and enhance river values. These are common across all alternatives, and include Leave-No-Trace regulations that encourage visitors to avoid building fires, carry out all trash, bury human waste, and use bear-resistant food canisters.

### ***Conclusion***

There are no user capacity tradeoffs in the segment below Wawona; all alternatives maintain the same encounter standards and existing low-use levels. This part of the corridor provides very low density, solitude-oriented recreation experiences and minimal visitor-related impacts, and no stakeholder or public input has advocated higher-use alternatives.