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Yosemite National Park

Merced Wild and Scenic River Values
Final Baseline Conditions Report

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Prepared by ESA for the
National Park Service, Yosemite National Park

Merced Wild and Scenic River Values Final Baseline Conditions Report

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INTRODUCTION

The *Merced Wild and Scenic River Values Draft Baseline Conditions Report* serves as a foundational document for the Merced River Plan (MRP). It provides concise, focused, summarized information on river values and their condition, information that is crucial in the development of the plan. This report provides this information to planners, decision-makers, stakeholders, and members of the public, who are important participants in the development of the plan. It is a "quick reference," with an extensive bibliography included for those who desire additional information.

The report describes the condition of the river values: (1) free-flowing condition, (2) water quality, and (3) proposed outstandingly remarkable values (ORVs). This report is tightly focused on the condition of these river values and is not intended to describe other environmental conditions. The description of conditions is scientifically based, with scientific references and other sources of information listed at the end of each section. Following the direction provided by the Wild and Scenic Rivers Act (WSRA) and subsequent case law, this report describes conditions at the time of designation and at the present time. This report may continue to be revised and amended as new information becomes available, particularly information from ongoing scientific studies.[1]

Each section contains:

- A brief description of the river value addressed by that section
- Background information for that river value
- Condition of the river value in 1987 when the Merced Wild and Scenic River was designated
- Current condition of the river value
- Preliminary management considerations

Preliminary management considerations are river value conditions that should be addressed by the MRP in order to protect and enhance river values. They were developed from information in this report, from park staff input, information from the ORV workshops in the spring of 2011, and public comment on a previous draft baseline conditions report released in April 2011. To be considered a preliminary management consideration, a river value condition may have potential to have a segment-wide adverse impact or may be experiencing a downward trend to reach the level of segment-wide adverse impacts if left untreated. Preliminary management considerations also include actions or programs conducted to protect and enhance river values, such as long-term monitoring of water quality.

An earlier draft of this report was released in April 2011, and the public was provided the opportunity to review the report and provide feedback. The next draft, released in July 2012, incorporated new information about river values from recently completed scientific studies. This report, the Final Baseline Condition Assessment, reflects the ORVs of the draft Merced River Plan. As the planning process continues to evolve, the list of ORVs may change based on new information. In the case of any ORVs that might be added, the reader is advised to review the *Merced Wild and Scenic River Final Comprehensive Management Plan and Environmental Impact Statement* (chapter 9) for a discussion of their baseline conditions.

[1] In some cases, the supporting information for description of conditions comes from non-scientific disciplines such as history or architecture, and is considered scholarly instead of scientific. The supporting information may directly or indirectly describe the ORV conditions, particularly when describing conditions at time of designation because information from that era is sparse.

1. BIOLOGICAL VALUES

Biological Outstandingly Remarkable Values

The Merced River and South Fork Merced River support a suite of riparian and meadow ecosystems within Yosemite National Park. Within the river corridor, these outstandingly remarkable values include alpine and subalpine meadows along the river stretches above Yosemite Valley and Wawona, as well as the meadow and riparian complex within Yosemite Valley. Dependent on these habitats are a variety of native, endemic, and/or rare plant and animal species. Sustained by periodic flooding and/or high water tables, and also influenced by periodic burning by American Indians (Anderson 1991), these habitats are river-related crossroads of life in a landscape vibrant with productive habitats.

River Segments 1 and 5: Merced River above Nevada Fall

The Merced River creates numerous, exquisite small meadows and relatively intact adjacent riparian habitats.[2]

Numerous small meadows and adjacent riparian habitats occur on these stretches of river. The meadows and rich riparian habitat within this intact riverine system support a great diversity of plant and animal species, owing their existence to the river and its annual flooding. These range from common species like mule deer (*Odocoileus hemionus*) to rare species such as the spotted bat (*Euderma maculatum*).[3]

River Segment 2: Yosemite Valley

The meadows and riparian communities of Yosemite Valley comprise one of the largest mid-elevation meadow complexes in the Sierra Nevada.

The large, moist, mid-elevation meadows and the riparian vegetation communities of Yosemite Valley owe their existence to river processes sustained by the high water table of the river and its annual flooding, as well as periodic burning by American Indians (Anderson et al., 1991) . These mid-elevation meadows (most greater than 30 acres in size), the riparian zone, and wildlife species associated with these habitats are rare and unusual at a regional and national scale.[4] Yosemite Valley meadows and riparian habitats support rare and endemic plant and wildlife species, including an exceptional diversity of both bat and sedge species. This biological diversity is a function of the variety of niches made possible by the meadows and presence of year-round water.

River Segments 7 and 8: Wawona and South Fork Merced River below Wawona

The Sierra sweet bay (*Myrica hartwegii*) is a rare plant found along the South Fork Merced River.

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[2] Riparian areas are generally identified by the plant communities contiguous to and affected by surface and subsurface hydrologic features, with distinctly different vegetative species or more vigorous growth forms than those in adjacent areas, and are usually transitional between wetland and upland communities.

[3] While many of these species depend primarily on the river and its fish, the adjacent and related riparian habitats provide crucial nesting or denning habitats without which the species would not be present.

[4] The majority of large Sierra Nevada meadows occur between 6,500 and 8,500 feet; 62% of all Sierra meadows are smaller than 10 acres.

In Wawona and downstream, the South Fork Merced River provides habitat for a rare plant, the Sierra sweet bay (*M. hartwegii*). This special-status shrub is found in only five Sierra Nevada counties. In Yosemite, it occurs exclusively on sand bars and riverbanks downstream from Wawona and on Big Creek, although only a portion of the Big Creek population is found within the Wild and Scenic River corridor.

Biological ORV Conditions

Riparian and meadow communities are a hydrological/geological/biological concept. In riparian areas, local physical features (such as river meanders) are naturally created and change through time, while the overall pattern remains constant at a larger scale. This dynamic balance in the physical system creates a corresponding dynamic balance in the biologic system (Galat et al. 1996). These dynamic systems also promote ever-changing habitats for a diverse suite of wildlife and plants, with a structural complexity that includes mosaics of sun and shade, different moisture regimes and soil types, shelter, unique microclimates for animals, and protected corridors between adjacent plant communities (Rundel et al. 1998). Meadows are driven by surface and ground water flows, which regularly saturate or inundate soils. Vegetation and wildlife (including aquatic invertebrates) have special adaptations to these environments.

In general, features that indicate the quality and character of riparian and meadow ecosystems are those that reflect the fundamental ecological processes that sustain these dynamic systems. This includes function-based, structure-based, and species-based features. An example of a function-based feature is the flow rate of the Merced River. Examples of structure-based features are the aerial extent of meadows and structural integrity. The level of species richness and the presence of focal species are also indicators of the quality and character of riparaian and meadow ecosystems.

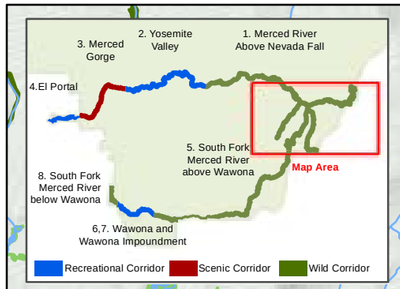
An altered climate could lead to fundamental changes in natural plant communities, including changes to riparian and meadow complexes (Panek et al. n.d.). Warming temperatures are already causing an increase in winter precipitation as rain rather than snow (Knowles et al. 2006), earlier snowmelt, earlier stream peak flows (Mote et al. 2005; Stewart et al. 2005), and ealier blooming dates of flowering plants (Cayan et al. 2001). These changes in climate may reduce water availability, especially in the summer (Lundquist and Roche 2009), which could lead to changes in the species composition of vegetation communities, a decline in the number of large-diameter trees (Lutz et al. 2009), and increase in the frequency and intensity of wildfires, all of which could affect the biological resources of the Merced River corridor. In particular, meadow and riparian ecosystems, which are closely associated with the hydrologic regime of the Merced River, would be sensitive to alterations to the water cycle linked to climate change.

River Segment 1: Merced River above Nevada Fall

The upper Merced River watershed (Figures 1-1 and 1-2) is characterized by steep canyons, broad interstream areas of glacially smoothed granite, lakes and meadows, and thin, granitic soils (Photos 1-1 and 1-2). Much of the Merced River above Nevada Fall is bordered by a narrow riparian zone influenced by stream gradient, slope, sedimentation, and aspect. Riparian areas are characterized by a combination

of high species diversity, species density, and productivity. Continuous interactions occur among riparian, aquatic, and upland terrestrial ecosystems through flows of energy, nutrients, and species (Mitsch and Gosselink 1986). All riparian habitats have an exceptionally high value for many wildlife species. Such areas provide water, thermal cover, migration corridors, and diverse nesting and feeding opportunities. The shape of many riparian zones – particularly the linear nature of streams – maximizes the development of ecotones (transitional areas between adjacent habitat types), which are highly productive for wildlife (Mayer and Laudenslayer 1988). Floodwater and subsequent groundwater levels are the main determinants of the type and productivity of the vegetation in riparian zones (Mitsch and Gosselink 1986).

Numerous small meadows and adjacent riparian habitat are present in the upper reaches of the Merced River corridor above Nevada Fall (NPS 1997) (Photo 1-3). These high-elevation meadows typically occur on fine-textured, permanently to semi-permanently wet soils generally associated with perennial streams, seeps, lake margins, or depressions. Vegetation consists of low-growing, native, tussock-forming grasses, sedges, rushes, and perennial herbs. Within the alpine zone (generally above 9,600 feet—the highest portion of the Merced River's headwaters), meadows often form thin margins around small glacial lakes (Photo 1-4). At lower elevations (such as Merced and Washburn Lakes), subalpine meadows (7,000 to 9,600 feet) form a distinct ecosystem linking the aquatic environment and drier coniferous forests. At these elevations, larger meadow complexes are infrequent but are present in some locations. These wetland plant communities are hydrologically driven by the groundwater and flooding regime of the Merced River (NPS 1997; Ballenger et al. 2011; Sawyer et al. 2009).



*Only meadow and riparian vegetation located within the WSR Corridor is part of the biological ORV.

Yosemite Wilderness

Ansel Adams Wilderness

Gray Peak Fork
Washburn Lake
Washburn Lake Meadow
Washburn Stock Camp
Doc Moyle's Meadow- West
Doc Moyle's Meadow- East
Doc Moyle's Stock Camp
Lyell Fork Merced River
Rodgers Peak
Electra Peak
Mount Ansel Adams
Foerster Peak
Mount Clark
Red Peak Fork Merced River
Triple Peak Fork Merced River
Foerster Creek
Gray Creek
Gray Peak
Red Peak Meadow- North
Red Peak Meadow- South
Merced Peak Fork Merced River
Triple Peak Meadow- North
Triple Peak Meadow- South
Harriet Lake
Long Mountain
Red Creek
Red Peak
Isberg Peak
Ottoway Creek
Ottoway Peak
Edna Lake
Turner Meadow- South
Isberg Pass
Merced Peak
Merced River Watershed
South Fork Merced River Watershed
Triple Divide Peak
Sadler Peak
North Fork San Joaquin River
Long Creek


Triple Peak Fork of the Merced River

0 0.5 1
Miles

Figure 1-1
Biological ORV - River Segment 1. Merced River Above Nevada Fall Wild WSR Corridor

Wild WSR Corridor Classification
Yosemite National Park Boundary
Lakes
Meadow
Riparian Vegetation
Watershed Boundary
Trail
100' Contour Line
Stock Campsite

Meadow/Riparian Vegetation
Data Source: NPS, 1997

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Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 1-1

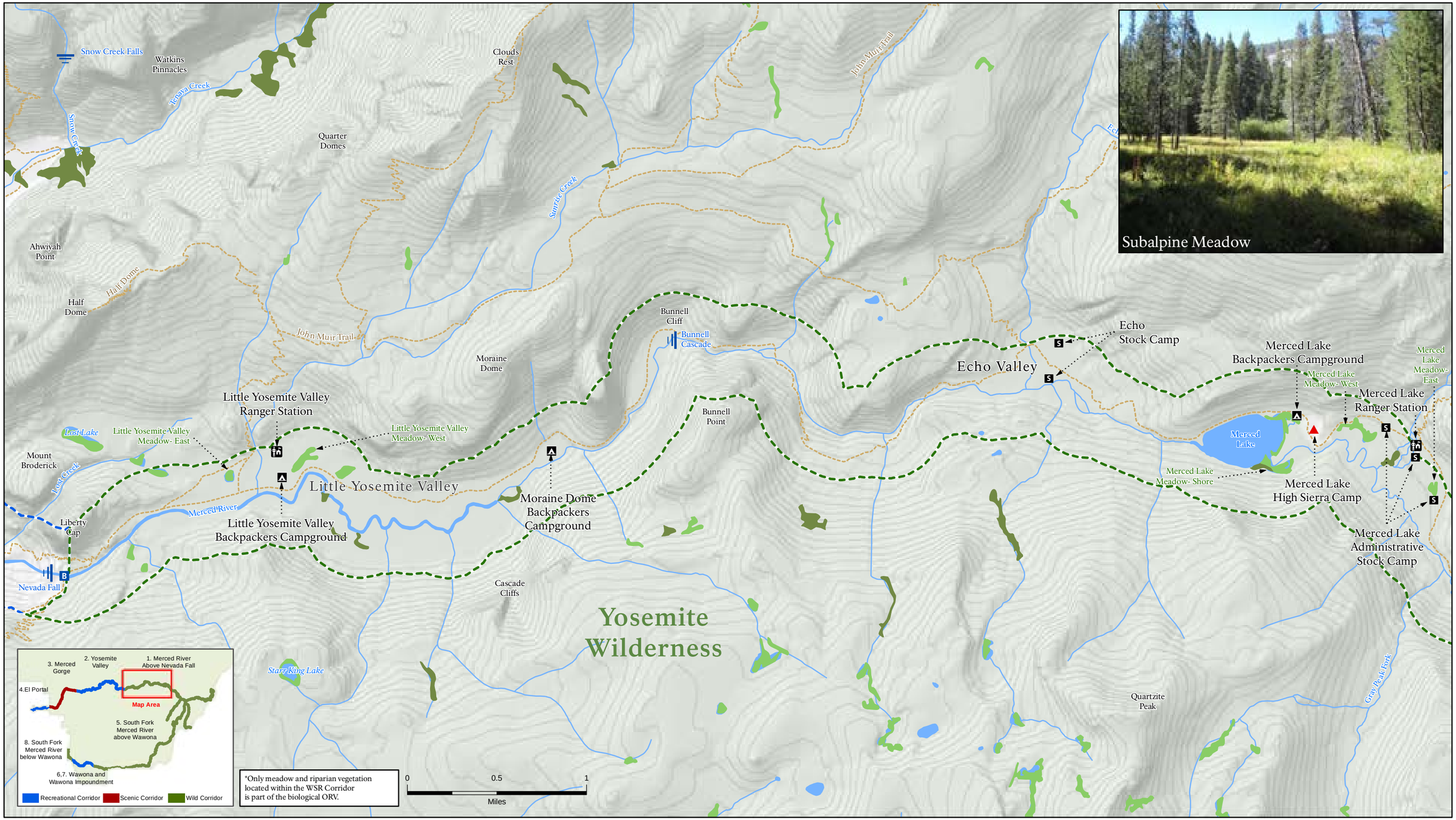

Figure 1-2
Biological ORV - River Segment 1. Merced River Above Nevada Fall-Little Yosemite Valley and Merced Lake High Sierra Camp Wild WSR Corridor

Recreational WSR Corridor Classification
Wild WSR Corridor Classification
Lake
Meadow
Riparian Vegetation
Meadow/Riparian Vegetation Data Source: NPS, 1997

Trail
100' Contour Line
Stream/River
Waterfall

High Sierra Camp
Ranger Station
Backpackers Campground
Stock Campsite
Footbridge

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Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 1-2

PHOTO 1-1: UPPER MERCED RIVER WATERSHED (YOCHIM 2010)

PHOTO 1-2: UPPER MERCED RIVER WATERSHED (YOCHIM 2010)

PHOTO 1-3: SUBALPINE MEADOW (NPS 2010)

PHOTO 1-4: LAKE-MARGIN MEADOW IN ALPINE ZONE (NPS 2010)

High-elevation tributaries to the Merced River (e.g., Merced Peak Fork and Triple Peak Fork) are sparsely vegetated with scattered patches of alpine riparian scrub and alpine willow thickets. As the river descends and the gradient becomes gentler, lodgepole pines, aspens (*Populus tremuloides*), willows (*Salix* spp.), and alders (*Alnus* spp.) become more prevalent (Photo 1-5). Willows often colonize where point bars form (at the margins of, or within, the river channel). Riparian species often intergrade with coniferous forest at or near the river's upper banks (NPS 1997; Sawyer et al. 2009).

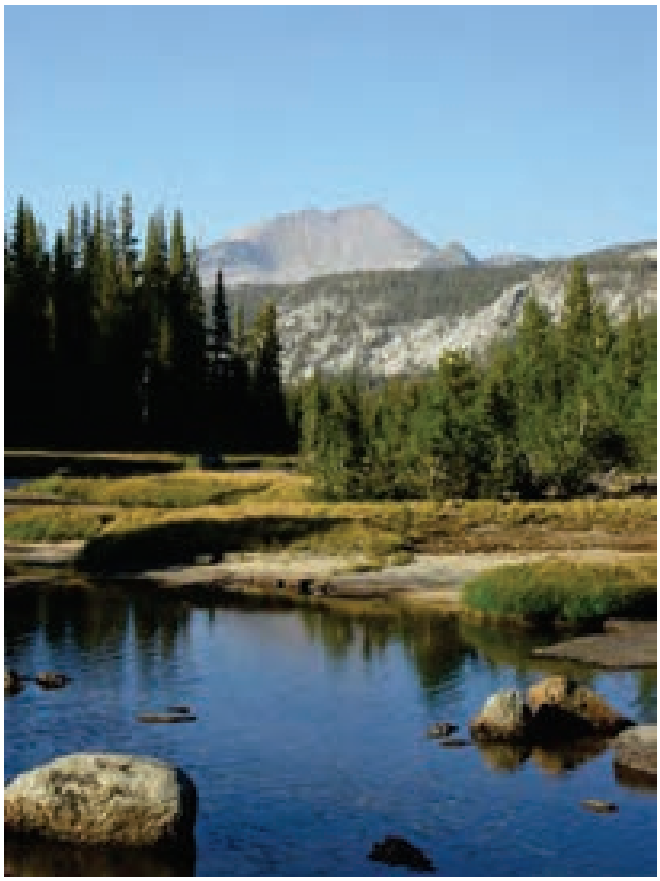


PHOTO 1-5: TRIPLE PEAK FORK (YOCHIM 2010)

Condition at the Time of 1987 Designation

Little information exists regarding the condition of meadows and riparian habitat along River Segment 1 at the time of designation. What information does exist is qualitative in nature and is derived from narrative accounts from that time period.

Although human use in the wilderness reaches of the Merced River has been ongoing for thousands of years, the upper reaches of the river and its associated meadow and riparian habitats remained intact and relatively free from human disturbance (NPS 2005b). Although subalpine meadows historically experienced grazing impacts, most of the meadows in this river segment have not been grazed for several decades. At the time of designation, river-dependent meadow and riparian habitats along the Merced River above Nevada Fall had recovered from many of the impacts associated with grazing in the late 19th century (Sharsmith 1961) with the exception of the meadows at Merced Lake. The meadows at Merced Lake-West and Merced Lake-Shore were grazed by NPS and concessioner stock in 1987 and showed typical grazing-related impacts such as trampling, erosion, and a decline in herbaceous production (Sharsmith 1961). Meadows in this area were closed to stock in the 1990s, with the exception of Merced Lake-East meadow, which currently serves as a holding area for National Park Service stock. The vegetation in Merced Lake-West and Merced Lake-Shore meadows appears to have recovered since they were closed to grazing (Ballenger et al. 2011).

A study by Millar et al. (2004) determined that subalpine meadows in the Sierra Nevada became more forested from 1946 to 1975. Similar findings are documented by Vale and Vale (1994). This meadow-to-forest conversion occurred during a climatic period that included warm, dry years with little annual variability (Millar et al. 2004). While the study did not specifically look at subalpine meadows along the Merced River corridor, a correlation may be inferred since this unique climatic period likely

influenced the entire region (Ballenger et al. 2011). Other studies have linked conifer invasion in meadows to historic sheep grazing (Sharsmith 1959; Dunwiddle 1977) and fire suppression (DeBenedetti and Parson 1979), and these practices may have contributed to forest invasion in the subalpine Merced River corridor (Ballenger et al. 2011).

Less is known about the impacts from recreational use on the meadows and riparian habitat of this segment at the time of designation, but conditions were likely similar to conditions of today. There is some evidence that large backcountry outings took a high toll on mountain meadows in the first half of the 20th Century (Ballenger et al. 2011). By 1987, overnight visitation in the Yosemite high country was being controlled through quotas due to the increasing popularity of outdoor recreation at Yosemite National Park.

Current Condition

The condition of river-related meadows and riparian habitat in the Merced River high country are similar to those described for conditions in 1987, except where changes in management practices and site specific restoration projects have improved meadow and riparian condition.

The recently completed *2010 Assessment of Meadows in the Merced River Corridor, Yosemite National Park* (Ballenger et al. 2011) provides details on the current condition of meadow habitats in the Merced River corridor in Yosemite National Park. The authors found that subalpine meadows in the Merced River corridor were dominated by native graminoids,[5] a potentially healthy sign because these species create dense sods that stabilize soils. Higher elevation subalpine meadows in the Red Peak Fork and Triple Peak Fork had a relatively higher proportion of subshrubs and forbs. Bladder sedge (*Carex utriculata* and *C. vesicaria*) communities dominated most subalpine zone meadows in the Little Yosemite, Merced Lake, Doc Moyle's, and Washburn Lake meadows. The dominance of these obligate wetland species indicates that these meadows stay wet later into the growing season when compared to many of the other meadows along this segment.

The extent of conifer encroachment in subalpine meadows varied widely, with some meadows (Merced Lake-East and Little Yosemite Valley-East) having no seedlings present and others (Turner Lake, Triple Peak-North and Red Peak South) having three to four times the extent of conifer encroachment relative to other subalpine meadows. With the exception of the Little Yosemite Valley area, non-native species were uncommon in meadows of the Merced River high country and were not observed in any meadows along the Merced River above Washburn Lake. Non-native Kentucky bluegrass (*Poa pratensis* ssp. *pratensis*) was found in drier areas of Little Yosemite Valley-East, while the non-native bull thistle (*Cirsium vulgare*) was mapped in the wooded area outside Merced Lake-East meadow.

The *2010 Assessment of Meadows in the Merced River Corridor, Yosemite National Park* (Ballenger et al. 2011) concluded that pack stock impacts or vulnerability to impact in subalpine meadows were a primary consideration for management of these areas. Potential issues related to pack stock use raised in the study include levels of use, timing of use, and suitability for use. The issues are particularly

[5] Graminoids are grasses and grass-like plants, and include plants in the Poaceae (grasses), Cyperaceae (sedges), and Juncaceae (rushes) families.

important for those subalpine meadows (such as Merced Lake and Doc Moyle's) with wet soils supporting hydrophytic sedge species.

Table 1-1 shows the total annual number of stock-use nights within this river segment by NPS administrative and commercial operators. The majority of stock-use nights occurred at Merced Lake-East. Annual commercially guided pack trips in this river segment averaged 48 stock-use nights. The *Assessment of Meadows in the Merced River Corridor* found that pack stock impacts were absent or uncommon in most subalpine meadows, with the exception of Merced Lake-East, which had the highest levels of pack stock use of any meadow in the corridor, and Doc Moyle's-West, which had much lower levels of use. The study found that it is likely that pack stock use contributes to lower vegetation cover and higher levels of bare ground at Merced Lake-East. Interestingly, the two meadows nearest Merced Lake-East (Merced Lake-West and Merced Lake-Shore) exhibited higher vegetative cover and lower bare ground levels when compared to Merced Lake-East, even though they had the same dominant plant species. Although grazed in the past, these two meadows were closed to stock use in the 1990s due to concerns over deteriorating conditions. Ballenger et al. (2011) concluded that these two meadows appeared to have recovered from previous stock impacts, and that they could provide a comparative baseline when monitoring conditions in Merced Lake-East. The study also found that Doc Moyle's-West may be recovering from heavy use of the site as a pack camp in the mid-20th century.

Scattered signs of stock use, such as hoof punches and/or manure, were observed in five other subalpine meadows (Washburn Lake, Triple Peak, Merced Lake-Shore, Triple Peak-South, and Turner Lake). These signs are likely from stock use prior to 2010, as those meadows have no recorded 2010 stock use.

There are no formal trails present in any of the subalpine meadows surveyed for the study. Most subalpine meadows had little or no informal trails present, though five did, with Merced Lake-Shore having the most, likely due to its proximity to Merced Lake High Sierra Camp. The study could not differentiate between informal trailing caused by human or equine use on those sites with pack stock use (Ballenger et al. 2011). Table 1-2 provides details on informal trails in subalpine meadows of the Merced River corridor.

Alpine meadows in this study showed less conifer encroachment than lower elevation subalpine meadows. This is likely due to the harsh growing conditions of the alpine environment (Ballenger et al. 2011). Non-native species were not found in the alpine meadows. The meadows showed little to no impacts from visitors or pack stock use. Formal NPS-maintained trails run through some meadows in the Red Peak and Triple Peak Forks. Some sections of trail were braided and rutted, conditions that can interrupt or divert natural hydrological flows in the meadows. Pack-stock impacts were limited to formal trail corridors (Ballenger et al. 2011).

TABLE 1-1: STOCK-USE NIGHTS WITHIN SEGMENT 1 BY LOCATION (2004 TO 2010)[A]

Wilderness Stock Campsite Areas	2004	2005	2006	2007			2008			2009			2010			Total	2004 to 2010	High
	Commercially Guided Pack Trips	Commercially Guided Pack Trips	Commercially Guided Pack Trips	Commercially Guided Pack Trips	Administrative[b]	Total	Commercially Guided Pack Trips	Administrative[b]	Total	Commercially Guided Pack Trips	Administrative[b]	Total	Commercially Guided Pack Trips	Administrative[b]	Total		Average[c]	
Horsethief				12		12	8		8	50		50	21		21	**91**	13	50
Merced Lake-East					350	350		96	96		410	410	28	300	328	**1184**	296	410
Washburn Lake	23	36	20				28		28				28		28	**135**	19	36
Doc Moyle's	19			33		33			0				6		6	**58**	8	33
Echo		36					20		20							**56**	8	36
Total	**42**	**72**	**20**	**45**	**350**	**395**	**56**	**96**	**152**	**50**	**410**	**460**	**83**	**300**	**383**	**1524**	**344**	**460**

NOTES:

[a] Data shows the number of overnight stays by stock within the river segment. One stock-use night is equivalent to one overnight stay by one head of stock. Concessioner's stock used to supply the Merced Lake High Sierra Camp is not shown in the table.

[b] Administrative use within the Merced River corridor was not tracked by NPS staff until 2007. The stock-use night estimates do not include ranger patrols or sawyers but predominantly show stock use providing operational support for the NPS ranger operations and the backpacker campground facilities within Little Yosemite Valley and at Merced Lake.

[c] Average is for the stock use between 2007 and 2010. Although an average is presented for each wilderness stock campsite area, one caveat is necessary: year-to-year NPS administrative stock use levels can vary widely based on management and project work performed that year.

SOURCE: NPS 2011

TABLE 1-2: INFORMAL TRAILS IN SUBALPINE MEADOWS

Meadow Name	Informal Trails (length in meters)
Doc Moyle's-West	205.8
Doc Moyle's-East	60.6
Little Yosemite Valley-West*	0
Little Yosemite Valley-East	0
Merced Lake-Shore	1,637.5
Merced Lake-West	0
Merced Lake-East*	144.0
Red Peak-North	0
Red Peak-South	0
Triple Peak-North	0
Triple Peak-South	0
Turner Lake	0
Washburn Lake	144.2

NOTE: Includes informal trails within 50m of each meadow.

* Indicates site was largely inundated at time of survey, so detection of informal trails may not have been possible.

SOURCE: Ballenger et al. 2011

Preliminary Management Considerations

The preliminary management consideration associated with the Biological ORV in segment 1 is that the meadow east of the Merced Lake ranger station has grazed vegetation, roll pits, and manure and trampled soils due to stock use.

River Segment 2: Yosemite Valley

Although this evaluation is based on ORV conditions at the time of Wild and Scenic River designation, changes that occurred prior to 1987 are described to gain an understanding of some of the factors that contributed to conditions in 1987 and associated trends in Biological ORV conditions.

The meadows and forests of Yosemite Valley are a function of both natural and cultural processes. 0Natural processes related to hydrologic function have been as important in shaping the meadow complexes of the Merced River as have cultural processes like burning by American Indians to promote the growth of plants that provided food and materials to them. Indeed, many of the meadow and riparian species are important in the history and ongoing cultural traditions of the associated American Indian tribes and groups. . Ethnographic studies have shown Yosemite Valley's original inhabitants—the Ahwahneechee—used fire to manage a landscape of sustainability (Levy 1978).This type of fire management created openings and clearings, creating a greater diversity of habitats, plant species, and wildlife (Anderson and Moratto 1996; Gassaway 2005). Shortly following the arrival of visitors and Euro-American residents in Yosemite Valley in the 1850s, anthropogenic impacts changed, with burning no longer occurring but new developments introduced like roads and trails, fences, user-made campsites, undersized bridges, and permanent structures apple orchards (Perrottet 2008). Vista clearing to maintain views of Yosemite's iconic scenery of Yosemite

Valley also began influencing the landscape.

The net effect of these changes is that, over the past century, the acreage of meadows in Yosemite Valley has decreased. According to Cooper and Wolf (2008) conifers likely colonized meadows for several reasons: (1) the installation of drains, water diversions, and other facilities caused hydrologic changes that lowered the summer water table; (2) the cessation of burning by Native Americans allowed tree seedlings to persist; (3) disturbance caused by plowing meadows and planting hay crops and apple orchards allowed conifers to invade the bare soils after the densely-rooted, sod-forming meadow species were destroyed; and (4) placement of fill to raise the ground elevation allowed upland species to invade (Photo 1-6).

PHOTO 1-6: CONIFER ENCROACHMENT IN YOSEMITE VALLEY MEADOW

The widening of the Merced River in east Yosemite Valley—attributable to human causes, such as trampling of riparian vegetation and bridges too narrow to adequately accommodate high flows (Madej et al., 1994)—may also be a factor altering groundwater hydrology, which appears to be a contributing factor to conifer colonization (Cooper and Wolf, 2008). This colonization has produced a reduction in areal coverage of meadows in Yosemite Valley due to forest encroachment (Gibbens and Heady 1964; Heady and Zinke 1978). Historic photos and accounts add perspective to the current conditions of Yosemite Valley meadows. In 1866, State Geologist J.D. Whitney (1868) mapped 745 acres of meadows in Yosemite Valley. In 1937, the NPS mapped 327 total meadow acres in Yosemite Valley. By 2010, botanists mapped only 269 total meadow acres, a 64% decrease from the 1866 Yosemite Valley survey (Ballenger et al. 2011) (Photo 1-7) (Figure 1-3 and 1-4).

Fluvial systems behave according to the concept of "base level", which is the level at which a stream or river cannot erode its bed. The ultimate base level for fluvial systems is sea level, but temporary base levels may exist locally, controlling the elevation of a river or stream immediately upstream. The El Capitan Moraine likely created a local base level for the Merced River in western Yosemite Valley (Huber, 2007). Blasting of boulders within the river channel where it crosses the El Capitan Moraine in 1879 is thought to have lowered local base level, though the exact amount of the lowering is unknown(Milestone 1978). Base level lowering typically creates a knickpoint, or pronounced change in river gradient, that promotes channel incision immediately upstream from the site of base level decline (Ritter et al. 2002). Knickpoints tend to migrate upstream with time, although the form of the migrating knickpoint will vary depending on the substrate. Thus, blasting of the El Capitan Moraine may have affected groundwater levels in a significant portion of western Yosemite Valley.

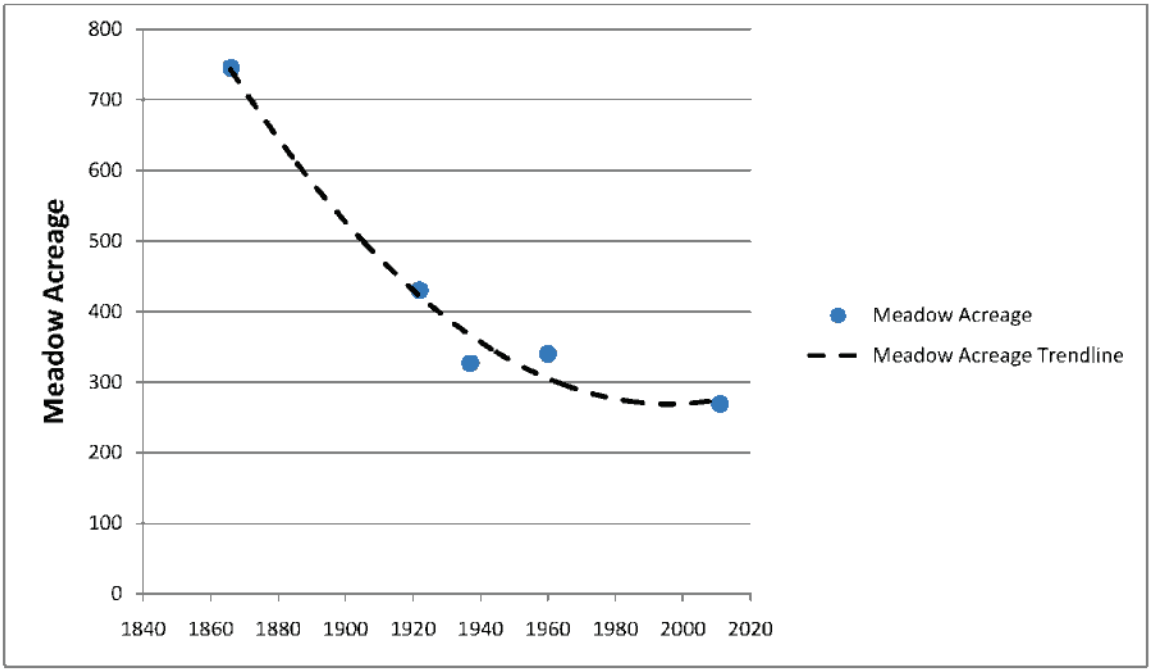
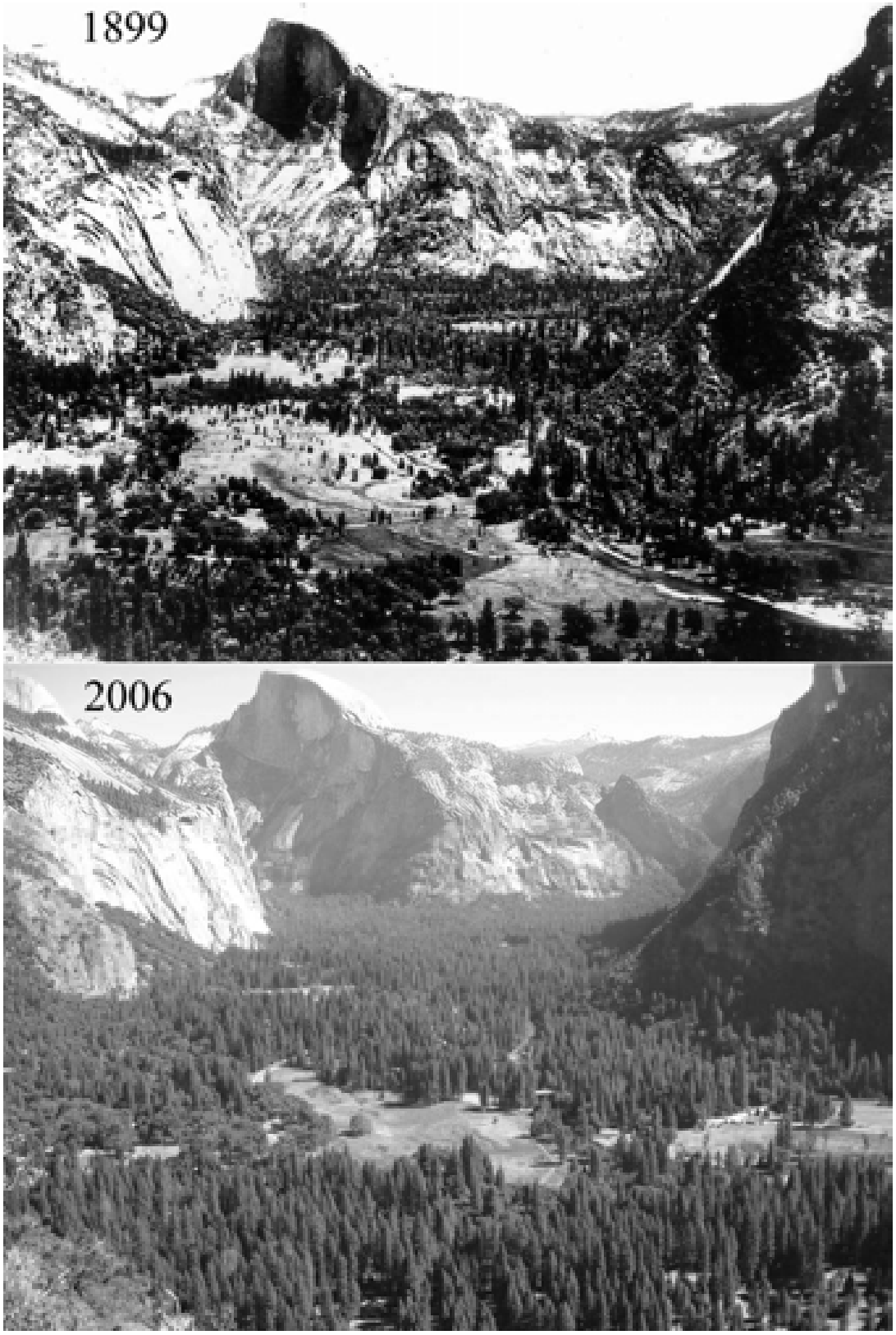


FIGURE 1-3: MEADOW ACREAGE IN YOSEMITE VALLEY (1866-2011)

SOURCES: Whitney 1868; Gibbens and Heady 1964; Heady and Zinke 1978;
Cooper and Wolf 2008; Ballenger et al. 2011



SOURCE: Cooper and Wolf, 2008

Photo 1-7

Photo looking east toward Half Dome from Columbia Point, 1899 and 2006.
An increase in conifers and a decrease in oak and meadows are apparent

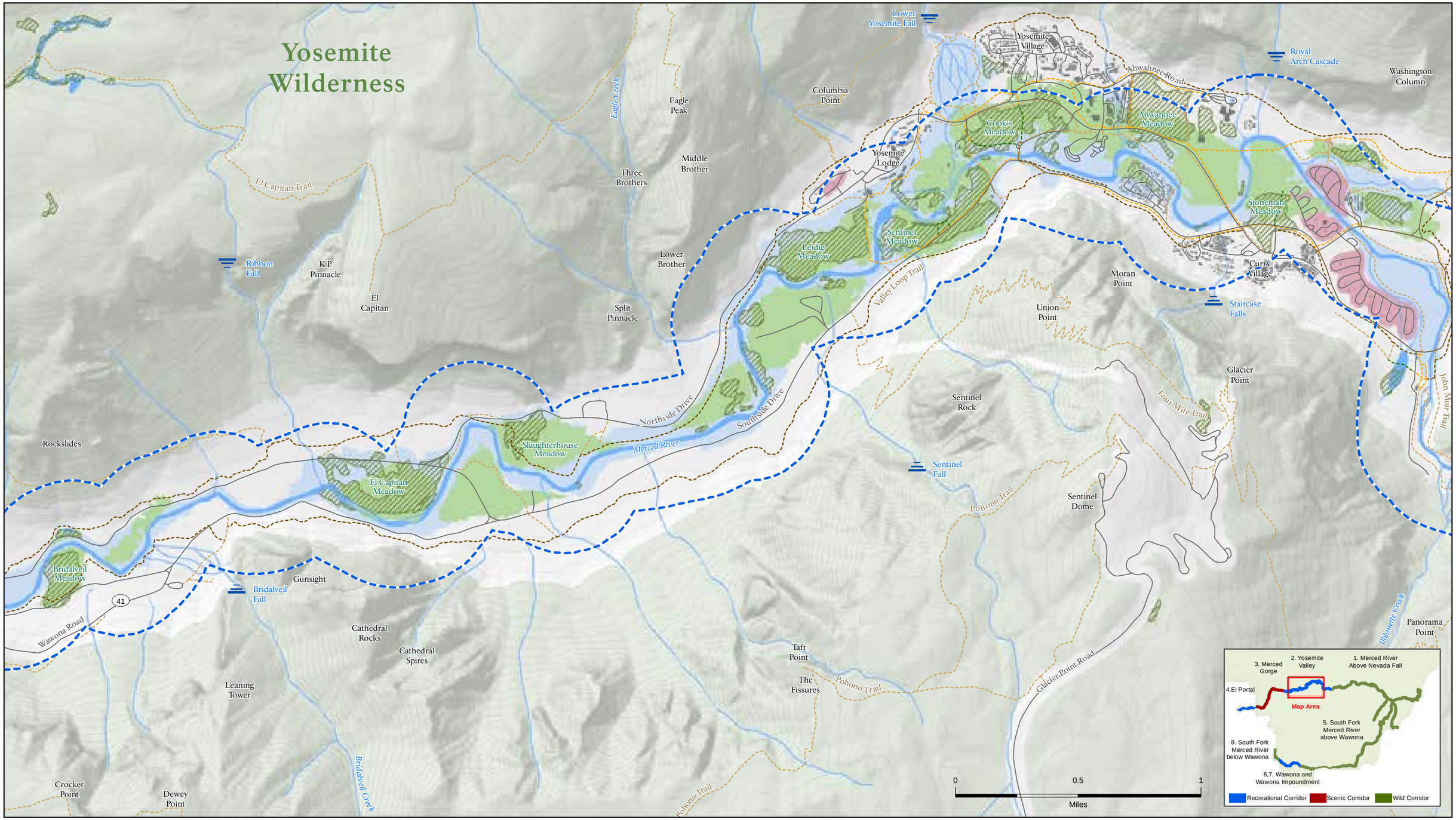


Figure 2.1-4
River Segment 2. Yosemite Valley
Yosemite Valley Meadows: Historic and Current
Recreational WSR Corridor

Source: Current Meadow Vegetation Data: NPS, 1997/2010; Historic Meadow Data: Hoffman/State Geological Survey, 1867

- Recreational WSR Corridor Classification
- Building
- Campground
- 100 Year Flood Boundary
- Current Meadows (1997/2010)
- Historic Meadows (1867)
- Road
- Valley Loop Trail
- Boardwalk
- Bike Path
- Trail
- Stream/River
- 100' Contour Line
- Waterfall

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	7/22/11
File:	Figure 1-4

Despite this loss in aerial extent, meadows in Yosemite Valley are much larger than most mid-elevation meadows in the Sierra Nevada, which makes them rare and unusual at this regional scale (NPS 1997). In addition, meadows in Yosemite Valley are highly diverse, both from a structural point of view, as the meadows contain a wide variety of microhabitats, and from a species point of view, as the meadows support high numbers of different native plant and animal species. For example, Yosemite Valley harbors about 30 different sedge species (Acree 2011a). Experts consider areas with as few as 15 sedge species to be exceptional in terms of species richness. The 17 different bat species found in Yosemite Valley also illustrates the exceptional species richness of Yosemite Valley habitats. These attributes combine to make Yosemite Valley's meadows an extraordinary example of a regionally rare ecosystem (Photos 1-8 and 1-9).

PHOTO 1-8: YOSEMITE VALLEY MEADOW (NPS 2010)

Condition at the Time of 1987 Designation

Despite the history of disturbance within Yosemite Valley's meadows and riparian habitats, by 1987 these areas had been afforded a level of protection from human disturbance through a variety of restoration projects. For example, in an attempt to restore the natural fire regime and control non-native species and conifer encroachment in meadows, the NPS systematically reintroduced fire into Yosemite Valley meadows on a rotating basis starting in 1970 (Ballenger et al. 2011).

At the time of designation, informal trails were found in most of Yosemite Valley meadows, particularly Stoneman and Sentinel meadows. Subsequent restoration projects have removed many of these informal trails (Ballenger et al. 2011). Infrastructure such as a historic roadbed, several ditches, and paved interpretive trails traversed Cook's Meadow. These features disrupted the meadow's natural hydrology, which inhibited seasonal inundations, affected the water table, and promoted the proliferation of non-native species and conifer encroachment (Cardno ENTRIX 2011). Cook's Meadow underwent a comprehensive restoration project to improve the meadow's hydrologic function. In Sentinel Meadow, imported fill used for the foundation of Pavilion Square, a movie house and dance hall (which had been razed in 1963), was still in place in 1987. This fill area was visible from the top of Yosemite Falls but was removed and restored in 1994 (Ballenger et al. 2011).

PHOTO 1-9: YOSEMITE VALLEY MEADOW IN SPRING (YOCHIM 2010)

In 1987, stretches of the Merced River's banks through Yosemite Valley were suffering from a number of impacts including erosion, denuded riparian vegetation, and poorly designed riprap revetment (Tucker 1996; Cardno ENTRIX 2011). Heavily used areas of the river such as the El Capitan Picnic Area, the Lower River Housekeeping Camp, Devil's Elbow, Lower River Campground, and the North Pines Campground exhibited extensive trampling from visitor use and a subsequent decrease in riparian vegetation (Cardno ENTRIX 2011). Since the time of designation, numerous restoration projects along the Merced River's stretch through Yosemite Valley have been implemented to mitigate these impacts (Tucker 1996; Cardno ENTRIX 2011).

Madej et al. (1991) found a strong association among levels of human use around campsites and river access points, the loss of riparian vegetation cover, and accelerated bank erosion. Trampling of soils and vegetation in developed, high-use areas in eastern Yosemite Valley (e.g., at Upper, Lower, and North Pines Campgrounds) had widened the Merced River in some reaches. Riverbanks were largely denuded along some reaches, thus affecting shading and nutrient dynamics in aquatic habitats. Potential effects include increased water temperature due to a lack of riparian cover, increased suspended sediment, and reduced dissolved oxygen levels (Madej et al. 1994).

Current Condition

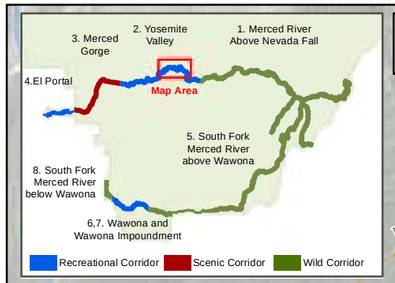
Although current conditions are relatively similar to those at the time of designation, a number of restoration projects and other actions have occurred since 1987 that have improved the condition of the meadow and riparian habitat of Yosemite Valley (Figures 1-5 and 1-6).

Restoration projects have been implemented in many places along the Merced River in Yosemite Valley since the time of designation. The projects range from removal of bank revetment to restoration of riparian and meadow vegetation. For example, tens of thousands of conifer seedlings and saplings were removed from Yosemite Valley meadows. Populations of high priority non-native species such as Himalayan blackberry (*Rubus armeniacus*), bull thistle (*Cirsium vulgare*), St. John's wort (*Hypericum perforatum*), and

velvet grass (*Holcus lanatus*) were mapped and many of these populations were treated (Ballenger et al. 2011).

Riparian vegetation has been restored along a reach of the river adjacent to North Pines Campground (Photo 1-10). Park staff fenced the riverbank and planted riparian vegetation in an attempt to halt erosion and protect the banks and vegetation. Associated interpretive and educational efforts direct visitors to areas that can better accommodate heavy use without long-term impacts, such as sandy beaches and gravel bars. Similar riparian restoration efforts have occurred at Lower River Campground, El Capitan Picnic Area, Lower River Housekeeping Camp, Devil's Elbow, Sentinel Bridge, Swinging Bridge, Housekeeping Camp, Clark's Bridge, and South Fork Bridge. By removing debris and riprap, improving soil conditions, and planting native plant species, these projectsimproved the riparian corridor of the Merced River through Yosemite Valley (Tucker 1996; Cardno ENTRIX 2011).

PHOTO 1-10: REVEGETATED RIVERBANK (FOREGROUND) AND DENUDED, ERODING BANK (OPPOSITE SIDE OF RIVER). (NPS)



*Only meadow and riparian vegetation located within the WSR Corridor is part of the biological ORV.

Yosemite Wilderness

Lower Yosemite Fall
Upper Yosemite Falls Trail
Lower Yosemite Falls Trail
Valley Loop Trail
Yosemite Village
Tenaya Way
Boulder Ingress
Castle Cliff Court
Lost Arrow Drive
Post Arrow Drive
Oak Lane
Cedar Lane
Ahwahnee Road
Church Bowl Picnic Area
Royal Arch Creek
Royal Arch Cascade
Ahwahnee Bike Path
Ahwahnee Meadow
The Ahwahnee Hotel
Royal Arches
Lower Yosemite Fall Picnic Area
Northside Drive
Yosemite Creek Bridge
Cook's Meadow Boardwalk
Cook's Meadow
Sentinel Crossover
Village Drive
Tecoya Road
Camp 6 Road
Housekeeping Bridge Trail
Ahwahnee Bridge
Sugar Pine Bridge
Backpackers Campground
Stock Bridge
North Pines Campground
Yosemite Lodge
Yosemite Lodge Road
Valley Loop Trail
Camp 4
Superintendent's Bridge
Sentinel Bridge
Merced River
Southside Drive
Housekeeping Camp
Housekeeping Camp Bridge
Northside Drive
Stoneman Bridge
Stoneman Meadow
Stoneman Boardwalk
Lower Pines Campground
Clark's Bridge
Tenaya Creek Bridge
Mirror Lake Loop Trail
Happy Isles Trail
Sentinel Meadow
Sentinel Boardwalk
Leidig Meadow
Swinging Bridge
Swinging Bridge Picnic Area
Curry Village
Sentinel Beach
Sentinel Beach Picnic Area
Four Mile Trail
Union Point
Staircase Falls
Upper Pines Campground
Yellow Pine campground road
Southside Drive
Happy Isles Bridge
Happy Isles Fen
Happy Isles Nature Center
Glacier Point
0
0.125
0.25
Miles

Figure 1-5
Biological ORV - River Segment 2. Yosemite Valley
Yosemite Lodge, Yosemite Village, and The Ahwahnee
Recreational WSR Corridor

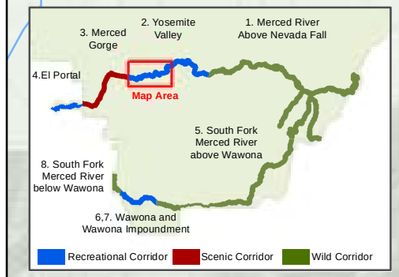
Meadow/Riparian Vegetation
Data Source: NPS, 1997/2010

- Recreational WSR Corridor Classification
- Building
- Campground
- 100 Year Flood Boundary
- Meadow
- Riparian Vegetation
- Road
- Stream/River
- 100' Contour Line
- Valley Loop Trail
- Bike path
- Boardwalk
- Trail
- Road bridge
- Footbridge
- Waterfall
- Picnic Area

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 1-5



*Only meadow and riparian vegetation located within the WSR Corridor is part of the biological ORV.

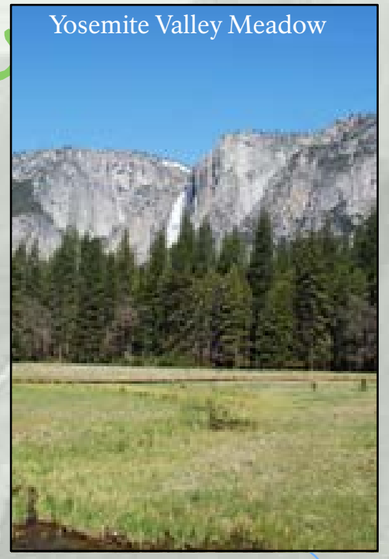


Figure 1-6
Biological ORV - River Segment 2. Yosemite Valley
El Capitan Meadow, Cathedral Beach, and Sentinel Beach
Recreational WSR Corridor

Recreational WSR Corridor Classification
100 Year Flood Boundary
Meadow
Riparian Vegetation
Road
Stream/River
Valley Loop Trail
Bike path
Trail
100' Contour Line
Waterfall
Trailhead
Picnic Area

Meadow/Riparian Vegetation
Data Source: NPS, 1997/2010

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 1-6

Other examples include the Cook's Meadow Restoration Project and the Eagle Creek Restoration Project, which were specifically designed to enhance meadow and riparian habitat. These projects included actions to restore meadow hydrology (by filling ditches and replacing an abandoned roadbed) and riparian streambank integrity (by recontouring and revegetating eroded streambanks, de-compacting soils, and constructing fencing so that visitors would access the river via sandbars). In Cook's Meadow, the NPS excavated paved interpretive trails that crossed the meadow and replaced them with elevated boardwalks. In Sentinel Meadow, the NPS constructed one boardwalk and fencing along the strip parking area, reducing the extent of 29 informal trails. Similarly, in Stoneman Meadow, the NPS constructed a boardwalk across the meadow to reduce the extent of 25 social trails (Photos 1-11a,.1-11b, and 1-12).

PHOTO 1-11A AND B: STONEMAN MEADOW (DATE UNKNOWN) WITH NETWORK OF SOCIAL TRAILS AND STONEMAN MEADOW IN 2005. THESE TRAILS WERE RESTORED AND A BOARDWALK WAS CONSTRUCTED ACROSS THE MEADOW IN 1987. (NPS, GOOGLE EARTH)

PHOTO 1-12: PEDESTRIAN BOARDWALK IN YOSEMITE VALLEY MEADOW

The recently completed Merced River and Riparian Vegetation Assessment (Cardno ENTRIX 2011) evaluated the current condition of eight geomorphic reaches of the River and riparian corridor in Yosemite Valley using a variety of different methods. The Merced River riparian corridor was assessed following the California Rapid Assessment Method (CRAM). The CRAM is a rapid, standardized assessment method that provides information on the overall condition and functional capacity of the riparian corridor and the stressors that may be affecting it (Collins et al. 2008). The CRAM includes the evaluation of four main attributes (Buffer and Landscape Context, Hydrology, Physical Structure, and Biotic Structure) which are broken down into fourteen metrics. For the Merced River study, these metrics were used to calculate an overall "CRAM score" for each geomorphic reach (higher scores indicate better condition). The CRAM score is an indication of the overall condition of the riparian corridor relative to the best achievable conditions for riparian corridors in California. Table 1-3 provides details on the CRAM scores for each geomorphic reach.

TABLE 1-3: CRAM SUMMARY TABLE BY GEOMORPHIC REACH

Geomorphic Reach	Buffer and Landscape Context	Hydrology	Physical Structure	Biotic Structure	Overall CRAM Score
Happy Isles	0.90	0.95	0.70	0.81	0.84
Above Tenaya	0.79	0.85	0.50	0.69	0.71
Below Tenaya	0.81	0.82	0.56	0.57	0.69
Upper Meadows	0.84	0.86	0.66	0.77	0.78
Inter-meadows	0.85	0.93	0.66	0.79	0.81
Lower Meadows	0.84	0.93	0.68	0.74	0.80
Above Pohono Bridge	0.86	0.90	0.78	0.79	0.83
Below Pohono Bridge	0.83	0.73	0.67	0.64	0.72
Scores range from 0 to 1, with 1 being the best possible score. SOURCE: Cardno ENTRIX 2011					

Reaches with higher overall CRAM scores (Happy Isles, Inter-meadows, Lower Meadows, and above Pohono Bridge) were generally characterized by no or few locations with bank protection measures (riprap revetment), less extensive bank erosion, lower intensity visitor use, high topographic complexity, and a moderately developed vegetation community with moderate vegetation structural complexity, including some overlap of canopy layers and distinct plant layers. The riparian corridors with comparatively poorer overall CRAM scores (Above Tenaya, Below Tenaya, and Below Pohono Bridge) were generally characterized by higher intensity of human use, bank protection measures, more extensive bank erosion, low topographic complexity, and a relatively poorly developed riparian community with few co-dominant species and little canopy overlap with few distinct plant layers (Cardno ENTRIX 2011).

The study found that riparian and wildlife habitat condition variations were largely caused by recreational use and the presence of infrastructure. For example, the reach just below Happy Isles has wide riparian buffers with complex physical structure and provided good wildlife habitat. Conversely, the stretch just below Tenaya Creek, where human use is more abundant, had narrow riparian buffers and low vegetation structural complexity, providing poor wildlife habitat (Cardno ENTRIX 2011).

The study also found that the majority of the riparian corridor has few non-native species, while supporting a minimum of three plant layers (e.g., various heights of trees, shrubs, and herbaceous vegetation). Most of the riparian corridor through Yosemite Valley exhibits moderate horizontal zonation of species and vertical overlap among plant layers, which are generally indicative of a well-developed riparian community (Photo 1-13). These types of riparian communities generally have greater wildlife diversity. Stretches of the riparian corridor in the vicinity of Clarks Bridge and Stoneman Bridge and downstream of Pohono Bridge exhibit less horizontal zonation and vertical complexity compared with the majority of the corridor. This same study observed evidence of at least moderate levels of human use throughout most of the study reaches. Areas with moderate to high levels of human use were concentrated near the developed areas between Clark Bridge and Sentinel Bridge and areas easily accessible from adjacent roads. Bank erosion was observed throughout the study reaches, particularly near bridges, recreation facilities, and around some meander bends. Areas with moderate to high human use also generally had fewer co-dominant species and generally exhibited lower riparian community structure complexity (Cardno ENTRIX 2011).

PHOTO 1-13: RIPARIAN HABITAT IN YOSEMITE VALLEY

The *Wildlife Condition Assessment for the Merced River Corridor in Yosemite Valley* (Espinoza et al. 2011) assessed the health of the Yosemite Valley riparian and meadow habitats in relation to wildlife focal species. In part, the study used bird survey data to assess the health of the river corridor and its riparian habitat. Espinoza and his coauthors examined detections of five riparian focal species (RFS) [black-headed grosbeak (*Pheucticus melanocephalus*), song sparrow (*Melospiza melodia*), spotted sandpiper (*Actitis macularia*), warbling vireo (*Vireo gilvus*), and yellow warbler (*Dendroica petechia*)], a nest brood parasite [brown-headed cowbird (*Molothrus ater*)], and two nest predators [Steller's jay (*Cyanocitta stelleri*) and common raven (*Corvus corax*)] in relation to the same eight geomorphic reaches assessed by Cardno ENTRIX (2011). Table 1-4 breaks down detections in each geomorphic reach by species richness (the number of RFS), relative abundance of RFS (the number of individuals averaged across point count stations), brown-headed cowbirds, Steller's jays, and common ravens.

The highest species diversity was observed in the Upper Meadows, Inter-meadows, and Lower Meadows reaches. These were the only reaches where all five RFS were present. However, these were also the only geomorphic reaches where brown-headed cowbirds were present. The relative abundance and species richness of RFS in these three reaches suggest that there is greater availability of riparian habitat in these reaches compared to the other reaches, and that the structural integrity of the riparian habitat in these three reaches may be higher (Espinoza et al. 2011).

TABLE 1-4: BIRD SURVEY DATA

Geomorphic Reach	No. Point Count Stations	RFS Species Richness[a]	RFS Relative Abundance[a]	Brown-headed Cowbird Relative Abundance[b]	Steller's Jay Relative Abundance[b]	Common Raven Relative Abundance[b]
Happy Isles	2	1	1.00	0	1.50	0
Above Tenaya	2	3	4.00	0	3.50	6.50
Below Tenaya	1	3	7.00	0	2.00	1.00
Upper Meadows	7	5	14.14	1.86	2.86	0.86
Inter-meadows	4	5	12.00	1.00	1.75	0
Lower Meadows	4	5	20.75	3.75	0.75	0.50
Above Pohono Bridge	5	4	3.00	0	2.00	0.40
Below Pohono Bridge	1	3	5.00	0	5.00	0

a Higher scores indicate higher species richness

b Higher scores indicate greater abundance of the given species, all of which are associated with human recreational activity.

SOURCE: Espinoza et al. 2011

The *2010 Assessment of Meadows in the Merced River Corridor, Yosemite National Park* (Ballenger et al. 2011) provides details on the current condition of meadow habitats in Yosemite Valley. The study examined a wide variety of attributes including vegetation, wetland extent, bare ground, non-native species, conifer encroachment, and meadow stream condition. Disturbance from small mammal burrows, informal trails, and pack stock use was also documented. Mean vegetation cover in Yosemite Valley meadows ranged from 50-70%, with El Capitan and Leidig meadows having the lowest mean vegetation cover and Cook's Meadow having the highest. The authors found that graminoid species, which are a healthy component of meadow vegetation, dominated Yosemite Valley meadows. However, non-native plant species are common in Yosemite Valley meadows (Table 1-5), with the highest extent of non-natives in Stoneman and El Capitan meadows. The study also compared mean cover of non-native plants across all meadows for different surface soil moisture categories and found that non-native plant cover was lowest in saturated and inundated plots. Dry and moist plots had two to three times the cover of non-native plants as plots with early-season saturated or inundated soils. Because El Capitan and Stoneman Meadows also had the lowest proportion of wetland area of Yosemite Valley meadows, the study suggests a connection between the extent of perennially wet soils and non-native species in Yosemite Valley. Kentucky bluegrass, which outcompetes native meadow species when soil moisture is reduced, was the most common non-native recorded (Martin and Chambers 200; Kluse and Allen-Diaz 2005). Based on the 2010 data, most non-native plants currently present in Yosemite Valley meadows are not well-adapted to outcompete native plants in the wettest portions of the meadows (an important exception to this is velvet grass— *Holcus lanatus*— which prefers wet conditions and is already established in Yosemite Valley). Close attention to early detection and eradication of non-native meadow plants can keep additional species and populations from encroaching into wetlands, and maintenance and restoration of the hydrologic regime of Yosemite Valley meadows may help sustain native meadow vegetation (Ballenger et al. 2011).

TABLE 1-5: PERCENT OF PLOTS WITH NON-NATIVE PLANTS PRESENT

Meadow	Present	>25% cover	>50% cover	>75% cover
Bridalveil	51%	0%	0%	0%
Cook's	60%	9%	5%	1%
El Capitan	96%	11%	1%	0%
Leidig	80%	11%	2%	0%
Sentinel	90%	10%	2%	0%
Stoneman	92%	29%	7%	4%
Total	81%	12%	2%	1%
SOURCE: Ballenger et al. 2011				

Across all Yosemite Valley meadows, 75% of plots were wetland. Bridalveil, Cook's, and Sentinel meadows had the highest proportion of wetland plots (87-89%). El Capitan and Stoneman meadows had the lowest proportion of wetland plots with 60% and 61%, respectively. The extent of tree seedlings was highest in El Capitan and Stoneman Meadows, while Leidig and Sentinel Meadows had the lowest extent. Because El Capitan and Stoneman Meadows also had the lowest proportion of wetland area of Yosemite Valley meadows, the study suggests a connection between the extent of perennially wet soils and tree encroachment in Yosemite Valley.

Informal trailing is common in Yosemite Valley. The Visitor Use and Impact Monitoring Program has tracked informal trailing in Yosemite's meadows since 2004, using five different indices. One of the primary ways this program measures informal trailing is by calculating the extent, i.e. length and density, of informal trails. Of the seven surveyed meadows in Yosemite Valley, El Capitan Meadow and the portion of Sentinel Meadow north of Southside Drive have the highest extent of informal trailing, formal trailing, and disturbed areas (NPS 2010a). However, reporting on this measure does not take into account the total area of the meadow. The Visitor Use and Impact Monitoring Program also tracks the total percent of fragmentation, which is the extent of formall trailing divided by the total meadow area. The southwestern section of Cook's Meadow (Cook's Meadow A) has a higher percentage of fragmentation. The meadows with the least informal trailing are Bridalveil and Stoneman Meadows. Overall, when looking at all five indices collectively, the 2010 study found that the three meadows of greatest concern for informal trailing were El Capitan, Cook's (Section A), and Sentinel (also Section A) (NPS 2010a).

NPS has implemented a number of management programs to improve meadow and riparian condition along the Merced River within Yosemite Valley, including prescribed burning, treatment of non-native plant populations, and restoration of native plants. Although the meadows of Yosemite Valley have experienced a variety of human-related impacts over the past 150 years, the remaining meadows are still largely intact and are some of the most ecologically valuable meadows in the Sierra Nevada.

Preliminary Management Considerations

The preliminary management considerations associated with the Biological ORV in segment 2 are:

- Informal trailing is common in some Yosemite Valley meadows, with the highest levels found in El Capitan, Sentinel and Cook's Meadows.
- Trampling of soils and riparian vegetation in developed, high-use areas in east Yosemite Valley contributed to the loss of riparian vegetation cover, accelerated bank erosion in some reaches, and has likely contributed to the widening of the Merced River.

- Invasive plant species are common in Yosemite Valley meadows, with El Capitan, Stoneman and Sentinel Meadows having the highest levels of invasive plants.
- Conifer encroachment is widespread in the meadows of Yosemite Valley.

River Segments 7 and 8: Wawona and South Fork Merced River below Wawona

Sierra sweet bay is a small shrub endemic[6] to the Sierra Nevada and occurring at elevations from 1,000 to 5,000 feet. It is found in five Sierra Nevada counties, ranging from Yuba County in the north to Fresno County in the south (Calflora 2010; Consortium of California Herbaria 2010). In Yosemite National Park, Sierra sweet bay is found in two areas: 1) on sandbars and the lower banks of the South Fork Merced River downstream from Wawona and along Big Creek, a tributary to the South Fork, and 2) the South Fork of the Tuolumne River some miles upstream and downstream from the old Carlon Campground at the western park boundary (Colwell and Taylor 2011). Calflora, an online database of California flora, documents four observations in the park—two from Wawona Campground and two from Big Creek. Unpublished spatial data from the Yosemite National Park Geographic Information System document a larger population along an approximately two-mile reach of the South Fork in the vicinity of Wawona Campground (NPS 2010b) (Figure 1-7).

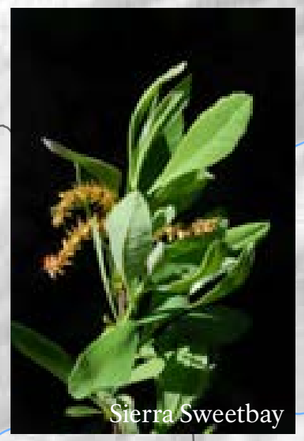
PHOTO 1-14: SIERRA SWEET BAY FEMALE PLANT

Sierra sweet bay is a deciduous shrub with male and female flowers occurring on separate plants (Photo 1-14). The species ranges in height from approximately 3 to 6 feet and typically blooms from May to June. Sierra sweet bay is usually found on streambanks in pine forests or riparian habitat. Most sources characterize Sierra sweet bay as a plant that can grow in wetlands but is not restricted to them, although it prefers relatively moist environments (Calflora 2010; USDA 2010). The species has not been formally listed as rare, threatened, or endangered by the federal or state government, but is listed by the California Native Plant Society (2010) as a plant of limited distribution whose populations are not known to be under immediate threat (CNPS List 4.3). Sierra sweet bay is also listed as a sensitive species in Yosemite National Park (NPS 2002).

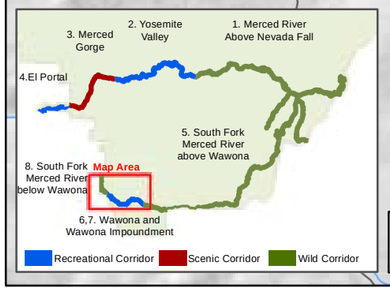
Condition at the Time of 1987 Designation

Information regarding the status of Sierra sweet bay populations in Yosemite at the time of the 1987 designation is scarce. None of the herbarium accession records contain pertinent information, such as the number of plants observed or the condition of plants and/or habitat. The species is listed in the California Natural Diversity Database, but no observations are documented there. In 1980, Yosemite National Park staff described the species as rare in the park since it was known to be present in only a few locations. At the same time, however, it was believed that it should not be considered threatened or endangered since the species had sufficiently widespread distribution outside the park and occurred in minimally impacted areas (NPS 1980).

[6] Endemism is the ecological state of being unique to a particular geographic location. An organism endemic to a place or region is found only in that part of the world and nowhere else.



Bishop Creek Trailhead
Alder Creek
Alder Creek Trailhead
Mosquito Creek
Iron Creek
Sierra National Forest
Yosemite National Park
Segment 8: South Fork Merced River below Wawona
Yosemite Wilderness
41
Segment 7: Wawona
Wawona Campground
Wawona Road
Alder Creek Trail
Wawona Campground Road
South Fork of the Merced River
Rush Creek
Big Creek
Wawona Bridge
Wawona Covered Bridge
Alder Creek Trailhead
Gordon Way
Chilnualna Falls Road
Wawona Point Trailhead
Wawona Golf Course
Wawona Meadow Loop
Spelt Road
Fir Street
Pine Street
Larkspur Lane
English Lane
Chilnualna Falls Trailhead
Chilnualna Creek
Segment 6: Wawona Impoundment
Segment 5: South Fork Merced River above Wawona
River Street
Forest Drive
Wawona Swinging Bridge Trail
Wawona Swinging Bridge
Bills Hill Road
Koon Holar



*Only meadow and riparian vegetation located within the WSR Corridor is part of the biological ORV.

0 0.25 0.5
Miles

Figure 1-7
Biological ORV - River Segments 7 and 8.
Wawona and the South Fork Merced River Below Wawona
Recreational WSR Corridor

Meadow/Riparian Vegetation
Data Source: NPS, 1997

- Recreational WSR Corridor Classification
- Wild WSR Corridor Classification
- Campground
- Building
- Meadow
- Riparian Vegetation
- Myrica hartwegii (2010 distribution)
- Yosemite National Park Boundary
- Trailhead
- Road bridge
- Footbridge
- Covered Bridge
- Golfcourse
- Highway 41
- Road
- Stream/River
- Trail
- 100' Contour Line

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 1-7

A recently completed study by NPS investigated historic reports of Sierra sweet bay growing along the main stem of the Merced River below Yosemite Valley (Colwell and Taylor 2011). This study surveyed for the plant from the lower end of Yosemite Valley to El Portal but did not find this species. It is unclear if the species ever occurred on this reach of the river or if it has been extirpated from this section. The study found that this segment of the river did not provide preferred habitat for Sierra sweet bay (due to its high volume and fluctuating water levels).

Current Condition

Within the river corridor, the Sierra sweet bay population follows Big Creek, a tributary to the South Fork Merced River, fairly continuously from Fish Camp into the park near the south entrance and down to the junction of Big Creek with the South Fork Merced River. Sierra sweet bay is absent upstream on the South Fork from the mouth of Big Creek to the wilderness boundary above Wawona. However, Sierra sweet bay is found on both sides of the South Fork from the mouth of Big Creek downstream to below the Wawona Campground. The species is very closely associated with the river channel, occurring at the river's normal high-water mark to the five-year flood line.

Surveys of Sierra sweet bay in the vicinity of the Wawona Campground revealed few effects from human impact. The most frequent and ongoing impact is foot traffic. Social trails are worn through its habitat along the river, and sandbars attract distributed foot traffic (Colwell and Taylor 2011).

Preliminary Management Considerations

The preliminary management consideration associated with the Biological ORV in segments 7 and 8 is that visitor use may affect the riparian vegetation of the South Fork by compacting soils, reducing vegetative cover, altering streambanks, and inducing erosion, thereby impacting the Sierra sweet bay population at Wawona Campground.

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2. RECREATIONAL VALUES

Recreational Outstandingly Remarkable Values

Yosemite, one of America's first national parks and a World Heritage site, is a nationally and internationally renowned destination. The Merced River provides for exceptional river-related recreational opportunities, and the dramatic and picturesque setting is central to these recreational experiences. Settings range from the undeveloped wilderness of the Upper Merced to Yosemite Valley's views of high granite cliffs and towering waterfalls. Many first time-visitors are awe-inspired by the rivers' natural wonders and form their first connection to wilderness. Others return year after year, building long-lasting relationships and attachments to the rivers and their environs. For all visitors, the Merced River is a place to experience a designated Wild and Scenic River (WSR) in one of America's most revered national parks.

River Segment 1: Merced River above Nevada Fall

Visitors to this federally designated wilderness in the corridor engage in a variety of activities in an iconic High Sierra landscape, where opportunities for primitive and unconfined recreation, self-reliance, and solitude shape the experience.

Wild segments of the Merced River flow from the heart of the Sierra Nevada through its towering granite peaks and impressive forests. These spectacular, rugged river landscapes provide opportunities for solitude and immersion in nature, personal reflection, independence, and self-reliance. Activities are oriented toward primitive camping and wilderness travel, exploration, and adventure.

Of the many recreational activities, a few are particularly distinctive. Spectacular cascades vary by season along this river segment. In spring, hikers and backpackers experience the sight, sound, and power of the river's crashing waters. In drier months, the cascading waters become beautiful, delicate plumes. Backpacking on a major segment of the John Muir Trail affords visitors a multi-day Sierra Nevada wilderness trip that is internationally renowned for gorgeous riverside views, undeveloped settings, opportunities for solitude, and wilderness camping near the river.

River Segment 2: Yosemite Valley

Visitors to Yosemite Valley enjoy a wide variety of river-related recreational activities in the valley's extraordinary setting along the Merced River.

Every year, millions of visitors from around the world come to Yosemite Valley to recreate in and along the Merced River. Well-known and iconic features such as El Capitan, Yosemite Falls, and Half Dome provide a dramatic backdrop that shapes the recreational experiences of first-time and return visitors alike. Yosemite National Park affords a wide variety of activities in and along the river, several of which are river related or dependant and rare, unique or exemplary. These include primary river recreational activities such as swimming, paddling and water play, along with secondary river recreational activities such as hiking, picknicking or camping in proximity to the river.

Visitors can choose time frames and seasons that suit their desired activities, ranging from short day trips to multi-day opportunities. Appropriate infrastructure and services facilitate these river-related activities but do not dominate the landscape or interfere with the natural setting.

Overall, the Yosemite Valley River Segment offers a variety of outstanding opportunities for frontcountry river recreation for people of all ages and abilities. The Merced River in this segment allows people to

immerse themselves in their surroundings, taking in the sights, sounds, and feel of the river and its dramatic backdrop.

Recreational ORV Conditions

The quality of recreational values can be characterized as visitors participating in desired activities in specific outdoor recreation settings to obtain desired experiences (Driver and Brown 1978, Haas et al. 1980a). The condition of recreational ORVs in the Merced River corridor is therefore defined by these measures: 1) the activities visitors participate in or "activity participation rates"; 2) the condition of the various setting attributes in which these activities occur; and 3) the visitor reported quality of the recreation experience or "satisfaction". Applying these measures, the recreational ORV of the Merced River in the wilderness above Nevada Fall and Yosemite Valley segments would be considered to be in a good condition when visitors have access to and can participate in the activity of their choice in a setting that meets their expectations for environmental, social, and management attributes and yields a relative level of satisfaction.

1) ***Recreational Activity Participation*:** As mentioned above, visitors participate in a variety of activities in specific settings to obtain desired experiences. According to the Guidelines, recreational activities can be both primary and secondary to the river. Primary contact recreation refers to activities in which there is prolonged and intimate contact with the water. Secondary contact recreation refers to activities in which contact with the water is either incidental or accidental. Both primary and secondary contact recreation are part of the recreational outstandingly remarkable values of the Merced River in the wilderness segment above Nevada Fall and the Yosemite Valley. This assessment of recreational values will include a listing of the primary and secondary recreational activities that occur in each river segment.

    - <u>*Measure: Activity Participation Rates*</u>. This measure applies to both the wild and Valley segments. Activity participation rates (% of visitors participating in a given activity) can be used as a measure of an activity's importance. These data are collected using general visitor surveys. In these studies visitors are asked to list the activities they participated in during their visit. They are also asked to list which activity was the primary reason for their visit. Results provide an indication as to which activities are most important to the visiting public.

2) ***Setting Attributes*:** refers to the environmental, social and managerial setting in which visitors participate in recreational activities to derive desired benefits (Manning 1985a).

    a) *Environmental setting attributes* consist of the degree of naturalness, remoteness, etc. versus more developed areas. The environmental setting quality of a given river segment is inherent in its classification. According to the Guidelines, "the basis for classification is the degree of naturalness, or stated negatively, the degree of evidence of man's activity in the river area. The most natural rivers will be classified wild; those somewhat less natural, scenic; and those least natural, recreational" (Secretarial Guidelines 1982). Accordingly, visitors can expect a more natural setting in the wild segment above Nevada Falls, whereas they can expect a less natural setting in the recreational segment in Yosemite Valley. This degree of naturalness is a significant attribute of the recreational experiences in these segments.

        - <u>*Measure: Visitor Perceptions of Naturalness*</u>. Visitor survey research has addressed these setting attributes as well (Newman & Manning 2002).

    b) *Social Setting Attributes* refer to the number of other people in an area. The negative and subjective evaluation of too many people in a given area generally refers to crowding (Manning 1999). Visitor perceptions of crowding provide a salient measurement of the negative effects of high visitor use levels on an individual's recreational experience (Vaske et

al. 2008). Perceived crowding can be measured in multiple ways through visitor survey research. Commonly used measures in the literature and applied to Yosemite include perceived crowding, encounter rates, people at one time (PAOT), and vehicles at one time (VAOT).

- *Measure: Perceived Crowding*. This is a measure applied to both the wilderness and Valley segments. Visitor studies have asked the extent to which respondents feel crowded in certain situations (at specific locations and/or participating in certain activities). For example, visitors are asked to evaluate how crowded they felt while visiting an attraction site such as the base of Yosemite Falls. In these studies, visitors rate their level of perceived crowding on a 9-point scale from (1) "Not at all crowded" or (1) to (9) "Extremely crowded." Results show the percent of visitors expressing various levels of perceived crowding along this scale.

- *Measure: Encounter Rates*. This is a measure applied specifically to the wilderness segment.[7] This measure refers to the number of encounters with other groups along trails in wilderness in a specified amount of time. Encounter rates are used as a measure of the extent to which visitors are able to obtain their desired solitude experience without the negative impact of too many encounters with other people.

- *Measure: People At One Time (PAOT)*. Other measures that are used involve asking visitors to evaluate the level of acceptability of the number of people at one time (PAOT) in a given area (see Manning 1999).

- *Measure: Vehicles At One Time (VAOT)*. Similarly, other studies measure visitors' perceptions of crowding along roadways in terms of the number of vehicles at one time (VAOT) along a specific road segment (see White 2010).

c) *Managerial Setting Attributes* refer to the degree to which management presence and related activities are part of the setting. These may include the presence of regulatory signs and other developments in frontcountry areas or park rangers on patrols in backcountry areas. The condition of the managerial setting is important in determining the condition of recreational values.

- *Measure: Importance-Performance*. Visitor surveys have addressed managerial setting attribute by asking respondents to rate the relative importance and perceived quality of various facilities and services in the park. The resulting "importance-performance" analysis provides park managers with feedback as to the extent to which the management setting, as measured by the quality ratings of various facilities and services, meets the expectations and needs of the visiting public.

3) ***Recreation Experience Quality***: The quality of the recreational experience is typically measured through visitor surveys where visitors are asked to rate their level of "satisfaction" with various aspects of their visit to the park. Satisfaction is a commonly used measure in outdoor recreation research and study (Manning 2011) and has been defined as "a function of the degree of congruence between aspirations and the perceived reality of experiences" (Bultena and Klessig 1969). That is to say, the degree to which visitors are satisfied with their experiences may be largely due to whether or not their experience meets their expectations. Given this, it is important to note the subjective nature of satisfaction as a relative concept, specific to each individual's own interpretation of their experience. Nevertheless, satisfaction provides park managers with a general metric of whether visitors' recreational experiences are positive or negative, that is whether the experience meets their expectations or not.

[7] Encounter rates measure the frequency of meeting other individuals during the course of a recreational activity. Typically, a visitor that experiences a higher number of encounters will have a decreased sense of solitude than a visitor that has a lower encounter rate.

- *Measure: Visitor Satisfaction*. This measure applies to both the wild and Valley segments. It refers to the extent to which visitors report being "satisfied" with their experience. For example, in recent studies visitors were asked the following, "overall, how would you rate the quality of the facilities, services, and recreational opportunities provided to you and your personal group at Yosemite National Park during this visit?" The response scale ranged from "very good" to "very poor" (Blotkamp et al. 2009). Results provide insight into the overall quality of the experience of the recreational values along the Merced River corridor.

River Segment 1: Merced River above Nevada Fall

Segment 1 of the Merced Wild and Scenic River is located in the Yosemite Wilderness. In summary, this segment provides wilderness-oriented recreational experiences in a river setting containing dramatic scenery and natural sounds.

Condition at the Time of 1987 Designation

Recreational Activity Participation

The most common visitor activities within the corridor at the time of designation included hiking, backpacking, and lodging at the Merced Lake High Sierra Camp. Both day-use and overnight camping took place within the river corridor, and both dispersed and designated camping opportunities were available. Visitors could also stay in tent cabins at the Merced Lake High Sierra Camp, access restroom and shower facilities, purchase meals, and temporarily keep stock.[8] (Where available, specific information on use levels and facility conditions is provided in the next subsection.)

Although data specific to the Merced River corridor are unavailable for 1987, approximately 52,200 park visitors spent a total of 105,100 nights in the Yosemite wilderness in 2010 (NPS 2011b). Based on this overnight visitation and permit data, the estimated average group size for wilderness use was 2.6 people per group, and the average visitor length of stay in the wilderness was approximately two days (Table 2-1). While park managers record wilderness permit allocations, information on visitation at specific locations within the wilderness is generally unavailable, except for data derived from periodic survey and visitor-count efforts.

TABLE 2-1: VISITOR USE IN YOSEMITE WILDERNESS IN 1987 AND 2010

	Quantity	
Visitor Use Measurement	1987	2010
Yosemite Wilderness Visitors	52,233	53,139
User Nights (in Yosemite Wilderness)	105,103	142,864
Wilderness Permits Issued	20,063	18,632
Group Size (number of people)	2.6	2.9
Average Stay (number of nights)	2.0	2.7
NOTE: Data specific to the Merced River corridor are not available. SOURCE: NPS 2011c		

Yosemite's wilderness, including the Merced River corridor, was one of the most highly visited wilderness

8 The High Sierra Camps are special administrative areas within the Yosemite Wilderness where lodging is operated by the park concessioner. Visitors with horses are permitted to board their animals at the camp's corral during their stay. However, very few visitors with horses stay overnight within this river segment.

areas in the National Wilderness Preservation System (NPS 2005b). Common activities in 1987 included hiking and backpacking. Figure 2-1 shows wilderness visitation and overnight stays between 1974 and 2010. Recreational use of Yosemite's wilderness peaked in 1975 when an estimated 172,000 overnight stays were recorded (NPS 2011c).

Hiking. The Merced River trail is the main trail in Segment 1, extending from Nevada Fall to Red Peak Pass Junction. The trail passes through Little Yosemite Valley to Merced Lake and then on to Washburn Lake. At Red Peak Pass Junction visitors can access the upper wilderness areas such as the Red Peak Pass, Isberg Pass, and Tuolumne Meadows (Figure 2-2).

The Mist Trail[9] from Happy Isles to the top of Nevada Fall is a primary access route for visitors to this river segment and a major day-use hiking attraction. The John Muir Trail[10] also originates at Happy Isles and provides an alternate route out of Yosemite Valley. A visitor use study conducted by Pettebone et al. (NPS 2008d) demonstrated that approximately 95% of the use originating at the Vernal Fall trailhead is day use. The two trails meet after Nevada Fall and the John Muir Trail continues along the Merced River for 1.5 miles, at which point it veers northward and exits the Merced River corridor. The downstream end of Segment 1 is located before the Mist and John Muir Trails meet. Although the majority of Segment 1 is upstream of this junction, the trails' popularity influences the recreational experience here.

Backpacking. The Merced River corridor above Nevada Fall provided some of the park's most popular wilderness camping opportunities.However, the potential for physical impacts on trails and meadows (e.g., trampling) from hiking and backpacker use within the Yosemite wilderness was noted in 1978 (Sano 1978). Camping in the Little Yosemite Valley and Merced Lake areas was allowed only in designated campgrounds. At the time of Wild and Scenic designation, there were three such campgrounds in this river segment: Little Yosemite Valley, Moraine Dome, and Merced Lake Backpackers' Campgrounds (Figure 2-2). In addition, overnight lodging was available in the Merced River corridor at the concessioner-operated Merced Lake High Sierra Camp, a potential wilderness addition.[11] Elsewhere in the wilderness areas, backpackers were free to choose their own dispersed campsites. Table 2-2 provides a summary of backpack camper facilities.

TABLE 2-2: BACKPACKING FACILITIES AND USE IN 1987

Camping Area	Estimated Maximum Capacity (number of campers)	Visitor Use	
		Overnight Stays	Average Group Size
Little Yosemite Valley Campground	125	11,214	3.27
Moraine Dome Campground	50		
Merced Lake Backpackers' Campground	90	N/A	N/A
Merced Lake High Sierra Camp (tent cabins)	60 (22 tent cabins)	N/A	N/A

N/A: not available
SOURCES: NPS 1987; Fincher 2010

9 The Mist Trail is located within the Yosemite Valley (River Segment 2) and is a unique and popular trail that allows visitors to interact directly with the Merced River.

10 The 211-mile John Muir Trail is a world-famous trail stretching from Yosemite Valley to Mount Whitney, the highest point in the contiguous United States. This trail overlaps with the Pacific Crest Trail for most of its length.

Figure 2-1: Annual Yosemite Wilderness Permits, Visitation and Overnight Use (1974-2011)

Note:
1. Visitation counts do not include day use visitors to the Yosemite backcountry.
2. No Permit information available for 1995 and 1996
3. 100-year-flood event occured in 1997

Other Recreational Activities. Wilderness users in the Merced River corridor participated in other recreational activities in addition to those discussed above. Photography, swimming, and contemplation are among the activities that enabled wilderness visitors to experience the sense of solitude, self-reliance, exploration, and adventure that contributed to a fulfilling recreational experience.

Recreational opportunities within the Merced River corridor also included commercially guided pack trips and private stock use (i.e. horseback riding). Total stock use[12] levels and proportion of recreational stock use (either by the concessioner-run commercial trips or private individuals) in 1987 is not known (Sano 1978). However, in 1978, total stock use reportedly constituted less than 3% of all wilderness use. Furthermore, at that time, private individual stock use accounted for the greatest proportion of stock use within the Yosemite wilderness (42.3% of grazing use) (Sano 1978). Horseback/mule day trips operated by the concessioner also offered visitors the opportunity to ride on horseback/mule to the Half Dome shoulder area. From this point these visitors could climb Half Dome by foot and later return to Yosemite Valley that same day.

Setting Attributes

At the time of designation in 1987, the location of hiking trails and camping areas allowed park users close contact with the river itself. Other setting attributes included the park's wilderness trailhead quota system. Scenic qualities influencing the recreational experience are described in Section 4, Scenic Values.

Although no information on wilderness conditions prior to designation is available regarding the extent and effects of wilderness stock use, the potential for physical impacts on trails and meadows (e.g., trampling), grazing effects, and aesthetic factors (e.g., manure on trails) from hiking and stock use in the Sierra wilderness was acknowledged in 1978 (Sano 1978).

Environmental Setting Attributes

At the time of designation in 1987, the recreational experience was primarily influenced by the scenic value of the landscape in this river segment and by the river itself. Section 4, Scenic Values, provides a description of these scenic values. Section 2 introduction describes the character of the river as it affected the recreational experience.

Social Setting Attributes

At the time of designation in 1987, no formal surveys had been conducted to evaluate visitor perceptions of crowding, or encounters with other parties on or off wilderness trails. The park instituted a wilderness trailhead quota system in 1977 to protect resources and provide for an experience of solitude and independence. Permit allocations controlled the number of overnight wilderness users entering at specific trailheads throughout the park. In 1987, the NPS issued 20,060 overnight wilderness permits for areas throughout the park. Day visitors could access the Merced River corridor (and other wilderness areas) without obtaining a wilderness permit. As a result, the extent of past day-use visitation to the Yosemite wilderness in 1987 is unknown. However, day use in the wilderness portion of the Merced corridor was minimal, except for the stretch from Nevada Fall to the Half Dome trail (Fincher 2010).

[12]Stock use in the Yosemite wilderness consists of the following: (1) NPS Administrative Use (e.g. wilderness patrols, facility and trail maintenance, or repair crew support), (2) Concessioner Use (e.g., High Sierra Camp supply support and concessioner guided trips), (3) Commercial Use Authorization (i.e., commercially guided overnight pack trips), and (4) private individuals (Acree et al 2010). Non-recreational stock use (i.e., for NPS Administrative Use and High Sierra Camp supply support) is discussed under "Facilities, Services, and Amenities."

As shown in Table 2-3, 170 daily wilderness permits were available in 1986 from six trailhead locations for overnight wilderness use in the Merced River corridor. While the permits identified park visitors' entrance points into the wilderness, users were free to choose where they wished to recreate. Consequently, the amount of time permit holders spent in the Merced River Corridor is unknown. Similarly, some park visitors could have entered the wilderness from elsewhere and hiked out through the Merced River corridor as part of their wilderness trip. As a result, wilderness permit data provide only a limited indication of the actual extent of visitor overnight use for River Segment 1 (Fincher 2010).

TABLE 2-3: TRAILHEAD QUOTAS PRIMARILY FOR MERCED RIVER WILDERNESS ACCESS

Trailhead	Wilderness Permit Quota[a,b]	
	1989	2012
Happy Isles (to Little Yosemite Valley)	35	30
Happy Isles (LYV Pass Through Access)[c]	10	10
Glacier Point (to Little Yosemite Valley)	25	10
Mono Meadow	15	20
Rafferty Creek	35	20
Lyell Canyon[d]	50	40
Total	**170**	**130**

NOTE:

[a] The wilderness trailhead quotas were modified in the mid- to late 1990s. Identified trailheads are only those primarily providing direct access to the Merced River corridor wilderness.

[b] Quotas represent maximum number of people per day permitted.

[c] "Pass Through Access" requires permit holders to hike through Little Yosemite Valley to camp further up river or elsewhere outside of LYV.

[d] Generally, only a minor proportion of wilderness visitors out of the Lyell Canyon trailhead will travel down to the Merced River corridor as part of their wilderness trips. Visitors wishing to access the Merced River corridor from Tuolumne Meadows mostly use the Rafferty Creek Trailhead.

SOURCE: Fincher 2010; NPS 2012a

Managerial Setting Attributes

At the time of designation in 1987, the managerial attributes of the recreational setting in this segment included limited infrastructure such as trails and some designated campsites along with administrative controls such as the trailhead quota system. These attributes likely had a beneficial effect on the recreational experience in this section allowing for access while minimizing impact to resource conditions and overcrowding.

The transportation and parking facilities in Yosemite Valley available to wilderness visitors also affected visitors' access to Segment 1. Visitors to the Merced River corridor generally travelled by private vehicle to Yosemite and parked in the Valley at the designated trailhead parking located east of Curry Village. Some Merced River corridor visitors also parked at the Glacier Point parking lot (for access via the Glacier Point trailhead) or in Tuolumne Meadows to hike down to the Merced River from the Sunrise trailhead (Fincher 2010). A park shuttle system also operated in Yosemite Valley 1987. Therefore, some wilderness users may have parked at other Yosemite Valley locations and travelled partly by shuttle bus or hiked all the way to the Happy Isles trailhead.

NPS rangers stationed in the wilderness were also important in managing wilderness visitation. Rangers were responsible for law enforcement, campground supervision, resource protection and providing information to Wilderness users. In addition, NPS work crews performed essential trail, utility and other

facility maintenance and repair duties in wilderness areas.

Administrative stock use within the Merced River corridor included both day and overnight use. Day use entailed transit along trails for supply and maintenance of the Little Yosemite Valley Ranger Station and backpacker campground, travel between overnight camps, NPS ranger patrols, and recreational rides. Most of this use occurred at Little Yosemite Valley, where visitor use is concentrated. No information is available on the extent of the 1987 day use levels for stock use within the Merced River corridor (NPS 2011g).

Administrative stock overnight use included essential support and maintenance activities related to the following: Merced Lake Ranger Station, Merced Lake High Sierra Camp (HSC), and Merced Lake backpacker campground; wilderness ranger patrols; trail crew camps; sawyer crews; firefighter spike camps; search and rescue operations; and research and resource management activities (NPS 2011g). No 1987 data are available on the level of administrative stock use. However, in 1978, administrative stock use was reported to represent a minor (15.6%) proportion of the total wilderness stock use (Sano 1978). The park's concessioner stock use was estimated to account for 40.7% of the total annual wilderness stock use (this figure included both the High Sierra Camps supply operations as well as commercially guided pack trips operated by the concessioner).

As the only designated camping areas in proximity to Valley trailheads, the Little Yosemite Valley and Moraine Dome Campgrounds were important overnight and staging locations for many wilderness visitors hiking up Half Dome, proceeding along the John Muir Trail, or continuing up-river. The Merced Lake Backpackers' Campground was also a popular backpacking location due to its proximity to Merced Lake and access to the nearby facilities at the Merced Lake High Sierra Camp. The wilderness campgrounds in Little Yosemite Valley were popular among overnight wilderness visitors because of camping restrictions elsewhere in the Merced River corridor and the demand created by hikers en-route to Half Dome or Tuolumne Meadows via the John Muir Trail. The availability of bear boxes may also have been a factor in backpackers' decisions to camp within established campgrounds. At the time of designation, the Little Yosemite Valley Campground (Figure 2-2) was the largest designated camping area in the wilderness. Although the wilderness campgrounds did not have set capacities, the Little Yosemite Valley Campground could typically accommodate up to 125 overnight backpackers (Fincher 2010). The Moraine Dome Campground, a smaller backpacker campground also located in Little Yosemite Valley, could accommodate up to 50 overnight campers (Fincher 2010). At both of these areas, there are no designated campsites. Instead backpackers select their own campsite location from within a relatively wide campground area where camping is permitted. In 1987, during the operating season (May 13 to October 10) at these two campgrounds, there were 11,214 overnight visitors, for an average of 75 campers per night. The average group size at these campgrounds was approximately 3.27 people (NPS 1987).

At the time of designation in 1987, both campgrounds were undeveloped and offered no amenities except for chemical toilet facilities. The toilet sumps had to be cleaned every few days, and the solid waste was packed out by mule. Reportedly, the toilets frequently needed repair and were often non-operational until the necessary repairs were completed. There was also a ranger station (the Little Yosemite Valley Ranger Station) in the area located within 100 feet of the Merced River (NPS 1987).

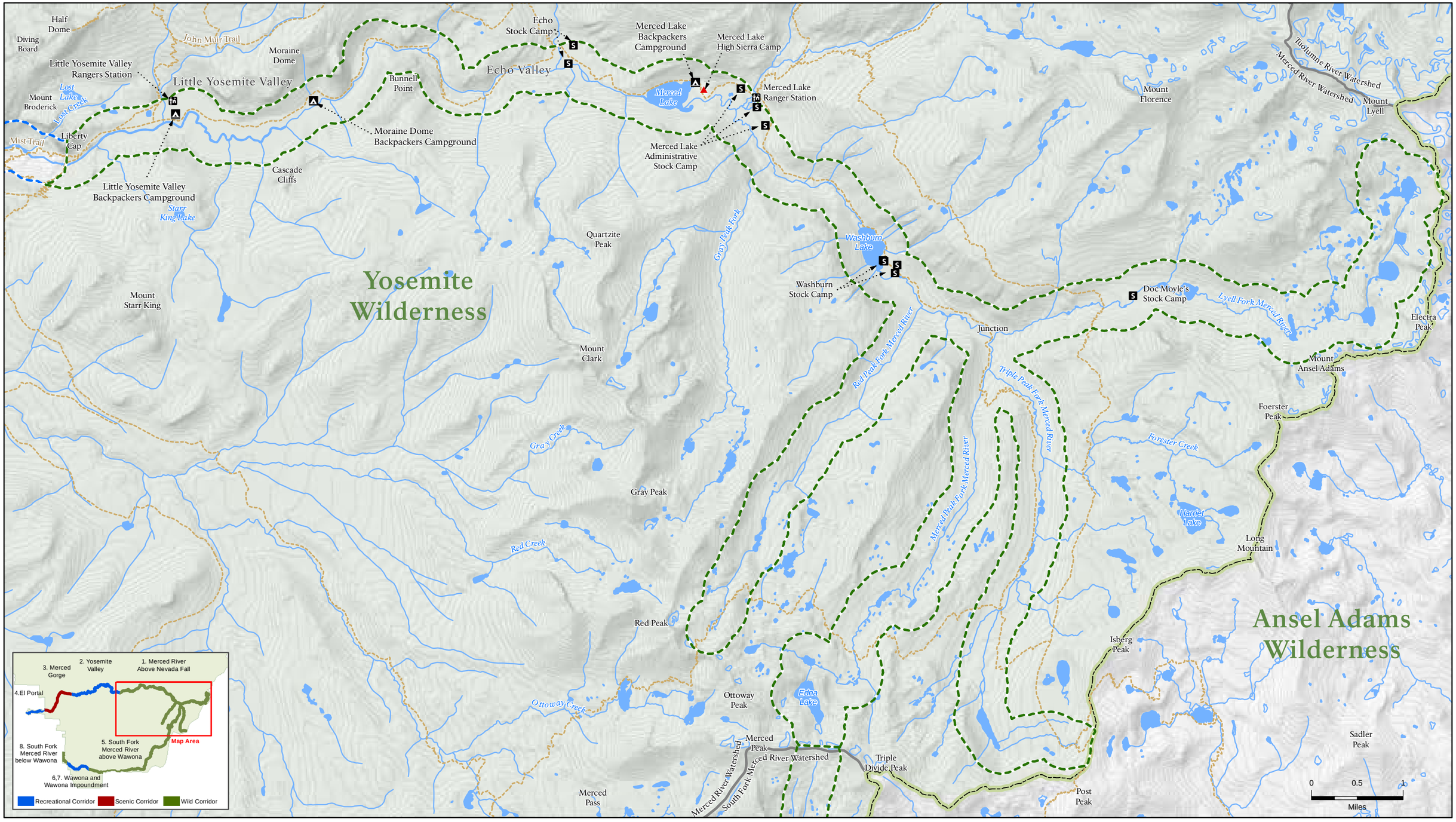


Figure 2-2
Recreational ORV - River Segment 1.
Merced River Above Nevada Fall
Wild WSR Corridor

- Wild WSR Corridor Classification
- Recreational
- Watershed Boundary
- Yosemite National Park Boundary
- Lake
- High Sierra Camp
- Ranger Station
- Backpackers Campground
- Stock Campsite
- Trail
- Stream/River
- 100' Contour Line

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 2-2

The Merced Lake Backpackers' Campground was farther up-river on the eastern shore of Merced Lake near the Merced Lake High Sierra Camp. The campground had basic toilet facilities. Campers could also purchase meals at the Merced Lake High Sierra Camp and use its shower and toilet facilities. Merced Lake Backpackers' Campground could accommodate approximately 90 overnight campers.

There is no specific information on the state of campsite facilities in the Merced River corridor at the time of designation. However, since 1972, three studies have been performed to evaluate the quality of campsite conditions within the Yosemite wilderness area parkwide (Boyers et al. 2000). An initial parkwide campsite baseline inventory and condition assessment was completed in 1972. A second major assessment of wilderness campsite conditions was performed between 1981 and 1986. Following extensive wilderness campground restoration efforts by NPS, a final wilderness campsite condition assessment was conducted in 1992. The assessment reported a major improvement in wilderness campsite quality over the study period (1972-1986) as a result of site restoration efforts in the mid- and late 1980s at the most impacted areas. Similar improvements were also observed in the later study period (1986-1992) (Boyers et al. 2000).

Merced Lake High Sierra Camp. In 1987, the High Sierra Camps provided tent cabin accommodations and meals for guests during the summer months. The Merced Lake High Sierra Camp was the only one of the five High Sierra Camps located in the Merced corridor. There were 22 tent cabins at the campground, each of which accommodated two to four people; the total capacity of the Merced Lake High Sierra Camp was 60 people/beds. Two of the tents were generally used to house employees, and one was reserved for wranglers traveling with stock.

Operation of the Merced Lake High Sierra Camp required regular delivery of supplies from Yosemite Valley to the camp. Supplies were delivered by the concessioner's stock operations (NPS 2005b). The concessioner's supply operations are discussed under "Facilities, Services, and Amenities" section below.

Recreational Experience Quality

At the time of designation in 1987, the river corridor through this segment provided for wilderness experiences characterized by solitude, personal reflection, immersion in nature, independence, and self-reliance. Although no formal surveys documenting visitor satisfaction, perceptions of crowding, or encounter rates had been conducted, the Yosemite wilderness (which includes the river corridor) was one of the most highly visited wilderness areas in the nation (NPS 2005b). Recreationists could expect to encounter other hikers as well as stock users, both on the trail and at some campsite areas.

Current Condition

Recreational Activity Participation

Similar to wilderness activities prior to designation, the most common visitor activities within the corridor are hiking, backpacking, stock use[13], and lodging at the Merced Lake High Sierra Camp. The area continues to see both day and overnight visitation. NPS has reduced the number of wilderness permits given to visitors for the main access trailheads from 170 in 1989 to 130 under current conditions (see Table 2-3). Additionally, NPS instituted an interim Half Dome permit system in 2010 to manage the number of Half

[13] As previously discussed, only the private and commercially guided trips would potentially represent recreational ORV activities. The majority of stock use in the Merced River corridor is for the administrative or concessioner supply purposes in support of recreational activities or resource protection (e.g., Merced Lake High Sierra Camp or NPS trail maintenance crews) (NPS 2011g).

Dome hikers.[14] This change may influence the length of stay and number of backpackers who use the Little Yosemite Valley Campground and the trail from Nevada Fall to Half Dome and Little Yosemite Valley. Recently, the park concessioner has discontinued day use horseback/mule trips to Half Dome, although visitors can arrange half-day trips to Clark's Point, which overlooks Vernal Fall.

General Wilderness Use. As shown in Figure 2-1, between 1987 and 2011, annual overnight wilderness use was usually below or comparable to the 1987 visitation of about 105,100 overnight stays (NPS 2011A). However, since 2006, Yosemite wilderness overnight visitation has increased substantially, exceeding 1987 levels. In 2011, approximately 51,400 Yosemite visitors spent nearly 137,077 nights in the wilderness (NPS 2011c) (Figure 2-1). Although the length of overnight visitor stays in 2011 is approximately 36% greater than 1987 levels, the number of wilderness visitors in 2011 was approximately the same as in 1987 (NPS 2011c). This spike in visitation indicates that users have increased their average length of stay in the park's wilderness areas.

Wilderness visitation in Yosemite is generally concentrated within a few popular locations, campsites, and trails. Visitor use is concentrated in less than 30% of the park, with most use distributed along approximately 70 miles of the park's 800-mile trail system (Newman 2001). The wilderness trails receiving the most use are the John Muir Trail and the "High Sierra Loop," a popular route that connects the High Sierra Camps. However, only short segments of these high-use trails are in the river corridor--1.5 miles of the John Muir Trail and 2.7 miles of the High Sierra Loop. Nonetheless, the presence of the Merced Lake High Sierra Camp in the corridor draws some backpackers (seeking the camp's services and amenities), and some of them use more trails in the corridor than the High Sierra Loop, such as the Merced River trail (Fincher 2010).

Half Dome visitors in the wilderness segment include both day and overnight users, primarily in the corridor from Nevada Fall upstream to Little Yosemite Valley (approximately 1.5 miles) where the trail leaves the river. The number of Half Dome visitors is currently managed through an interim permit system, which manages visitation to 450 people per day[15] to ensure visitor safety on the Half Dome cables and provide an appropriate wilderness experience. The 2011 permit system requires a Half Dome permit seven days a week. As of this writing, the NPS is completing an environmental assessment that may adjust the permit system or retain it on a long-term basis; the final decision is expected in late 2012 or early 2013.

Hiking. The designated trail system within Segment 1 has not changed since 1987. Table 2-4 shows the most recent trails condition assessment data for the main hiking trails located within the Merced River corridor above Nevada Fall. Between Nevada Fall and Merced Lake the hiking trails are considered to be in poor condition (NPS 2011e; Ballenger et al. 2011). The trails heading up river from Merced Lake are assessed to be in better condition. However, since the comparative condition of these trails in 1987 is unknown, the extent of any subsequent physical improvement or impacts to these trails' conditions cannot be determined.

An estimated average of 27 overnight users per day hiked from Little Yosemite Valley toward Merced Lake over the course of the 2010 wilderness season, for a total of 2,864 hikers. The highest daily use occurred in August, when an average of 34 individuals hiked along the route.

[14] Cables installed to assist Half Dome climbers are located outside of the wild and scenic river corridor.

[15] 450 people per day: 300 pre-register day use, 100 reserved for wilderness overnight permits, and 50 released at 7am the day before the permit is valid. Groups are restricted to 6 people or less.

TABLE 2-4: TRAIL CONDITIONS WITHIN THE MERCED RIVER ABOVE NEVADA FALL (2010)

Trail Segment	Distance (miles)	Condition
Nevada Fall to Little Yosemite Valley	1.0	Poor
Little Yosemite Valley to Echo Valley	6.65	Poor
Merced Lake[a]	2.56	Poor
Merced Lake Ranger Station to Triple Peak Trail	9.51	Fair
Red Peak Pass Trail	12.0	Good

NOTE:
[a] Trail between Echo Valley and Merced Lake Ranger Station
SOURCE: NPS 2011e

Backpacking. As shown in Table 2-3, in the mid- to late 1990s NPS reduced the number of overnight wilderness permits from 170 to 130 per day from the trailheads that provide access to Segment 1 from Yosemite Valley. As a result, fewer overnight wilderness visitors can access the Merced River corridor above Nevada Fall each day from the six trailheads. Table 2-5 shows average 2010 inbound trail use along the Merced (i.e., hikers traveling from Little Yosemite Valley toward Merced Lake).

TABLE 2-5: TRAIL USE ABOVE LITTLE YOSEMITE VALLEY TO MERCED LAKE (2010) (WILDERNESS-BOUND HIKER TRAFFIC)

Month	Average People per Day	Total People per Day
July	31	952
August	34	1,063
September	23	677
October[a]	10	117
Season (July to September)	30	2,864

NOTE: [a] Use counts were taken from October 1 through October 12.
SOURCE: NPS 2011a

Other Recreational Activities. Wilderness users in this river segment participate in other recreational activities in addition to those discussed above. Photography, swimming, wildlife viewing, and contemplation are among the activities that enable wilderness visitors to experience the sense of solitude, self-reliance, exploration, and adventure that contribute to a fulfilling wilderness experience.

Throughout the Yosemite Wilderness, commercially guided pack trips account for approximately 50% of the total overnight stock use,[16] with stock use by private individuals accounting for less than 5% (as informally tracked by the Yosemite Wilderness Office) (Acree et al. 2010). In 2003, NPS began limiting commercially guided pack trips to 3,973 stock and visitor nights annually. Actual commercial stock use by Commercial Use Authorization outfitters has been well below this limit, with, annual wilderness stock use by the nine Commercial Use Authorization outfitters averaging 1,629 stock-use nights between 2003 and 2009. In 2004, when the highest level of commercial stock use occurred, a total of 2,210 stock-use nights were spent in the wilderness, which is 57.3% of the commercial stock-use limit (NPS YOSE Wilderness Office). Stock use is also limited by the number of nights that the trail system is open each year, accounting in part for the incomplete utilization of the Commercial Use Authorization limit.

Commercially guided pack trip use within Yosemite is concentrated in several high-use travel corridors. Lyell and Virginia Canyons (both outside the corridor) are the most popular destinations, with a minority of groups traveling into the Merced corridor from Lyell Canyon (Acree et al. 2010). As a result, recreational use of stock animals within the Merced River corridor by commercially guided pack trips and private individuals is low. Furthermore, within the Merced River corridor, commercially guided pack trips travel only in the vicinity of the Meced Lake High Sierra Camp.

[16] The remaining 45% of overnight stock use is for NPS Administrative Use and concessioner High Sierra Camp supply trips.

Recently, the park concessioner discontinued its day use horseback/mule trips to Half Dome, although visitors can arrange for half-day trips to Clark's Point, overlooking Vernal Fall. However, this day-trip recreational stock use is also low. Data on the extent of stock use in Segment 1 of the Merced River are provided in Table 1-1. Average annual total stock use in this river segment from 2004 through 2010 was 344 nights. Of this overnight stock use, commercially guided pack trips averaged only 48 stock-use nights, which represents less than 3% of all the guided pack trips that occurred in Yosemite Wilderness areas.

Setting Attributes

A wilderness survey conducted in 2001 and 2002 provided recent data on the recreational experience and encounter rates in wilderness areas (Newman et al. 2001). The survey investigated visitor tradeoffs among environmental, social, and managerial aspects of the wilderness experience within Yosemite. The analysis indicated that the attitudes and preferences of wilderness users are influenced by numerous factors.

Environmental Setting Attributes

The recreational experience in the river corridor is primarily influenced by the scenic value of the landscape in this river segment and by the river itself. Section 4, Scenic Values, describes the visual qualities that contribute to the recreational experience in the river corridor. Section 2 introduction, above, describes the character of the river as it affects the recreational experience; current conditions remain similar to those in 1987 at the time of Merced Wild and Scenic River designation.

The 2001 (Newman & Manning) wilderness study indicated two indicators of environmental quality: signs of human use at campsites and signs of stock or stock use. In this study, more than half of the participants surveyed indicated that signs of human use were extremely to very important to them and their decision to recreate in that area of wilderness. Regarding stock use, this study reported that visitors reported seeing less stock and signs of stock use than they had expected to see, and would tolerate somewhat more stock use before they would consider not returning to that hiking trail. Regarding signs of human use at campsites, this study reports that visitors are experiencing a higher level of campsite impacts than they would like to see in their campsite(s), but reported seeing an expected level of impact. As with stock use, these visitors would need to see higher levels of human impacts to wilderness before they would no longer camp at those sites (Newman & Manning 2001).

Section 4, Scenic Values, describes the scenic qualities that influence the recreational experience. In general, the scenic qualities and river character are the same as existed in 1987.

Social Setting Attributes

Based on trail/campground use and encounter rates, the majority of users are concentrated in the river corridor between Nevada Fall and the Merced Lake High Sierra Camp. Encounters with more than one individual per hour, over consecutive hours, occured about 35% of the sampled time between Moraine Dome and Echo Valley. Upstream of the High Sierra Camp on the trail to Washburn Lake, this percentage drops to about 24%. Wilderness users beyond the Washburn Lake junction rarely encounter more than one party per hour on average (NPS 2008a). Encounter rates are described in the ORV Condition Measures section below.

Respondents from the 2001-2002 wildreness survey (Newman & Manning) reported that their wilderness experience was most affected by the ability to obtain a wilderness permit, the availability of opportunities for camping away from other users, and the variety of campsite choices (as well as the extent of previous human use of the campsites, as noted earlier). The survey suggested that many wilderness visitors tolerate

higher encounter rates on popular trails, but are less tolerant of high encounter rates at campsites and in more remote wilderness locations. The Merced River corridor between Nevada Fall and the Merced Lake High Sierra Camp is very popular, and the survey did not define this segment as a more remote wilderness area. Upstream of the Merced Lake High Sierra Camp, camping is dispersed (no established campgrounds) and the area offers a more remote wilderness experience.

The frequency of encounters with other people or groups along trails is commonly used as a proxy to evaluate opportunities for solitude in wilderness settings. Park staff measure encounter rates through actual trail counts or through surveys that ask visitors to estimate the number of other people/groups encountered during hikes. Increased encounters with other parties in the park's wilderness areas can diminish the feeling of solitude, which is a component of the Recreational ORV in this river segment. Newman and Manning (2001) found that visitors will tolerate higher numbers of encounters while hiking than while in camp. The NPS collected data between 2004 and 2010 to determine the frequency of wilderness encounters with other hikers along trails in the upper Merced River corridor. Encounter rates were observed at four trail segments: Moraine Dome to Echo Valley; Echo Valley to Merced Lake Ranger Station; Merced Lake Ranger Station to Washburn Lake; and Washburn Lake to Red Peak Pass Junction.

TABLE 2-6: PERCENT OF TIME WILDERNESS HIKERS ENCOUNTERED NO MORE THAN ONE OTHER PARTY DURING MOST (>80%) OF THEIR TRIP

Trail Segment	2004	2005*	2006	2007	2008	Average
Moraine Dome – Echo Valley	60.0%	72.2%	64.3%	71.4%	N/A	65.1%
Echo Valley – Merced Lake Ranger Station	71.4%	88.5%	58.6%	76.9%	45.5%	67.0%
Merced Lake Ranger Station – Washburn Lake	80.0%	100%	54.4%	83.3%	66.6%	76.3%
Washburn Lake – Red Peak Pass Junction	100%	100%	100%	100%	N/A	100%
Total for All Segments	**75.0%**	**85.7%**	**62.1%**	**78.8%**	**48.3%**	**70.7%**

NOTE: Percentages show the amount of time (hours) that hikers meet no more than one other party per hour during most (i.e., > 80%) of their trail use. The total for all segments is a weighted average of the survey data. Encounter data are for the wilderness recreation season between May to mid-October.

* High snow levels created atypical wilderness use. Tioga Road and many wilderness trails opened late in the season, and the High Sierra Camps did not open at all in 2005.

SOURCE: NPS 2008a

As shown in Table 2-7, the survey determined that 70.7% of the time, on average, hikers encountered one other party per hour or less for the majority of their trip.[17] Encounter rates among Merced River corridor hikers were lowest in 2005, when 85.7% of the time, on average, hikers encountered one or fewer parties per hour in the wilderness for the majority (at least 80%) of their trip. The highest encounter rates occurred in 2008 (NPS 2008a).

Encounter rates were generally lower on more remote trails. At no point did hikers on the Washburn Lake to Junction trail encounter more than one other party per hour for more than 80% of their trip. In contrast, the Moraine Dome to Echo Valley trail had the highest average encounter rate over the survey period. Over one-third of hikers met more than one other party for a significant portion (more than 20%) of their trip (NPS 2008a).

Managerial Setting Attributes

Recreational opportunities in Segment 1 have been influenced by wilderness permit allocations (described above), parking capacity, and other transportation services to and from trailheads. In addition, stock use

[17] Encounters with other hikers affect the "opportunity for solitude" component of the wilderness experience and thus could affect the segment's Recreational ORV. Higher encounter rates would generally diminish the "opportunity for solitude."

needed to supply the Merced Lake High Sierra Camp (or for NPS administrative purposes) sometimes results in trail conditions within the corridor that are considered problematic by some hikers (NPS 2011h). Users also report varying levels of campsite quality and evidence of stock-use impacts. Since 1987, problems with the Little Yosemite Valley campground toilet have been remedied, offering an improved facility. Additionally, in the mid-1990s the Merced Lake Backpackers' Campground was relocated away from the lake. In 2001, the campground's previous toilet sump and sewer line was also removed. The utility systems at the Merced Lake High Sierra Camp have also been upgraded.[18]

The availability of parking facilities and transportation services providing access to wilderness trailheads can influence the number of users entering wilderness areas. Most wilderness visitors to the Merced River corridor generally travel by private vehicle and park in the Valley at the designated trailhead parking located east of Curry Village. Some Merced River corridor visitors also parked at the Glacier Point parking lot (for access via the Glacier Point trailhead) or at Tenaya Lake or Tuolumne Meadows to hike down to the Merced River from those trailheads. Since 1987, the expanded bus transit options to locations outside Yosemite Valley (including both Glacier Point and out-of-park destinations, such as City of Merced and Mammoth Lakes) have offered additional options for visitors to reach the park and organize their visit.

As previously discussed, the wilderness trailhead quota system plays a direct role in managing the extent and location of wilderness use within this river segment. In addition, NPS rangers stationed in the wilderness are important in managing wilderness use, while NPS work crews perform essential trail and other facility maintenance services. Merced Lake High Sierra Camp is not within the Wilderness designation but was designated in the California Wilderness Act as a potential wilderness addition. However, amenities such as toilets, showers, and meal services at Merced Lake High Sierra Camp will also contribute to visitors' recreational experience within the Wilderness areas.

The designated wilderness campgrounds within Little Yosemite Valley and Merced Lake continue to experience heavy use. Throughout the peak visitation season, between Memorial and Labor Days, these campgrounds typically operate at or near capacity (Fincher 2010). The Mist and John Muir Trails, originating within Yosemite Valley, are most commonly used to access the Merced River corridor. Some overnight use may come from Half Dome visitors who camp in Little Yosemite Valley and extend their overnight stay in order to hike up to Merced Lake.

Since the 1987 designation, NPS relocated the Little Yosemite Valley Campground and Ranger Station away from the Merced River. In addition, the chemical toilets were replaced with composting toilets, and two public fire rings and bear boxes were added. The Moraine Dome Campground remains an undeveloped camping area. The capacity of these two campgrounds has not changed since the designation (Fincher 2010). And, in 1991, NPS relocated the Merced Lake Backpackers' Campground away from the lake. The campground capacity has not changed since the relocation (Fincher 2010).

As previously discussed, three studies have been performed to evaluate the quality of campsite conditions in the park's wilderness area (Boyers et al. 2000). During the study period (1972-1992), the number of identifiable campsites decreased by 17%—predominantly due to the successful restoration of many campsites to natural conditions.[19] A major improvement in wilderness campsite quality was reported as a

[18] The Merced Lake Ranger Station is located outside the Merced River corridor and therefore is not included in this discussion.

[19] Within most of the Wilderness area, backpackers are permitted to select their own campsites in accordance with NPS regulations. Wilderness visitors are only required to camp at a designated areas / sites within Little Yosemite Valley, at Moraine Dome, or at the five High Sierra Camps. Consequently, environmental restoration of formerly identifiable campsites does not reduce the available Wilderness camping opportunities.

result of site restoration efforts in the mid- and late 1980s at the most impacted areas (Boyers et al. 2000). However, in the absence of more recent assessment data, the current condition of campgrounds and campsites in this river segment cannot be characterized. Nonetheless, a visitor survey conducted in 2001 reported that most users had a positive wilderness experience (Newman 2001).

Merced Lake High Sierra Camp. Since 1987, the NPS has installed solar panels and a new septic system and made other minor utility repairs and upgrades at the Merced Lake High Sierra Camp. Residual sludge from the septic system is removed by helicopter once every three years. While the use of helicopters generates noise in areas near the wilderness, the alternative—hauling waste out by pack stock—would result in additional stock use. The capacity of the Merced Lake High Sierra Camp is 60 people/beds, which has not changed from 1987 levels (Fincher 2010). In 2008, the Merced Lake High Sierra Camp's occupancy rate was 82%, up from 59% in 2007 (NPS 2008c). The concessioner's supply operations are discussed under "Facilities, Services, and Amenities" section below.

The Merced Lake High Sierra Camp operations rely on concessioner-managed stock for supplies. Although the NPS does not tally this stock use, during the nine-week operating season, the concessioner typically operates two to three supply trips per week to the Merced Lake High Sierra Camp (running a string of six heads of stock). The supply trips leave from the Yosemite Valley stables in the morning and return the next night. In addition, at the start and end of the operating season, the concessioner also runs stock trips to open and close its High Sierra Camp facilities.

Except for a short portion of the trail near Vernal Fall, the supply trips share the trail with hikers along most of the Merced River corridor. Generally, conflicts between hikers and stock use occur mostly along the 1.5 mile segment of the John Muir Trail within the wilderness segment of the corridor. The concessioner schedules its supply runs early in the morning to reduce its interaction with trail hikers, but encounters occur on occasion (Fincher 2010). A 1994 survey of hikers within the nearby John Muir Wilderness found that over half of the hikers responding to the survey found stock use in the wilderness undesirable (Watson et al. 1994) Administrative stock operations also provide support and supplies for NPS staff working in the wilderness.[20] Not counting the concessioner's stock use to supply its High Sierra Camps, NPS administrative stock use typically accounts for approximately 45% of the total overnight stock use in the Yosemite wilderness[21] (as informally tracked by the Yosemite Wilderness Office) (Acree et al. 2010). Average total annual stock use in this river segment was 344 stock-use nights, with the majority (86%) of this overnight use by NPS administrative stock. The NPS uses stock for a variety of purposes including trail maintenance, historic structures maintenance, research and monitoring, etc.

Recreational Experience Quality

A comprehensive visitor study was conducted in 1991 (four years after the Merced designation) asked respondents to evaluate various aspects of their visit to Yosemite (Gramann 1992). Respondents were asked to rate the quality of their ovrall experience on a six-point scale ranging from 1-"Poor" to 6-"Perfect." The vast majority (93%) of visitors reported that their experience was "very good" or better, with 48% reporting

[20] All work performed in wilderness areas by park personnel (e.g. trail crews, backcountry utilities crews, historic preservation staff, resources management personnel, park rangers etc.) is subject to prior work plan development and management approval. In each case, employee logistical and safety needs are considered, as well as an analysis of the necessary supplies and equipment. In some cases, helicopter support is reviewed as an alternative. Park management considers the financial cost, resource impacts, efficiency and scheduling to select the recommended course of action. In each case, park staff also considers the potential resources and visitor experience impacts of a "no action" alternative.

[21] However, given that the need and location of many administrative activities (e.g. trail maintenance and resource management) may vary from year to year, it may be difficult to represent an "average" level of administrative stock use within specific management areas.

they had an "excellent" experience and 27% reporting a "perfect" experience.

More detailed anaylsis of visitor satisfaction ratings in the Gramann study reveled that the most common positive contributers to satisfaction were natural scenery, positive behavior of other visitors, and opportunities for solitude. Aspects of their visit that detracted from overall satisfaction included the perception of low quality services, lack of opportunity to relax, perceptions of crowding, and opinions about the level of development appropriate in the park.

Preliminary Management Considerations

The preliminary management considerations associated with the Recreation ORV in segment 1:

- High levels of stock use can result in user conflicts with hikers sharing the trails.
- Future efforts to improve opportunities for wilderness solitude are complicated by the competing desires many visitors have for increased wilderness access and their lack of tolerance of higher encounter rates (Newman 2001).
- Current use levels at the wilderness campgrounds, and trails leading to them, affect wilderness character and opportunities for solitude and primitive experiences.

River Segment 2: Yosemite Valley

Segment 2 of the Merced Wild and Scenic River flows through Yosemite Valley. This river segment provides an awe-inspiring setting for a variety of active, creative, educational, social, and reflective experiences and activities.

Condition at the Time of 1987 Designation

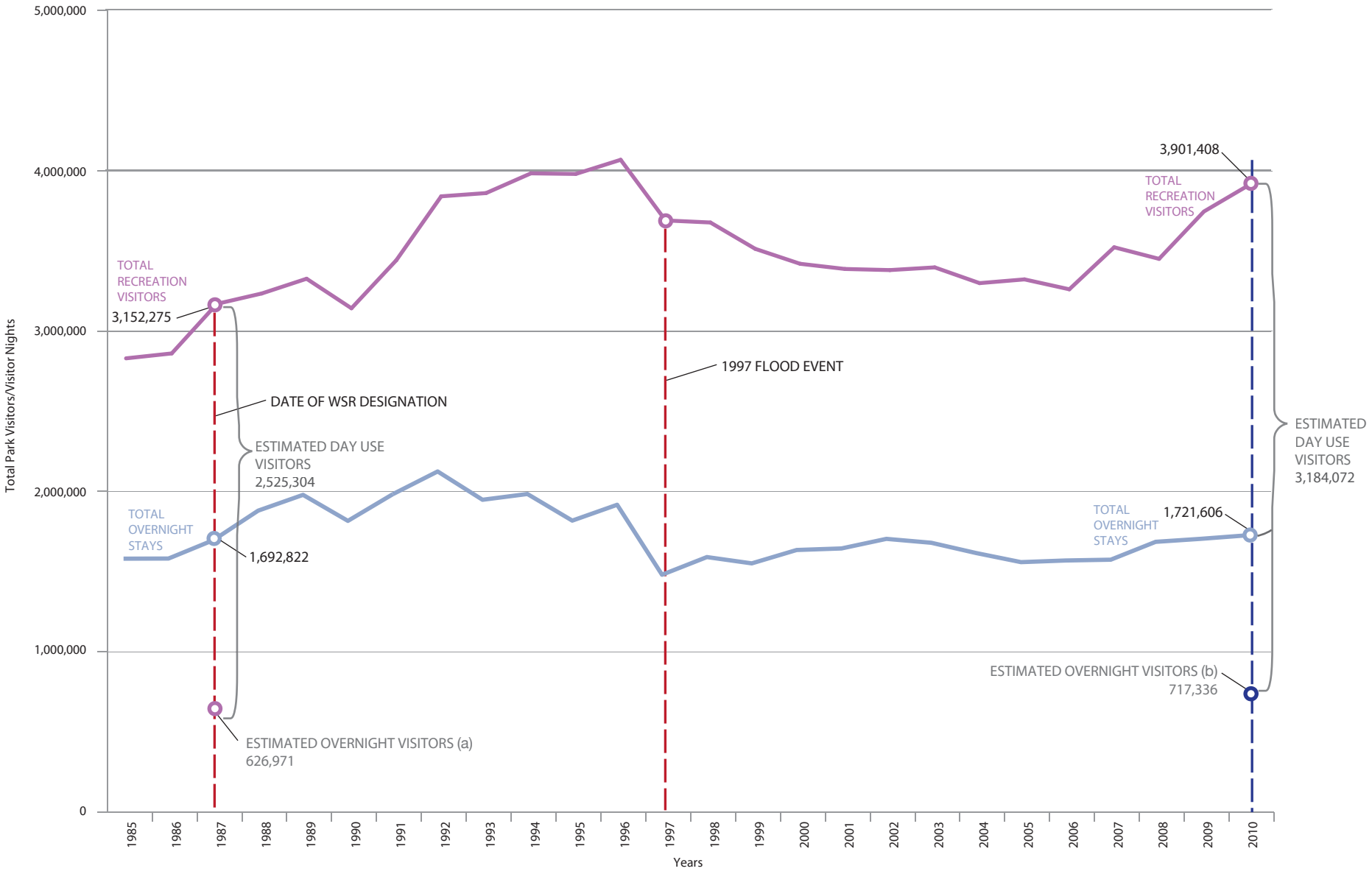
Recreational Activity Participation

Individual user experiences can be affected by the participation of other visitors in the same activity (e.g., by causing crowding) or in different activities within the same geographic area (e.g., fishing along the shore or floating the river). The most common visitor activities in this river segment at the time of designation included sightseeing, scenic driving, day hiking, wildlife viewing, picnicking, floating, creative arts, camping, bicycling, nature study, rock climbing, and engaging in ranger-led programs. In 1987, both day-use and overnight camping were popular in this river segment. In 1987, a larger number of riverside campgrounds were available. As a result of the 1997 flood, some of these areas were damaged and closed.

The 1992 Gramman study indicated that 75% of park visitors went to the Valley. This provides general visitation estimates of Valley visitor levels at the time of designation (Gramann 1992). In 1987, parkwide recreational visitation at Yosemite was approximately 3.15 million, and the total overnight stays were approximately 1.69 million. Based on the 1992 survey, approximately 2.3 million individuals visited Yosemite Valley in 1987.

Figure 2-3 shows park-wide and overnight visitation levels between 1985 and 2011 Figure 2-4 shows the camping and lodging overnight visitation. Yosemite Valley campground use was reported to be 384,000 overnight visits in 1988, and total overnight visits (including visits at campgrounds and lodges) was estimated to be 1.87 million people. Using the Gramann (1992) study's 1990-1991 average length of stay of 2.7 days, the calculated numbers of visitors are approximately 700,000 overnight and 2.5 million day use.

In 1987, recreational opportunities in the Yosemite Valley segment were similar to those currently available and included visiting attraction sites, auto touring, biking, hiking, camping, climbing, fishing, rock climbing,



NOTES: (a) The number of overnight visitors is estimated based on an average 2.7 days length of stay for 1992 park visitors (Gramann 1992).

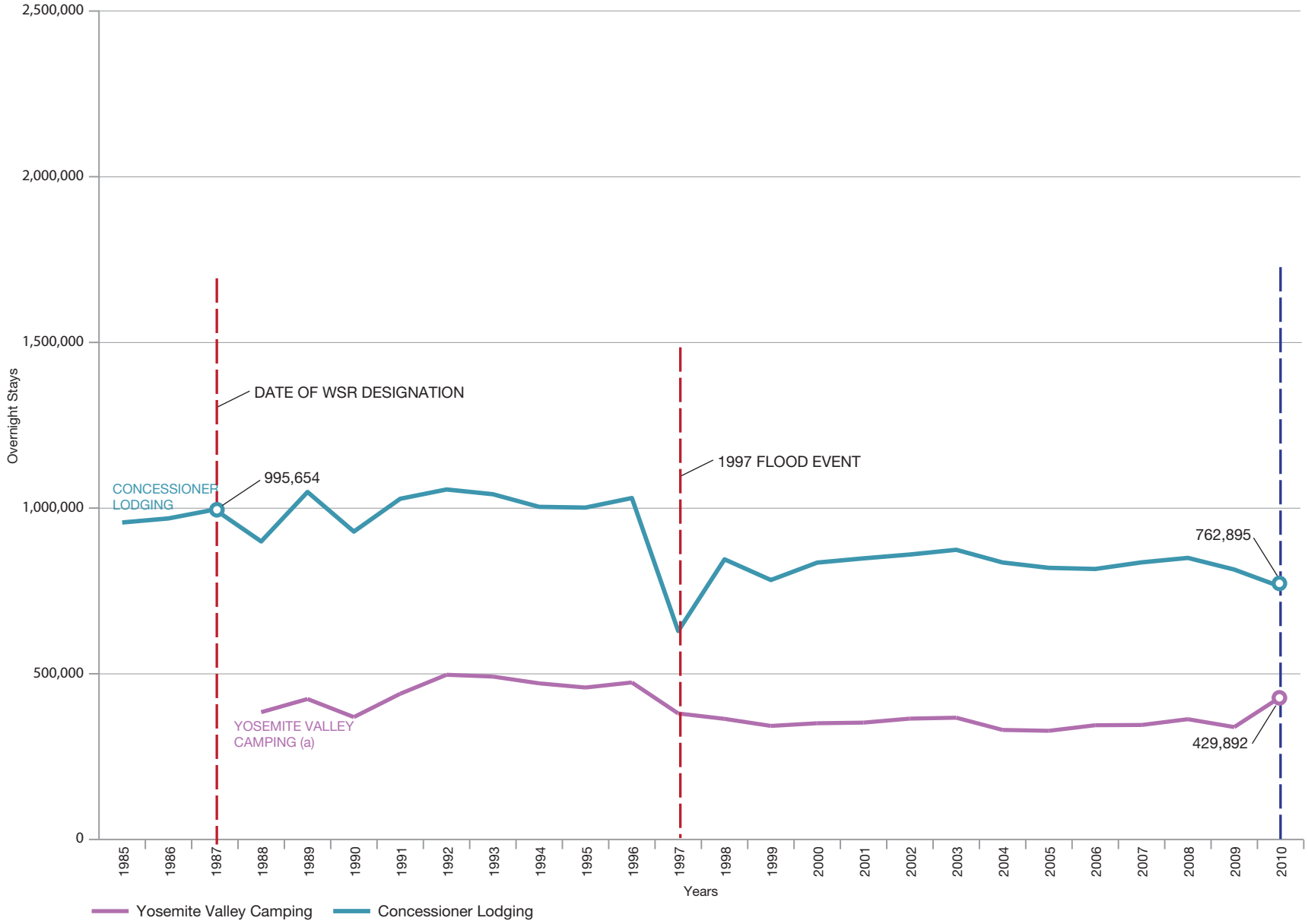
(b) The number of overnight visitors is estimated based on an average 2.4 days length of stay for 2010 park visitors (Blotkamp et al. 2010).

SOURCE: NPS 2011c; Blotkamp et al. 2010; Gramann 1992

Merced River Comprehensive Management Plan

Figure 2.2-3

Yosemite National Park Total Park Visitors and Overnight Visitor Use (1985-2010)



(a) Pre-1988 overnight visitor use counts do not include Yosemite Valley camping numbers.

SOURCE: NPS, 2010a

Figure 2-4

Yosemite National Park Overnight Visitor Use (1985-2010)

picnicking, swimming, floating, photography, wildlife viewing, painting, as well as educational and interpretive pursuits. Available information is summarized below.

Auto-touring. Private vehicles were the predominant form of travel for park visitors within the Valley at the time of designation (Van Wagtendonk 1980; BRW Inc. 1994).

Camping. In the Valley, camping was only permitted within designated campgrounds. In 1987, the designated campgrounds included: Sunnyside/Camp 4; Muir Tree; Upper, Lower, and North Pines; and Upper and Lower River. In addition, ten group campsites were available in the Valley. These facilities are described below under the subheading Facilities, Services, and Amenities.

Day Hiking. There were about 37 miles of hiking trails in the Valley ranging from short, easy hikes to very strenuous hikes (Table 2-7).

Visiting Attraction Sites. The primary attraction sites in Yosemite Valley were Yosemite, Bridalveil, and Vernal Falls, which have typically experienced high levels of visitor use. However, no visitor count information is available for these sites at the time of the designation.

TABLE 2-7: DAY HIKING TRAILS IN YOSEMITE VALLEY

Destination	Starting point	Distance/Time	Level of Difficulty/ Elevation Gain
Bridalveil Fall	Bridalveil Fall Parking Area	0.5-mile round-trip, 20 minutes	Easy
Lower Yosemite Fall	Lower Yosemite Fall Shuttle Stop #6	1-mile round-trip, 20 minutes	Easy
Upper Yosemite Fall trail to Columbia Rock	Camp 4 near Shuttle Stop #7	2-mile round-trip, 2 to 3 hours	Strenuous, 1,000-foot gain
Mirror Lake	Mirror Lake Shuttle Stop #17	2-mile round-trip, 1 hour	Easy
Vernal Fall footbridge, winter route	Happy Isles Shuttle Stop #16	1.4-mile round-trip, 1 to 2 hours	Moderate, 400-foot gain
Top of Vernal Fall,	Happy Isles Shuttle Stop #16	3-mile round-trip, 2 to 4 hours	Strenuous, 1,000-foot gain
Top of Nevada Fall, (Mist Trail)	Happy Isles Shuttle Stop #16	5-mile round-trip, 5 to 6 hours	Strenuous, 1,900-foot gain
Top of Nevada Fall (ice cut route)	Happy Isles Stop#16	5.4 mile round-trip, 5 to 6 hours	Strenuous, 1,900 foot gain
Four Mile Trail to Glacier Point (closed in winter past Union Point)	Southside Drive	4.8-mile one-way, 3 to 4 hours one-way	Very strenuous, 3,200-foot gain
Valley Floor Loop	Lower Yosemite Fall Shuttle Stop #6	13-miles full loop, 5 to 7 hours full loop	Moderate
SOURCE: NPS 2011d			

Setting Attributes

Section 4, Scenic Values, describes the visual qualities that influence the recreational experience. Throughout the Valley segment, the river has provided major visual attractions—such as Vernal and Nevada Falls—and also directly created recreational experiences for visitors, such as fishing, floating, and sightseeing. The natural hydrologic forces that result in periodic Valley flooding have also influenced the Recreational ORV by affecting visitor access and facilities.

Environmental Setting Attributes

From the Merced River and its banks, views of Yosemite Falls, Bridalveil Fall, El Capitan, and Half Dome, among other scenic vista points, have been important visual resources within Segment 2. Meandering through a sequence of compound oxbows, wetlands, and meadows, the river and its features provided

broad panoramic vistas. Other important scenic resources that could be seen from within the Yosemite Valley segment at the time of designation include Nevada, Illilouette, Vernal, and Ribbon Falls; the cliffs at Yosemite Point/Lost Arrow Spire; and the scenic interface of river, rock, meadow, and forest throughout the Valley.

Social Setting Attributes

The Valley received approximately 2.3 million visitors from all over the world in 1987. Although formal user surveys had not been conducted at the time of designation, NPS staff noted crowded conditions in the Valley in 1980 (NPS 1980a). A 1990-1991 study found that approximately 4 out of 10 respondents reported crowding in the park as a "moderate" problem (Gramann 1992).

Visitor concerns regarding crowding were reported and analyzed in 1990 and 1991 (Gramann 1992). Visitor surveys were completed in summer and the off-season, by auto passengers and tour bus passengers. Visitors were asked to rate a set of conditions in Yosemite Valley for items such as traffic, number of accommodations, and number of people. Respondents could select a category on a scale where -1 equaled "not enough", 0 equaled "the right amount", and 1 equaled "too much." Among summer visitors, who arrived by auto, both the amount of vehicle traffic and number of people received a rating of 0.49. According to Gramann, "In other words a relatively large number of summer auto visitors believed that there was too much traffic and too many people in Yosemite Valley" (Gramman 1992: 79). Regarding visitors' responses to a question about crowding, Gramann also specifically stated "overall, 42.1% of auto passengers felt that crowding represented at least a moderate concern…" (Gramann 1992: 85) Auto passengers were also asked if there were any locations within the park where there were too many people. The most frequently listed location in response to this question was Yosemite Valley/Yosemite Falls. In addition, 26% of auto passengers mentioned Valley/Curry Village as having too many visitors.

Managerial Setting Attributes

The recreational experience and opportunities were influenced by factors such as parking capacity, transportation services, lodging facilities, roads and trails, raft rental, ranger-led programs, and interpretive displays. At the time of designation, several Valley campgrounds offered additional overnight camping opportunities by the river. More specific details on the extent of these attributes and facilities are provided below.

Numerous park facilities directly affect the recreational experience in the Yosemite Valley segment. These include camping, lodging, parking, picnic areas, river access points, and trails, as described below. Recreational use, facilities, services, and amenities are concentrated in this segment compared with other Merced River segments.

Overnight Accommodations. Camping and lodging facilities in the Valley have provided visitors with opportunities for multi-day experiences within the river corridor with easy access to river. Table 2-8 shows the camping and lodging facilities operating at the time NPS issued the General Management Plan and in 2010 (NPS 1980b; NPS 2011b). At that time, there were 1,528 overnight lodging units and 872 campsites in Yosemite Valley. The information in the 1980 General Management Plan may be representative of the number and location of overnight camping and lodging facilities present at the time of Wild and Scenic River designation. The NPS estimated that park hotel and tent cabin facilities could accommodate an average of up to 4.5 people per room[22], and camping areas could accommodate six people per campsite

[22] The average group size of 4.5 people for a lodging room was used in the NPS Facilities worksheet (NPS 2009a).

(NPS 2009a). Based on these occupancy estimates, the Valley provided overnight accommodations for up to 12,108 people per night (NPS 2009a). Aggregate overnight stay information for the concessioner lodging facilities and camping within Yosemite is shown in Figure 2-3.

TABLE 2-8: YOSEMITE VALLEY VISITOR FACILITIES (1980 AND 2012)

Facility	1980 (GMP) No. of Sites/Units	2012 No. of Sites/Units
Campgrounds		
Sunnyside / Camp 4	38	35
Muir Tree / Yellow Pine[a]	20	NA
Backpackers Camp	NA	22
Pines Campgrounds[b]	438	379
Upper and Lower River	376	NA
Group Campsites	10	NA
Total Campsites	872	436
Lodging		
The Ahwahnee	121	123
Housekeeping Camp	300	266
Curry Village	626	394
Yosemite Lodge	481	245
Total Lodging	1,528	1,028
Day Use Parking	2,513	2,293

NOTES:
[a] Muir Tree campground has been renamed to Yellow Pine Campground.
b Includes North, Upper, and Lower Pines Campgrounds in Yosemite Valley as well as the Backpackers, and Group Campgrounds in the Yosemite Wilderness.
SOURCES: NPS 1980b, 2011b, 2012b

Parking. The availability of day-use and overnight parking facilities allows for—and in some instances limits—access to recreational locations in the Merced River corridor in Yosemite Valley. The 1980 General Management Plan identified 2,513 day parking spaces in the Valley (Table 2-8). Subsequent traffic and circulation analysis performed in 1994 confirmed the approximate number of Yosemite Valley day parking spaces; therefore, the 1980 and 1994 figures provide a good estimate of the number of sanctioned (allowed by NPS) day-use parking spaces at the time of designation (BRW, Inc. 1994).

The 1994 traffic analysis noted substantial change in the proportion of park visitation accounted for by day users to Yosemite Valley. In 1981 day users accounted for 15% of overall park visitation (not just Yosemite valley); by 1991, 37% of park visitors were making day trips in and out of Yosemite (BRW, Inc. 1994). The study reported that Yosemite Valley overnight accommodations were operating at or near full occupancy during peak-season periods. The study also reported that Yosemite Valley vehicle traffic exceeded the capacity of the loop roads on holiday weekends. Furthermore, the analysis determined that traffic congestion was a recurring problem at the intersection of Yosemite Falls and Northside Drive, and that Yosemite Valley's formal parking facilities were perpetually at capacity in the summer months (BRW Inc. 1994).

Recreational Experience Quality

Since designation, segment 2 – Yosemite Valley has afforded a variety of opportunities to view scenery and to travel along and interact directly with the Merced River. Again, Gramann (1992) reported that at or near the time of the Merced designation, visitors to the park had a relatively high level of overall satisfaction with 93% reporting that their experience was "very good" or better. This study also looked at visitor evaluations of satisfaction specific to Yosemite Valley. In general, most summer visitors to the Valley in 1991 reported

that the level of conditions and factilities in Yosemite Valley was either "the right amount" or "not enough." Two exceptions to this were the amount of vehicle traffic and the number of people. In general, a significant number of respondents felt that there were too much vehicle traffic and too many people in Yosemite Valley.

Current Condition

Recreational Activity Participation

Similar to 1987, the river corridor provides for a variety of opportunities to view scenery within the Valley and to travel along the river and interact directly with it. The most common visitor activities in the Yosemite Valley segment include scenic viewing and/or taking a scenic drive, day hiking, wildlife viewing, picnicking, creative arts, camping, ranger-led programs, bicycling, floating, nature study, and rock climbing. Both day-use and overnight camping and lodging are available in this river segment. Campground sites in the Valley are in very high demand and often fill to capacity.

Within Yosemite Valley, there are recreational opportunities available for visitors of all ages and ability levels. Visitors of all ages tour Yosemite Valley, with about one-fifth comprised of children and youth and 7% comprised of visitors 66 years or older. Ongoing studies assessing recreational user capacity in the Valley include a boating survey being conducted in the summer of 2011 to assess the quantity, type, and locations of recreational floating.The uniqueness of the Valley attracts many visitors, who engage in a wide variety of activities. Some of the activities most commonly engaged in are discussed below.

General Visitation and Use. Figure 2-4 shows park wide visitation and overnight use levels between 1987 and 2011. It also shows the camping and lodging overnight visitation by major park location (specifically including Yosemite Valley camping use between 1988 and 2010). In 2011, parkwide visitation at Yosemite was approximately 4 million visitors, and parkwide total overnight stays were reported to be 1.3 million, based on 2007 traffic data showing that approximately 33% of vehicles entering the park for recreation are overnight visitors (NPS 2007a). As discussed previously, Yosemite Valley entrance data is not collected by the NPS; therefore, exact counts of Valley visitation are not available. As a result, survey data with information on visitors' intended locations is used to infer the amount of visitation that occurs in Yosemite Valley.

According to the most recent visitor survey, Yosemite Valley was the most common destination for Yosemite visitors, with 85% of visitors traveling to Yosemite Valley (White and Aquino 2008; Blotkamp et al. 2010).[23] Therefore, Yosemite Valley's 2010 recreational visitation is estimated to be between 2.73 and 3.31 million visitors.

As a result of the decrease in overnight accommodations following the 1997 flooding, several rockfall events within the Valley, and the development of lodging and camping facilities in gateway communities, the proportion of day-use visitation within the Valley has increased. Based on a 2007 traffic analysis, 66% of park visitors were day users (NPS 2007a). In contrast, the 1980 van Wagtendonk study found that only 25% of park visitors were day users.

[23] Unlike the summer 2009 survey, the winter 2008 visitor survey did not specifically determine the proportion of visitors for whom Yosemite Valley was a preferred destination (Le et al. 2008). However, the three most commonly visited sites in winter 2008 were the same Yosemite Valley sites as those reported by summer visitors, with similar popularity among visitors (Yosemite Falls, Yosemite Valley Visitor Center, and Bridalveil Fall). Note that these three sites are all outside of the Merced River corridor.

Table 2-9 shows visitors' self-reported participation rates in the most popular activities that are typically considered river-related. Scenery-related activities had the highest proportion of participation, followed by day hiking and wildlife or bird watching. Bicycling and nature study showed lower levels of participation at 12% and 7%, respectively. Some of these activities will be discussed in greater detail below.

TABLE 2-9: SELF-REPORTED ACTIVITY PARTICIPATION RATES FROM 2009 SUMMER VISITOR SURVEY

Activity	Percentage Participation
Viewing scenery	93%
Taking a scenic drive	64%
Day hiking	54%
Wildlife viewing / bird watching	43%
Picnicking	33%
Creative arts	26%
Camping in a developed campground	16%
Attending ranger-led programs	15%
Bicycling	12%
Nature study	7%
Rock climbing	6%
NOTE: Activities listed do not include other popular but non-river-related activities engaged in by Yosemite Valley visitors, such as dining at Yosemite Valley restaurants, shopping, or visiting museums. SOURCE: Blotkamp et al. 2010	

Art and Photography. About one-fourth (26%) of visitors reported they participated in creative arts (NPS 2011d). Free art classes are offered from spring through fall at the Yosemite Art and Education Center in Yosemite Valley, and art supplies can also be purchased at the center. The Yosemite Conservancy's Outdoor Adventures program offers art and photography seminars throughout the park. The Yosemite Renaissance offers an artist-in-residence program. Free photography walks are offered year-round. The Yosemite Museum Gallery displays exhibits of Yosemite art during spring and summer, and the Ansel Adams Gallery features the work of Ansel Adams, contemporary photographers, and other fine artists.

Auto-touring and Sightseeing. As shown in Table 2-9, auto-touring and sightseeing are the two most common river-related visitor activities in Yosemite Valley. Auto-touring in the Valley provides opportunities to visit several "attraction sites" and/or viewpoints during a single trip. Key attraction sites include Bridalveil, Vernal, and Lower Yosemite Falls. Although Yosemite Falls is not located within the river corridor, their visibility from points within the river corridor and high attraction value directly influence visitation patterns by many visitors within the Merced River Corridor. Additionally, access trails and parking areas serving these key attraction sites are located within the river corridor. These attraction sites are particularly popular in spring and early summer when the snowmelt produces high flows. As flows diminish and summer advances, they are less heavily visited.

Biking. Of the survey respondents, 12% reported bicycling in the Valley (NPS 2011d), where more than 12 miles of paved bike paths are available. In addition, bicyclists can ride on roads unless posted otherwise. The park does not allow off-trail riding, mountain biking, or use of motorized bicycles or scooters on bike paths (with the exception of motorized scooters for accessibility). Bicycles are available for rent in Yosemite Valley in Curry Village and Yosemite Lodge when bicycle path and weather conditions are favorable (NPS 2011d).

Camping. About 16% of visitors reported they camped in developed campground facilities. Campground facilities and capacities are described in Table 2-8. Campground sites in the Valley are in high demand and frequently filled to capacity.

Day Hiking. Slightly more than half of survey respondents (54%) reported participating in day hiking. There are about 37 miles of hiking trails in the Valley (Table 2-7), ranging from easy to strenuous.

Floating. Floating in private or concessioner-rented vessels on the Merced River is permitted between Stoneman Bridge and Sentinel Beach Picnic Area. The concessioner began renting rafts for this three-mile segment of the river in 1982. Initially the concessioner rented up to 50 rafts a day; from the 1990s to the present, the concessioner has rented up to 200 rafts a day, with the stipulation that no more than 100 may be on the river at any one time.

Floaters were counted from Stoneman Bridge and from the Sentinel Beach Picnic Area in May and June of 2007. "Floaters" includes both persons on rafts and on inner tubes. An average of 205 floaters per day was counted at Stoneman Bridge and 193 floaters at Sentinel Beach Picnic Area (Table 2-10). At Stoneman Bridge, the number of floaters counted on weekdays was 226, compared to 177 for weekend days. At Sentinel Beach Picnic Area, the average number of floaters counted on weekdays was 219 and on weekends was 158 (Pettebone et al. 2008). Fridays were counted as weekdays, and during the survey one of the Fridays occurred over the Memorial Day long weekend, which may account for the higher observed weekday use levels.

TABLE 2-10: FLOATING COUNTS ON THE MERCED RIVER 2007

	Stoneman Bridge (persons)	Sentinel Beach Picnic Area (persons)
Weekdays (M- F)	226	219
Weekend Days (S- Su)	177	158
SOURCE: NPS 2008a		

Picnicking. One-third of survey respondents reported they participated in picnicking. Designated picnic areas exist at El Capitan picnic area, Cathedral Beach, Sentinel Beach, Swinging Bridge, Lower Yosemite Fall trailhead, the Church Bowl, and in Yosemite Village. Per the Concession Services Plan, visitors may picnic at all outdoor food service locations operated by the concessioner.

Ranger-led Programs. Of the survey respondents, 15% indicated they participated in ranger-led programs. Visitors were not asked about their participation in interpretive programs offered by organizations other than NPS. Programs are offered daily in the Valley and include walks and talks on cultural resources, ecology, and geology (NPS 2011d).

Rock Climbing. Yosemite Valley features world-renowned climbing. Of survey respondents, 6% indicated they participated in rock climbing. There are numerous climbing routes in the Valley; some are single-day and others are multi-day routes, requiring climbers to bivouac (camp) along the route.

Wildlife Viewing/Birdwatching. About 40% of survey respondents indicated they participate in wildlife viewing/bird watching. Survey respondents were not asked about particular species they were interested in viewing. Yosemite National Park provides essential habitat for about 165 species of migrating, wintering, and breeding birds, as well as for another 91 species recorded as transient or vagrant (NPS 2011d). There are also opportunities to view deer, black bear, and other mammals.

Attraction Sites. Examining use levels at specific attraction sites is another means of describing participation in the Recreational ORV. Pettebone et al. (2008) measured visitor use at attraction sites in the Valley. Table 2-11 shows the average daily visitor arrivals as measured for the peak season months in 2007 at Bridalveil, Vernal, and Yosemite Falls.[24]

[24] Yosemite Falls are located outside the Merced River corridor. However, while that fact means that the attraction itself may not represent a Recreational ORV, its proximity to the Merced River and its attraction value contribute to most Yosemite Valley visitors' recreational experience.

TABLE 2-11: AVERAGE DAILY VISITATION AT KEY YOSEMITE VALLEY ATTRACTION SITES BY MONTH (2007)

	Bridalveil Fall	Vernal Fall	Yosemite Falls
May [a]	3,510	2,377	4,796
June	3,188	2,297	4,425
July	2,870	2,219	3,782
August	2,307	2,077	2,174
September	1,505	1,588	1,504
Average arrivals	2,415	1,911	3,274

NOTE: Visitation averages are for visitors arriving at the attraction sites between 10 a.m. and 5 p.m.
[a] In May, data collection began on 5/24.
SOURCE: NPS 2007b

As shown in the table, Bridalveil, Vernal, and Yosemite Falls are particularly popular in the early summer, when the Sierra snowmelt ensures that the waterfalls have higher flows than they do in the later summer months.

Study results also show variation on an hourly basis and for weekdays and weekends. For example, at Vernal Fall Trailhead, hourly use is less than 100 people before 8 a.m. on weekdays but is more than 150 people for the same time period on weekends. Weekday use peaked at about 400 people at 3 p.m. on weekdays, but on weekends it peaked at about 500 people for a longer period of time (from 1 to 3 p.m.). Similar variations in use were found for Yosemite and Bridalveil Falls.

Additionally, a recent study of park visitation (Blotkamp, 2010) reported that 59% of visitor groups visited Yosemite Falls on their trip, 52% visited Bridalveil Falls, and 28% visited Vernal Falls (n=646 groups).

Summary of Recreational Activity Participation. Viewing scenery is by far the most popular activity for park visitors. Other popular activities include day hiking, floating, wildlife viewing, picnicking, and creative arts. The popularity of viewing scenery is reflected in use levels observed at attraction sites, particularly in spring and early summer when flow rates in the waterfalls are high. Use at attraction sites decreases as flow rates drop throughout the summer. During both weekdays and weekend days, there is high variation in hourly use levels, with relatively low use during early morning and early evening. Use tends to peak in the early afternoon and is consistently higher on weekends than on weekdays.

Setting Attributes

Opportunities to experience the sights and sounds of the Merced River and to view the Valley's scenery are Recreational ORVs. Visitors who perceive crowding may have a diminished recreational experience in this segment. In 1998, a visitor survey conducted queried visitors about what they liked and disliked about their visit to Yosemite Valley. Results of this study are discussed below.

Environmental Setting Attributes

Section 4, Scenic Values, describes the visual qualities that influence the recreational experience in this river segment. Major attractions in the Valley include Vernal, Nevada, and Bridalveil Falls, and the river provides directly for recreational activities such as fishing, floating, and swimming (Figures 2-5 and 2-6). The natural forces of the river that cause periodic Valley flooding may also influence the Recreational ORVs by affecting visitor access and facilities.

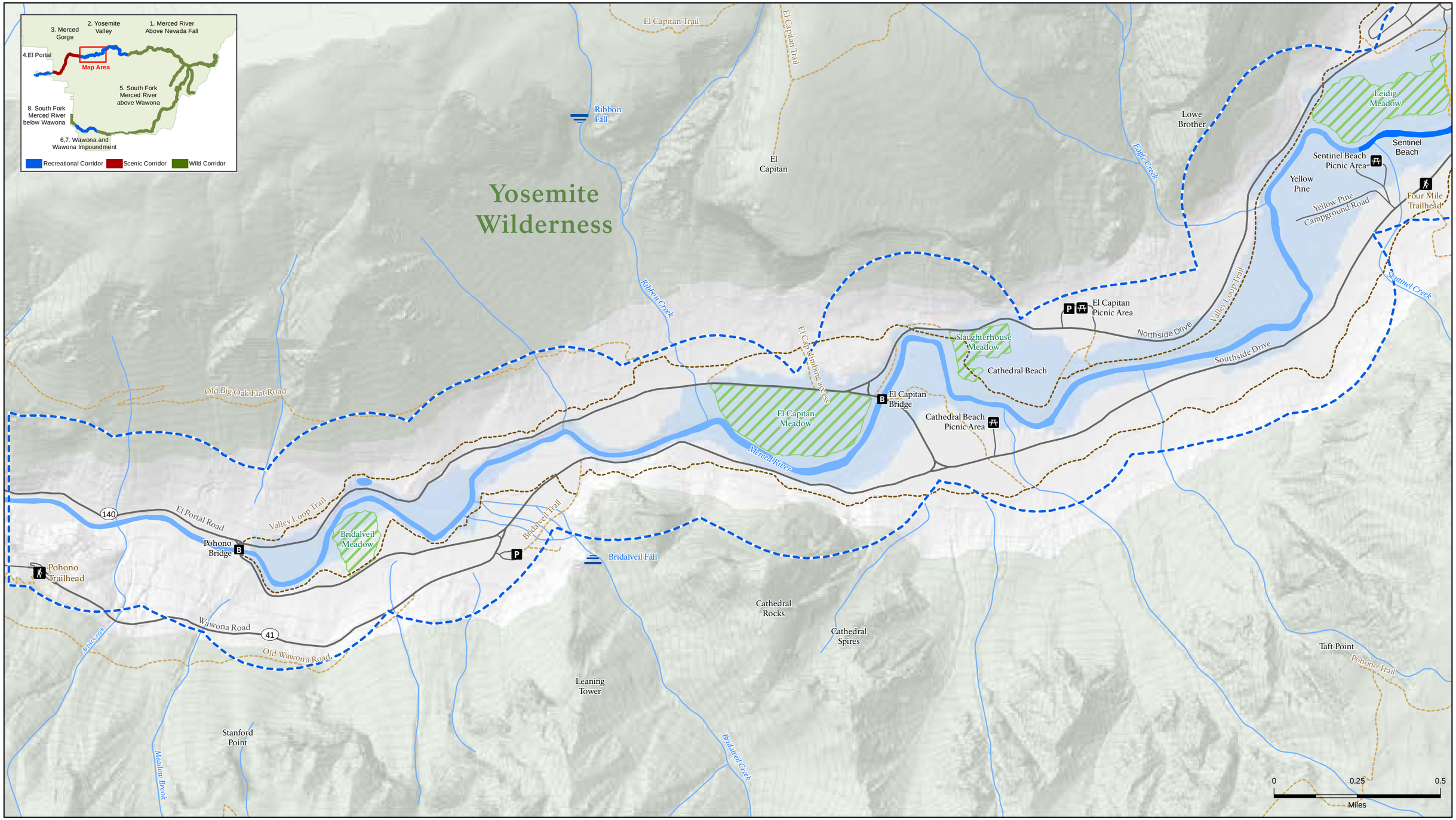


Figure 2-5
Recreational ORV - River Segment 2. Yosemite Valley
El Capitan Meadow, Cathedral Beach, and Sentinel Beach
Recreational WSR Corridor

- Recreational WSR Corridor Classification
- Monitored Meadow
- 100 Year Flood Boundary
- Rafting Permitted
- Road
- Stream/River
- Valley Loop Trail
- Bike path
- Trail
- 100' Contour Line
- Waterfall
- Picnic Area
- Trailhead
- Parking Area

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
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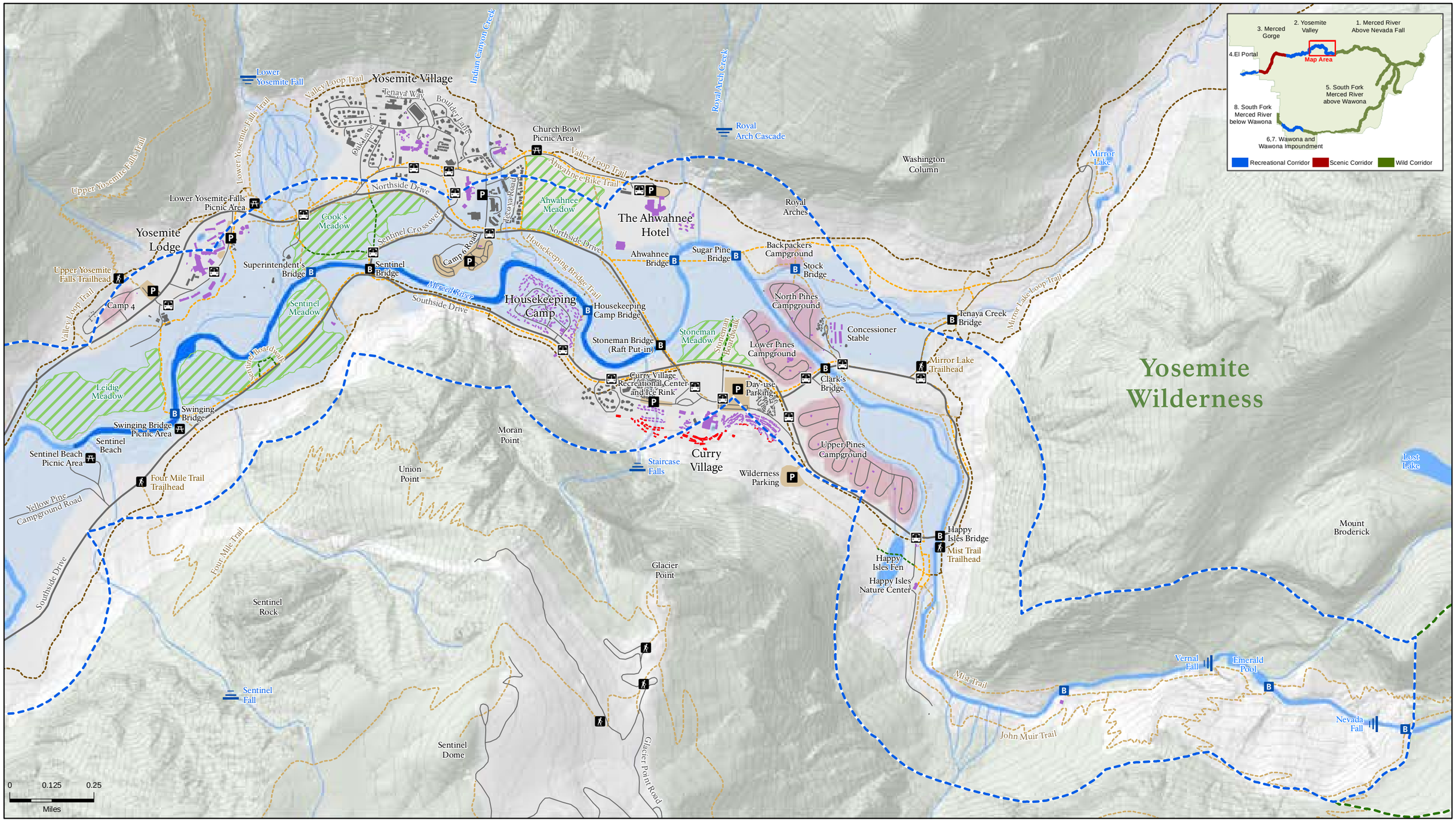


Figure 2-6
Recreational ORV - River Segment 2. Yosemite Valley
Yosemite Lodge, Yosemite Village, Curry Village, and The Ahwahnee
Recreational WSR Corridor

- Recreational WSR Corridor Classification
- Wild WSR Corridor Classification
- Building to be removed
- Visitor Based Activities and Services Building
- Other Building
- Monitored Meadow
- Campground
- Rafting Permitted
- 100 Year Flood Boundary
- Picnic Area
- Trailhead
- Shuttle Stop
- Parking Area
- Road bridge
- Footbridge
- Waterfall
- Stream/River
- Road
- Valley Loop Trail
- Bike path
- Boardwalk
- Trail
- 100' Contour Line

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 2-6

The Mist Trail allows visitors to see, hear, and feel the river and exemplifies a Recreational ORV for this river segment. This type of recreational opportunity is rare on other rivers in the Sierra Nevada as is floating and swimming along a flat reach of river in a mountainous, meadow setting. In a 1998 survey by Manning et al., visitors were surveyed at the base of and along the trail to lower Yosemite Falls and at the trailhead to Vernal Fall. Visitors liked the scenery/natural beauty (35.2% of respondents), hiking/walking/specific trail (28.7%), and the falls (17.7%). Visitors disliked crowds (41.7% of survey respondents) and traffic (5.7%).

Social Setting Attributes

In 2010, Yosemite Valley received approximately 3.56 million visitors (89% of total park recreational visitation during that year) (NPS Puglic Statistics Office). As part of the NPS-wide Visitor Services Project, a survey conducted in summer 2005 recorded visitor perceptions of crowding and, in the absence of facility or visitor population changes, the study's findings may offer a reasonable representation of the 2010 conditions. Approximately 55% of the survey respondents reported feeling crowded by other visitors in the Valley (Littlejohn et al. 2006). In a 2008 visitor survey, 40% of the park's winter visitors stated that they chose to visit Yosemite during the wintertime to avoid crowds (Le et al. 2008), providing another indication of perceived Yosemite Valley crowding.

The river and related attraction sites are focal points for visitor use and provide opportunities to experience the Valley's Recreational ORVs. Visitor perceptions of crowding were measured as part of several past visitor surveys (Manning 1998, 1999; White and Aquino 2008; Lawson et al. 2009).[25] While methodologies and results varied between surveys, all found some perceptions of crowding (up to 80% of those sampled in one survey regarding Bridalveil Fall). Perceptions varied depending on the visitor, place, and time of survey, but *some* perception of crowding was a common theme among these surveys and across more than a decade.

Manning et al. (1998) asked visitors to evaluate levels of crowding along a 50-meter length of trail at the aforementioned locations by viewing a series of 6 photographs that depicted 0 to 180 people. Respondents surveyed at the trail to the base of Vernal Fall would prefer to see 11 PAOT, would "tolerate" seeing 39 PAOT before they would no longer visit the area, and felt the National Park Service should allow a maximum of 30 PAOT. Visitors to the trail to the base of Vernal Fall reported seeing an average of 19 PAOT and reported being "somewhat crowded" (4.1 on a scale where 1 equals "not at all crowded" and 9 equals "extremely crowded"). Respondents surveyed at the trail to the base of Yosemite Falls would prefer to see 18 PAOT, would "tolerate" seeing 60 PAOT before they would no longer visit the area, and felt the National Park Service should allow a maximum of 46 PAOT. Visitors to this location reported seeing an average of 27 PAOT and reported being "somewhat crowded" (3.4 on a scale from 1 "not at all crowded" to 9 "extremely crowded"). Finally, respondents surveyed at the base of Yosemite Falls would prefer to see 43 PAOT, would "tolerate" seeing 126 PAOT before they would no longer visit the area, and felt the National Park Service should allow a maximum of 100 PAOT. Visitors surveyed at the base of Yosemite Falls reported seeing an average of 59 PAOT and reported being "somewhat crowded" (3.4 on a scale of 1 "not at all crowded" to 9 "extremely crowded"). A follow-up survey conducted at three additional sites in Yosemite Valley confirmed these findings (Manning et al. 1999).

In 2007, Lawson and others initiated research that integrated information on traffic levels, visitor use levels, and visitor preferences for use levels. Lawson et al. (2009) conducted visitor surveys and counts at attraction sites in the Valley. The authors used vehicle entrance traffic data from multiple entrance points to predict visitor use levels at attraction sites. The attraction sites included the trail to Mirror Lake, the base of and trail

25 NPS is currently undertaking an additional river_specific use study during the summer of 2011, the results of which should be available in 2012.

to Bridalveil Fall, the base of and trail to Lower Yosemite Fall, and the trailhead at Happy Isles. Multiple simulations predicted visitor use levels at attraction sites to determine how often visitor preferences for PAOT within a 50-meter stretch of trail would be exceeded. Many of these simulations indicated visitor preferences for PAOT were occasionally exceeded. Simulation results also showed that PAOT on trails and at attraction sites were exceeded more than 10% of the time at all study sites, except for PAOT on the trails to Mirror Lake and Lower Yosemite Fall. The preference standard for PAOT on the trail to Vernal Fall was exceeded in about one-quarter of the simulations. The preference standards for PAOT on the trail to Bridalveil Fall and at the base of Yosemite Falls were exceeded 50% of the time. Model simulations also showed that the preference standard for PAOT at the base of Bridalveil Fall was exceeded almost 80% of the time. Simulation results suggest there are crowding issues associated with Yosemite, Bridalveil, and Vernal Falls.

The Merced River is a focal point for Yosemite Valley visitor use. From June to September in 2005 and 2006, PAOT was measured at one minute intervals for one hour periods along 50 meter stretches of the Merced River from Stoneman Bridge to Sentinel Beach Picnic Area, the only reach where floating is currently allowed (Table 2-12). River segments were divided into low-, medium-, and high-use stretches. Data collected the following year showed PAOT levels increased (NPS 2006). There were 17 PAOT in the low-use segment, 32 in the medium-use segment, and 50 in the high-use segment.

TABLE 2-12: MAXIMUM PAOT LEVELS[1] FOR ALL ACTIVITIES ON LOW-, MEDIUM-, AND HIGH-USE SEGMENTS OF THE MERCED RIVER

	Low-use Segment	Medium-use Segment	High-use Segment
2005	8	13	37
2006	17	32	50

SOURCES: NPS 2005a, 2006
[1] Maximum PAOT levels were all recorded at 12 noon or later the day when sampling occurred.

Managerial Setting Attributes

The recreational experience and opportunities are influenced by such factors as seasonality, road and weather conditions, parking capacity, transportation services, picnic site availability, camping, lodging facilities, roads and trails, river conditions and access, raft rental, bike rental, ranger-led programs, and interpretive displays. Raft rentals affect the recreational experience in that the numbers of watercraft on the river at one point in time can impact visitors' perceptions of crowding. The presence, location, and capacity of various facilities in the Valley greatly influence visitor access and activities. More specific details on the extent of these attributes and facilities are provided in the following section. Since the time of designation several campground facilities, mostly in Lower and Upper River Campgrounds and Lower and North Pines Campgrounds (including ten group campsites), were removed following the 1997 flood. In addition, several hundred lodging units have been removed both at Yosemite Lodge (following the flood) and at Curry Village (due to a sequence of large rockfall events that have taken place in recent years).

Since 1987, the number of campsites and lodging units available in the Valley has decreased. More than 350 camping units were removed from the Upper and Lower Pines Campgrounds after the 1997 flood. There are 498 fewer lodging units due to the combined effects of the 1997 flood and the 2008 rockfall.

Overnight Accommodations. In 2010, 16% of the survey respondents reported camping in a developed campground. There are currently 583 campsites located within four campgrounds and 1,261 lodging units in Yosemite Valley. Altogether, these units can provide accommodations for up to 7,803 people (NPS 2009a). Overnight capacity within Yosemite Valley has decreased since 1987. In the 1997 flood, 353 campsites and

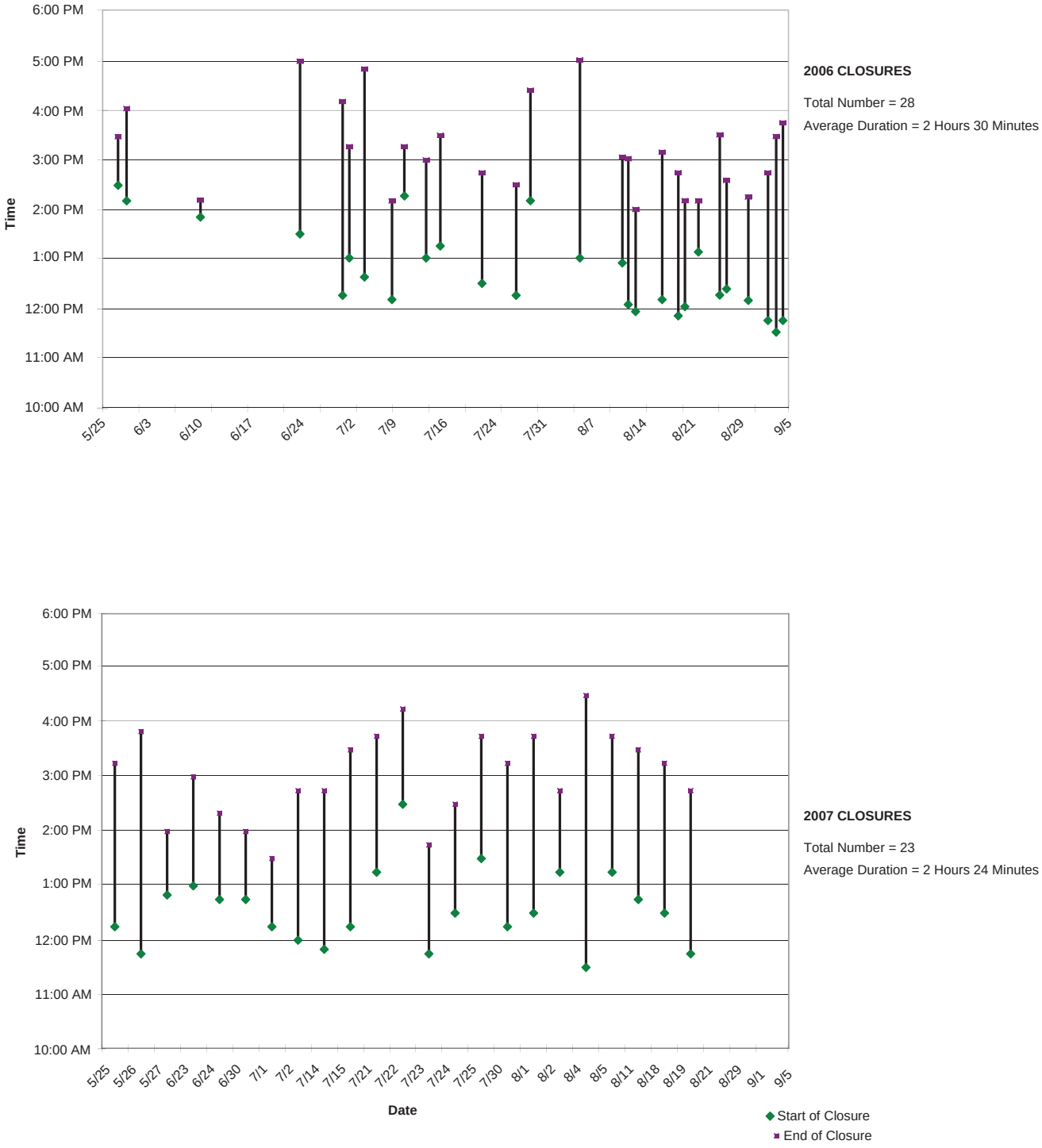
262 lodging units were lost. The 2008 rockfall event also eliminated 236 of the Curry Village cabins (Bacon 2010). Table 2-8 summarizes the overnight accommodations in the Valley.

Parking. Parking availability along with the number of day-use lot closures are indicators of congestion in Yosemite Valley. An estimated 3,650 parking spaces are available for visitors in Yosemite Valley. The parking capacity estimates within Yosemite Valley were determined based on data counts performed in a 2009 facility capacity spreadsheet (NPS 2009a). Additional data will be available in late 2011 or 2012, when an updated parking inventory is completed. Approximately 1,000 spaces are located in day-use parking lots with another estimated 750 spaces available along roadways. The other remaining 1,900 spaces are located at or near lodging or campsite facilities and are primarily used by overnight visitors.

From 2005 through 2007, NPS rangers recorded the number of vehicles in the Camp 6 day-use parking lot. In 2005, rangers reported that the Camp 6 lot was filled to capacity and alternate traffic measures were implemented on 90 days, with 51 lot closures occurring between June and August (NPS 2005). Table 2-13 shows the number and duration of parking closures within Yosemite Valley in 2006 and 2007. In 2006, rangers indicated that the total number of Camp 6 lot closures during summer months had decreased to 28 (NPS 2006) and to 23 in 2007 (NPS 2007b). Closures occurred between May and September and the lot reached an average capacity of 800 vehicles before it was closed. Figure 2-7 shows the time and duration of all 28 closures recorded in 2006 and 23 closures recorded in 2007. In general, these closures occurred in the afternoon between 12:00 p.m. and 4:00 p.m. The earliest recorded closure time was 11:40 a.m., and the latest recorded reopening time was 4:30 p.m. The average length of time the lot closed in 2006 and 2007 was approximately 2.5 hours (NPS 2006, 2007b). Such closures remain common, particularly on weekends in 2011.

TABLE 2-13: INCIDENCES OF PARKING FACILITY CLOSURES IN YOSEMITE VALLEY 2006-2007

Year	Total Number of Closures	Average Duration of Closure	Lot Capacity at Time of Closure
2006	28	2 hours, 30 minutes	800
2007	23	2 hours, 24 minutes	800
SOURCES: NPS 2006, 2007b			



NOTE: The 2007 parking lot closure data is shown by occurrence date to facilitate comparison between closures. Parking lot closures generally occurred on weekend days.

SOURCE: NPS 2006, 2007b

Merced River Comprehensive Management Plan

Figure 2-7

Time and Duration of Day Use Parking Lot Closures in 2006 and 2007

In the same 1998 study by Manning et. al referenced above, visitors were also asked to respond to questions about eight management issues and to rate the extent to which those issues were problematic on a scale ranging from 1, which equaled "no Problem," to 3, which equaled a "big problem." Approximately 3 out of 10 respondents mentioned traffic on roads in Yosemite Valley as a "big problem," while about 4 out of 10 stated that difficulty finding parking was a "big problem" (Manning et al. 1998). Moreover, respondents most frequently indicated that crowding was the least liked aspect of their visit.

A more recent study conducted by White and Aquino (2008) focused on transportation issues. Visitor surveys were conducted during the summer season at multiple locations in the park. Visitors were queried about waiting time to enter the park, the time needed to find a parking spot, and about the acceptability of waiting times. Only a few questions addressed crowding, and they were all asked in the context of traveling within the park. The majority of visitors reported waiting an average of less than three minutes to enter the park and an average of approximately two minutes to find parking. The majority of visitors rated traffic congestion at park entrances, on roadways, and in parking areas as "not a problem." Unlike the work conducted by Manning, this study did not investigate standards of quality for PAOT at attraction sites or along trails to attraction sites. The focus of this study was on transportation.

Recreational Experience Quality

Currently, visitors to the Merced River in Yosemite Valley continue to report a relatively high level of overall satisfaction. According to the most recent visitor survey, most visitor groups (92%) rated the overall quality of facilities, services, and recreational opportunities at Yosemite National Park as "very good" or "good" (Blotkam et al. 2010).

Preliminary Management Considerations

The preliminary management considerations associated with the Recreation ORV in segment 2 are:

- The popularity of some attraction sites results in perceived and real impacts of "crowding", reducing the quality of visitor experiences and/or resulting in other negative impacts to the site's use and resources.
- Yosemite Valley visitation periodically exceeds current parking and visitor facilities capacities.
- The reduction in the availability of overnight accommodations within Yosemite Valley as a result of the 1997 flood and 2008 rockfall events has decreased the number of visitors that can stay overnight in Yosemite Valley. This not only reduces the number of visitors that can have an overnight experience of Yosemite Valley, but the related higher proportion of day use may encourage greater concentrations of use at the major attraction sites.

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3. GEOLOGIC AND HYDROLOGIC VALUES, INCLUDING WATER QUALITY AND FREE FLOWING CONDITION

Geologic and Hydrologic Outstandingly Remarkable Values

The Merced River is the product of geologic and hydrologic processes that continue to shape the landscape. Glaciation and river erosion, coupled with the influence of bedrock fractures, carved pathways that the Merced River continues to follow, creating the river's variable gradients and dramatic changes in water speed and volume. Flows through classic, glacially carved canyons, over sheer cliffs and steep cascades exemplifying stair-step river morphology, through an alluvial landscape in Yosemite Valley, and past an exemplary boulder bar in El Portal.

River Segment 1: Merced River above Nevada Fall

The upper Merced River canyon is a textbook example of a rare, U-shaped canyon that was carved by glaciers.

This segment of the Merced River is characterized by a large-scale, U-shaped, glacially carved canyon. The Merced River above Bunnell Cascade highlights the relationship between geology and river course, as exemplified by the sweeping, glacially sculpted granite canyon that cradles the river.

River Segment 2: Yosemite Valley

The "Giant Staircase," which includes Vernal and Nevada falls, is one of the finest examples in the western United States of stair-step river morphology.

This river segment, famous for its glacially carved landforms, is unique in the scale, variety, and sheer grandeur of its celebrated rock and water features. Dropping over the 594-foot Nevada Fall and then the 317-foot Vernal Fall, the Merced River creates what is known as the "Giant Staircase." This exemplary stair-step river morphology is characterized by substantial variability in river hydrology, from quiet pools such as Emerald Pool to the dramatic drops in the waterfalls.

The Merced River, from Happy Isles to the west end of Yosemite Valley, provides an outstanding example of a rare, mid-elevation alluvial river.

In Yosemite Valley, the Merced River is alluvial, characterized by a gentle gradient, a robust flood regime with associated large woody debris accumulation, and complex riparian vegetation. There are few examples in the Sierra Nevada of similar river morphology at this scale and elevation (about 4,000 feet).

River Segment 4: El Portal

The boulder bar in El Portal was created by changing river gradients, glacial history, and powerful floods. These elements have resulted in accumulation of extraordinary, large boulders, which are rare in such deposits.

When river gradients decrease, rivers lose the energy needed to transport large sediments and boulders. In such areas, bar-type deposits—such as the large boulder bar at the east end of El Portal—are built up. This

rare boulder bar contains massive boulders measuring over a meter in diameter and weighing many tons. It is the combination of boulder availability, steepness of the river in the gorge, major change in gradient and valley width at El Portal, and size of the Merced's peak floods that enables the river to create such a boulder bar. As illustrated by the January 1997 flood, the Merced continues to sort and build this bar, providing evidence in all seasons of the river's potential erosional and depositional ability.

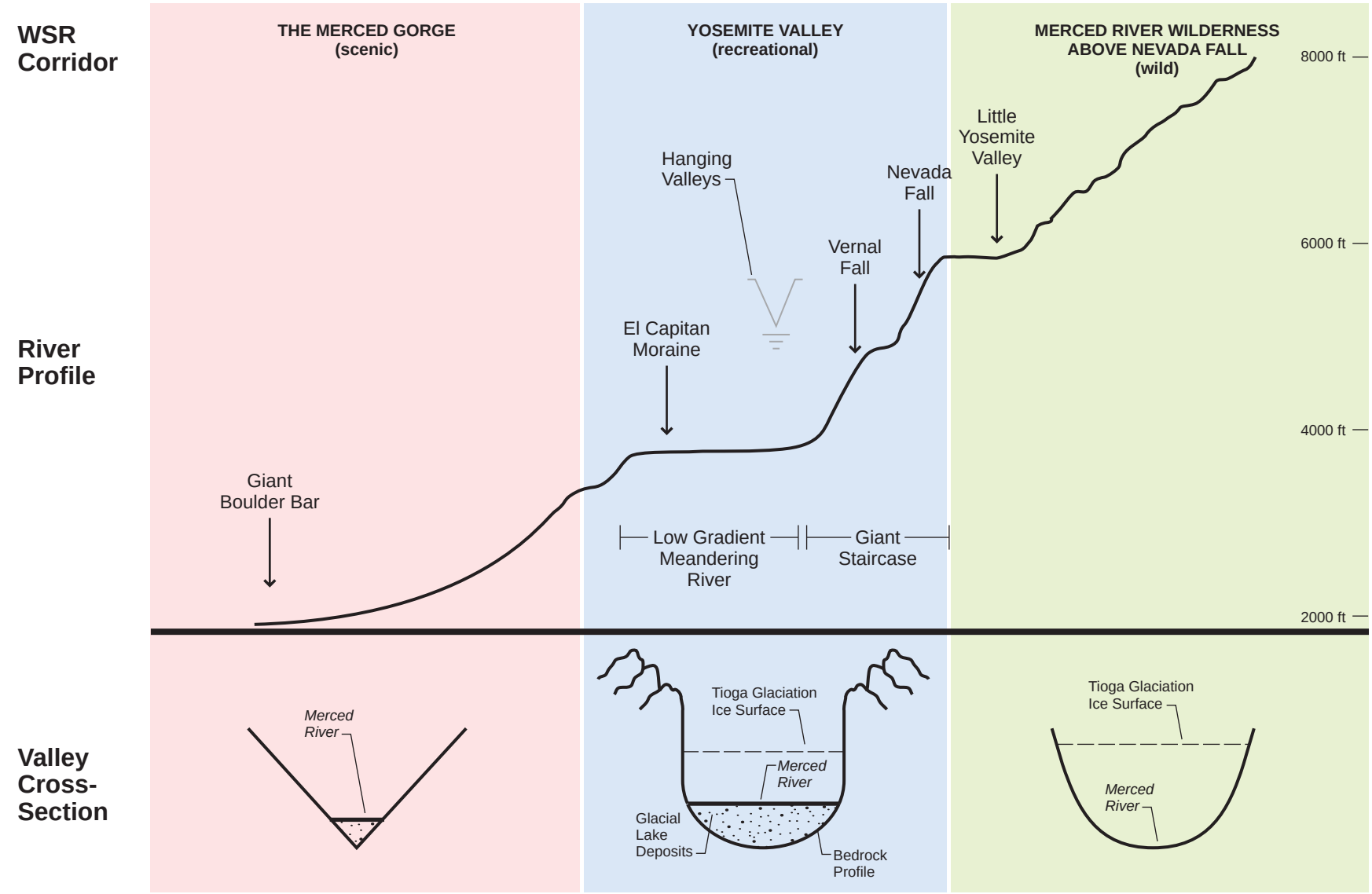
Geologic and Hydrologic ORV Conditions

1& 2) Free-flowing Condition and Water Quality:

The glacial pathways that carved the Merced River and South Fork Merced River valleys form strikingly varied gradients and features. The Merced River begins in a high alpine setting and flows through steep gradients before transitioning to alpine valleys. The river then flows down sheer cliffs in waterfalls and cascades, creating some of the most dramatic views in the world, including Nevada Fall and Vernal Fall. As the river enters Yosemite Valley, its gradient quickly drops and the Merced becomes a gentle, meandering river. Here, in contrast to the dramatic falls and cascades above, the river is characterized by an active floodplain, bank erosion, meandering channel, and channel cutoff. Downstream of Yosemite Valley, the Merced River enters the Gorge where it again becomes a steep, tumbling river. These varied gradients, illustrated in Figure 3-1, offer dramatic views and experiences that are found in few other places on earth.

The underpinning features of this relatively unspoiled river that led, in part, to its designation as a Wild and Scenic River, are its free-flowing condition and high water quality. Compared to other rivers in the Sierra Nevada, the Merced River has remained relatively untouched throughout Yosemite National Park. The river has been allowed to undergo natural stream processes that many rivers in more developed areas no longer experience. These processes include erosion, deposition, channel avulsion (i.e., abandonment of an old river channel and the creation of a new one), and regular flooding, which have led to the development of complex channel patterns and valuable riparian and wetland habitat. However, people have sought to control channel erosion and avulsion in Yosemite Valley to support development, which has caused a reduction in these natural processes and the associated habitat niches they create. The upper watersheds of the Merced River and the South Fork Merced River are entirely within designated Wilderness and are protected from development. As a result, water quality in the Merced and South Fork Merced is very high, and these river segments provide excellent habitat for aquatic organisms.

*3) **Geologic Processes***: The rocky cliffs, cascades, and broad valleys along the Merced River represent a nationally significant example of a glaciated landscape. The general Sierran landforms were all well established before glaciation, and the major stream drainages provided the avenues that the glaciers would later follow. The course of the present-day Merced River is determined by the path of glaciers that came and went during the geological epoch known as the Pleistocene (10,000 to 1.8 million years ago) (Table 3-1). These glaciers transformed valleys from V-shaped to U-shaped, left hanging valleys along their lower reaches, and deposited thick packages of glacial till—ultimately shaping the iconic landscapes for which Yosemite Valley and the upper Merced River are now known (Figure 3-2). Most researchers agree that at least three major glacial advances, or stages, have taken place: the Tioga, the Tahoe, and a much older pre-Tahoe (possibly the Sherwin). The Tioga glaciation is considered to have peaked around 20,000 years BP, but the precise timing of the earlier stages is still a topic of debate.



Note: River profile adapted from California Division of Mines and Geology Bulletin 182, 1962
Not to scale

SOURCE: ESA, 2010; CDMG, 1962

Merced River Comprehensive Management Plan

Figure 3-1

Schematic Longitudinal Profile and Cross-sections along the Merced River

TABLE 3-1: GLACIAL CHRONOLOGY OF YOSEMITE VALLEY

Sierra Glaciation	Age (approximate)	Characteristics/Evidence
Tioga	26,000 to 18,000 years ago	Minimal gullying of flanks Terminal moraine nearly complete except for narrow breaching by axial streams
Tahoe (or Tahoe II)	80,000 to 140,000 years ago	Flanks deeply gullied Termini eroded, mostly removed
Sherwin ("pre-Tahoe")	800,000 years ago	Scattered erratic boulders and formless bodies of till

BP = Before Present

SOURCE: Glazner and Stock 2010

The Tioga, Tahoe, and pre-Tahoe glaciations affected most of the Sierra Nevada (Table 3-1). These glacial processes are not by themselves rare; however, it is the combination and quality of glacial features present along the Merced River that makes its geological and hydrological processes unique and exemplary.

Following the upper Merced River through Yosemite Valley and down the Merced River Gorge, the limits, depths, or even absence of prior glaciers created an extraordinary variety of landscapes from the classic U-shaped valley along the upper Merced River above Nevada Fall to the V-shaped valley that characterizes the Merced River Gorge, as illustrated in Figure 3-1.

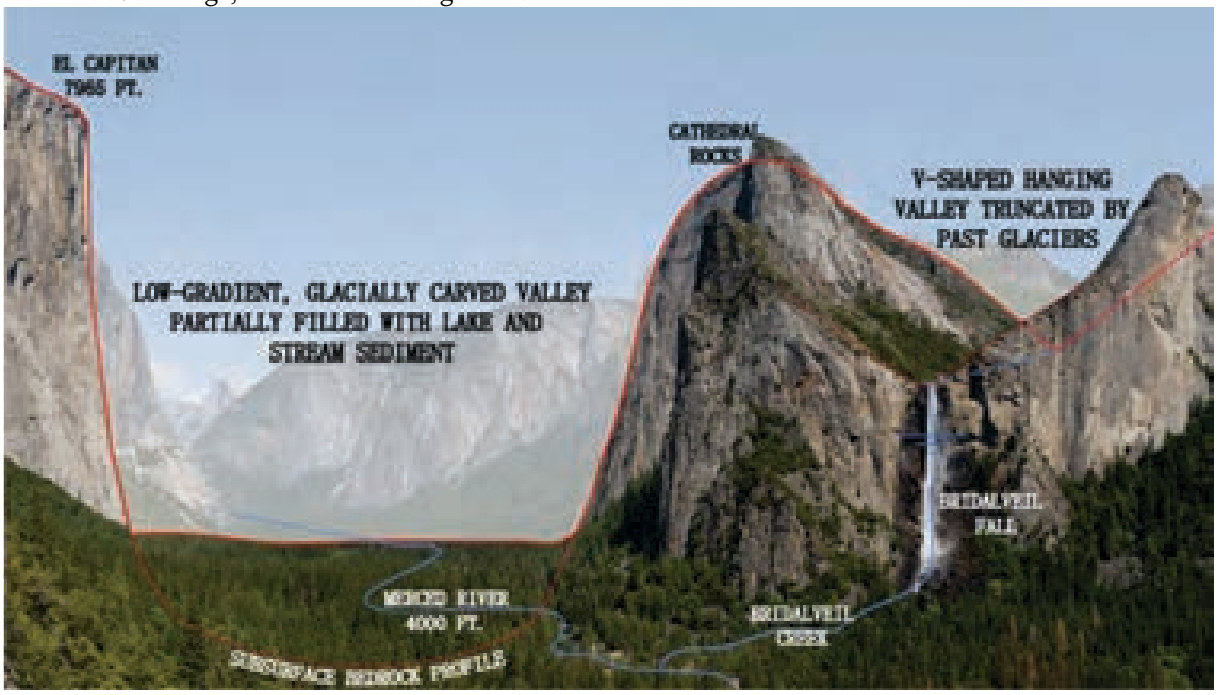
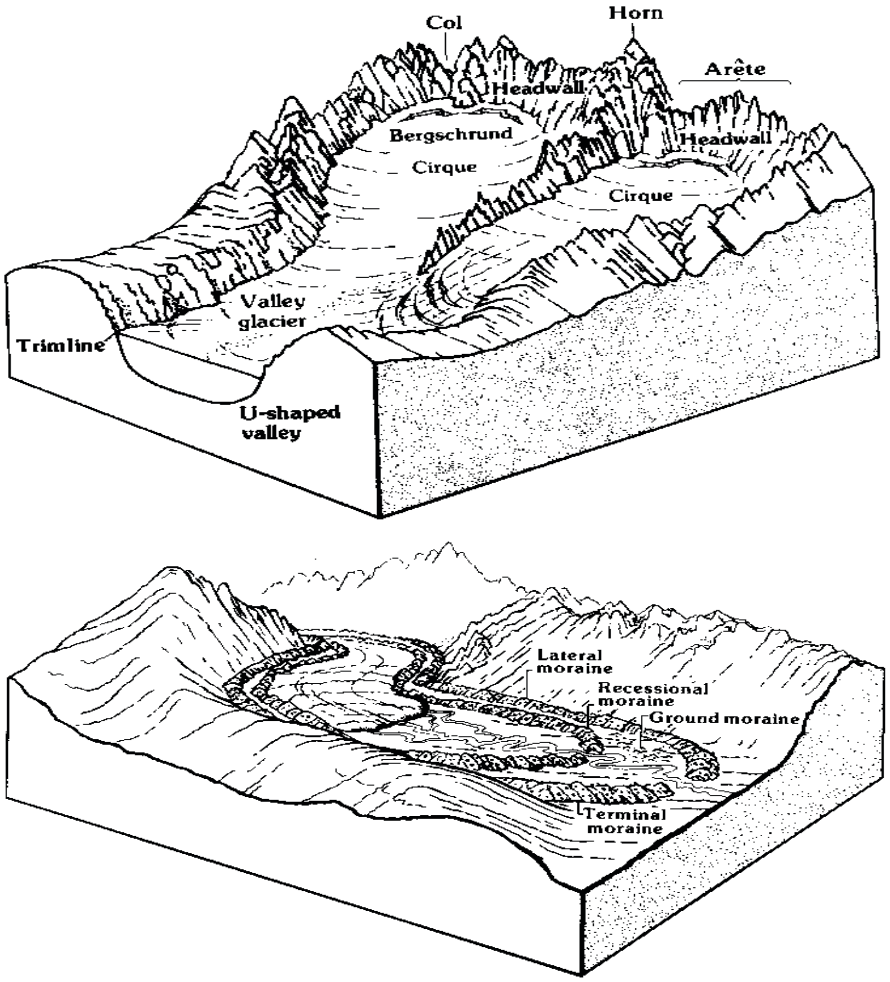


Photo Credit: NPS Panoramic Imaging Project

Figure 3-2
Yosemite Valley

François Matthes, who pioneered the study of Yosemite Valley's geology, continued the use of John Muir's term for Yosemite as being the "incomparable valley" largely due to the variety of geologic processes that are evident within the same panoramic views (Matthes 1930). When the Tioga-age glacier retreated from Yosemite Valley, it left behind a moraine across the Merced River. Acting as a natural dam, the Valley floor filled with sediment-laden waters that eventually formed a low-gradient platform along which the Merced

River could meander. This system facilitated the development of a rich riparian and meadow complex (Huber 1989). Because the most recent glaciations did not reach the rim of Yosemite Valley, the highest ridges and peaks have been exposed to natural weathering processes, creating the broken spires and irregularly sculpted surface that glaciers would normally polish away (Huber 1989; Glazner and Stock 2010). The valley walls below the glacial trimline exhibit textbook evidence of prior glaciers, such as glacial moraines and steep, polished surfaces (Figure 3-3). The type, quality, and variety of geological and hydrological features evident along the Merced River are unparalleled.



SOURCE: Huber 1989

Figure 3-3
Classic Elements of Glacial Landforms

River Segments 1 and 5: Merced River above Nevada Fall and South Fork Merced River above Wawona

These segments of the Merced River contain the most undisturbed riverine conditions in Yosemite National Park. The Merced River and South Fork Merced River watersheds lie entirely within the Yosemite Wilderness, so relatively few changes have been made to the river along these segments. These watersheds contain over 1,000 lakes and ponds, 36 miles of free-flowing river, and extensive high-altitude wetland complexes.

The Merced River above Nevada Fall descends from its headwaters through a glacially carved canyon, dropping from roughly 13,000 feet to 6,000 feet over a distance of 12 miles (Figure 3-4). Four tributaries to the Merced River (the Lyell Fork, Triple Peak Fork, Merced Peak Fork, and Red Peak Fork) meet in a low-gradient, glacially carved valley at approximately 7,500 feet. Below Bunnell Cascade, the Merced River enters Little Yosemite Valley, another low-gradient, glacially carved valley. Here, the river meanders across its floodplain, creating oxbow lakes and meander cutoffs. Just above the confluence of Sunrise Creek, a large, centuries-old logjam impounds the river. Logjams like this one are important for the development of complex river morphology. They have a profound influence on the formation of floodplain patterns and profiles, creating a diversity of channel forms and aquatic habitats (Montgomery and Abbe 2006). The location of this logjam is shown in Figure 3-4.

The headwaters of the South Fork Merced River originate near Triple Divide Peak at an elevation of over 10,500 feet. Upstream from Wawona, tributaries enter the steep-walled canyon of the South Fork from the north and south. Downstream from Wawona, the South Fork once again enters a steep canyon and is largely inaccessible, having no trail crossings in this reach. Chilnualna, Big, Alder, and Bishop Creeks are major tributaries to the South Fork.

Condition at the Time of 1987 Designation

Free-flowing Condition.

When the Merced River was designated as Wild and Scenic, Segments 1 and 5 had a few small structures, as well as riprap, that minimally impeded flow. Several small footbridges crossed the river in these areas. A small diversion wall above Nevada Fall also impounded flow. Approximately four small, wooden footbridges crossed the Merced River upstream of the Nevada Fall Bridge and created minor constrictions. On the South Fork, the river was largely inaccessible to hikers, so there were no footbridges or impoundments. No sections of the riverbank contained riprap or were otherwise hardened, and the river actively migrated and avulsed over time, creating the geomorphic conditions that contributed to diverse ecological niches. Channel avulsion was especially pronounced in the vicinity of the Little Yosemite Valley logjam.

Water Quality. At the time of designation, water quality in the South Fork Merced River above Wawona was characterized as high, with minor indications of impacts from human activities (NPS 1994). The water was generally found to be low in nutrients, salts, and suspended sediment and high in dissolved oxygen (NPS 1994). Although limited data had been collected for the Merced River above Nevada Fall, the available information indicated that water quality here was high (Clow et al. 1996).

Geologic Condition (U-shaped Canyon ORV). The segment of the Merced River above Nevada Fall runs through a large-scale, U-shaped, glacially carved canyon (Figure 3-5). The Merced River above Bunnell Point highlights the relationship between geology and river course, as exemplified by the sweeping, glacially sculpted granite canyon that cradles the river. At the time of designation, the geologic value of this ORV element (the U-shaped, glacially carved canyon) was unaffected by human activities. Segment 5 does not contain geologic ORVs.

Current Condition

Free-flowing Condition. No additional structures have been placed in the bed and banks of the river since the time of designation. All structures that existed at the time of designation remain, including the diversion wall above Nevada Fall and several small footbridges.

Water Quality. Water quality in these two river segments remains high. Nutrient levels in these segments are generally low (Brown and Short 1999). Nitrogen concentrations are higher above Nevada Fall than in Yosemite Valley, which is consistent with the lower rate of nitrogen assimilation that occurs at higher elevations (Brown and Short 1999).

Several studies have attempted to discern a link between pack stock use and transport of pathogens to receiving waters in River Segment 1 (Derlet and Carlson 2002; Derlet and Carlson 2006; and Derlet et al. 2008). These studies were considered for inclusion in this report, but they lack the scientific rigor necessary for drawing conclusions on water quality impacts from pack stock use in this segment.[26] In contrast, NPS water quality monitoring (using standard water quality monitoring methods) in wilderness sites downstream of more heavily used pack stock sites (Lyell Fork Tuolumne River at Twin Bridges and Tuolumne River below Conness Creek (outside the Merced River corridor) show low levels of pathogens over multiple samples and multiple years (Clow et al. 2011). Overall, water quality in wilderness areas appears to be excellent. These sites will continue to be monitored as part of the NPS water quality monitoring program.

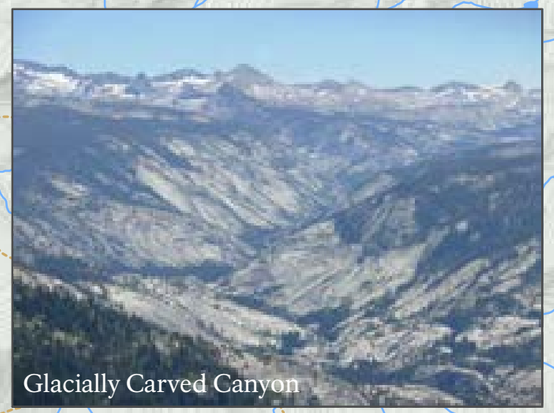
Geologic Condition (U-shaped Canyon ORV). The river- and glacier-carved landscapes along the Merced River are the result of varying geologic processes operating over immense spatial and time scales. Since the time of designation, human intervention has not perceptibly modified the ORV elements arising from these geologic processes.

Preliminary Management Considerations

There are no preliminary management considerations associated with the Geologic/Hydrologic ORV in segments 1 and 5.

[26] These studies did not use rigorous, published methods for water sample collection and storage, did not define sample locations and dates, and did not employ repeat sampling over time at any one location.

Half Dome
Diving Board
Little Yosemite Valley Rangers Station
John Muir Trail
Moraine Dome
Little Yosemite Valley
Lost Lake
Lost Creek
Mount Broderick
Liberty Cap
Logjam
Little Yosemite Valley Backpackers Campground
Starr King Lake
Cascade Cliffs
Bunnell Point
Merced River
Echo Valley
Moraine Dome Backpackers Campground
Merced Lake Backpackers Campground
Merced Lake High Sierra Camp
Merced Lake
Merced Lake Ranger Station
Tuolumne River Watershed
Merced River Watershed
Mount Florence
Mount Lyell
Yosemite Wilderness
Mount Starr King
Quartzite Peak
Gray Peak Fork
Washburn Lake
Lyell Fork Merced River
Electra Peak
Mount Clark
Mount Ansel Adams
Foerster Peak
Gray Creek
Red Peak Fork Merced River
Merced Peak Fork Merced River
Triple Peak Fork Merced River
Forester Creek
Harriet Lake
Long Mountain
Gray Peak
Red Creek
Red Peak
Isberg Peak
Ansel Adams Wilderness
Ottoway Creek
Ottoway Peak
Edna Lake
Merced Peak
Merced River Watershed
South Fork Merced River Watershed
Triple Divide Peak
Sadler Peak
Post Peak
0 0.5 1 Miles


Glacially Carved Canyon

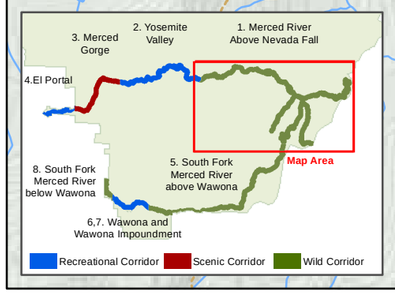


Figure 3-4
Geologic/Hydrologic ORV - River Segment 1.
Merced River Above Nevada Fall
Wild WSR Corridor

Wild WSR Corridor Classification
Recreational WSR Corridor Classification
Giant Staircase
U-Shaped Glacially Carved Canyon
Watershed Boundary
Yosemite National Park Boundary
Lake
High Sierra Camp
Backpackers Campground
Ranger Station
Trail
Stream/River
100' Contour Line

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
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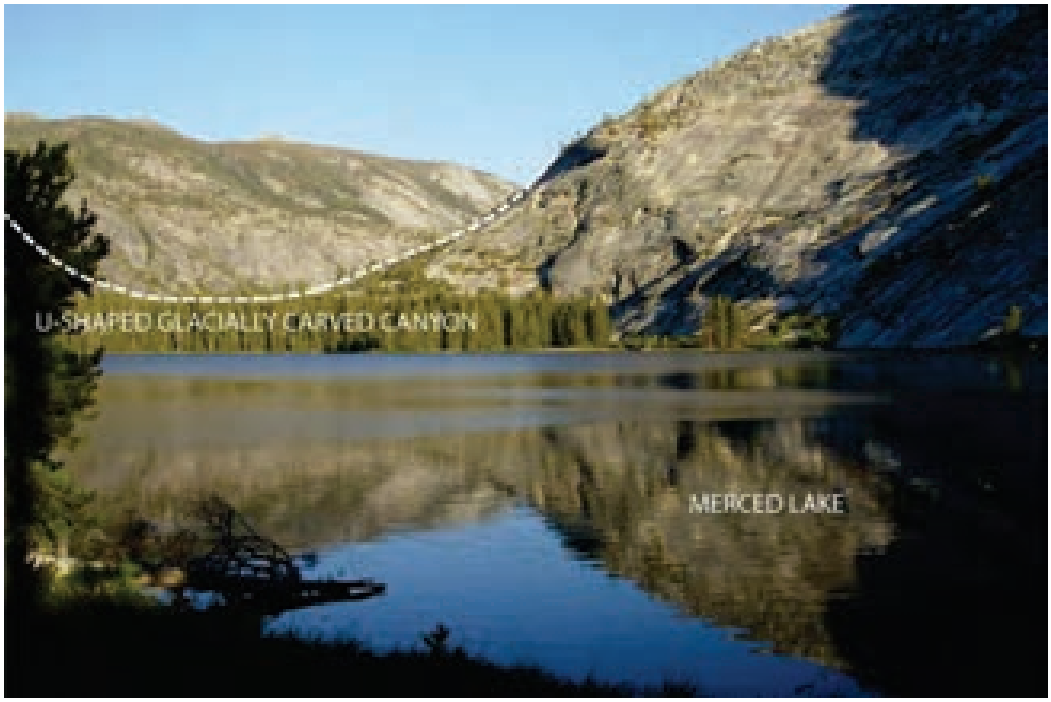


Photo Credit: Mike Yochim

Figure 3-5
U-shaped, Glacially Carved Canyon
along the Upper Merced River

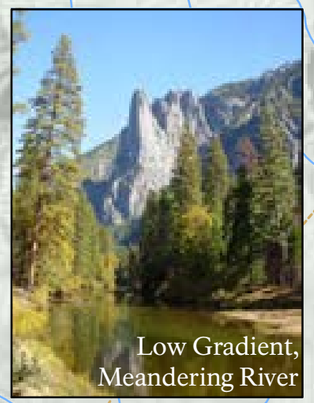
River Segment 2: Yosemite Valley

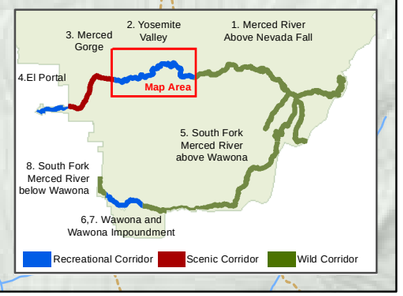
The Merced River plunges into Yosemite Valley via Nevada and Vernal Falls, descending from 6,000 feet to the Valley floor over a distance of two miles. At 594 feet in height, Nevada Fall is one of the tallest waterfalls in the United States. Together with the 317-foot-high Vernal Fall, these waterfalls form what is known as the Giant Staircase. As the river crosses the floor of Yosemite Valley, its character changes dramatically in response to the changing geology and gradient of the Valley. Between Nevada Fall and Happy Isles, the river transitions from a granite bedrock channel, to a cascade formed by huge boulders that have fallen from the Valley walls since glacial times, to a step-pool channel formed from smaller talus and woody debris from the surrounding forests. Downstream of Happy Isles, the gradient changes from 2% to less than 1% as the river transitions from a cobble and boulder plane-bed to a riffle-pool morphology in the alluvial sands and gravels of the Valley floor. In its alluvial portion through the east and west Valley, the channel is almost flat. This low gradient is due to the sediment deposited by the river since the last glaciation and the glacial moraine between El Capitan and Cathedral Rocks. The El Capitan recessional moraine rises 58 feet above the Valley floor. Since the last glaciation, this moraine has provided a partial dam that slowed floodwaters causing sedimentation upstream, giving the Valley its characteristic flat floor, and contributing to the development of extensive wet meadows (Milestone 1978).

The Merced River flows across the Valley floor in a series of meanders (Figure 3-6). Aerial photos and maps reveal a series of relict meander oxbows that were created and abandoned as the river migrated across the Valley floor. These forms, and the processes that created them, are integral to the free-flowing condition of the Merced River and form a key linkage between the geomorphic processes of the river and the ecology of the Valley floor. Meanders migrate downstream and towards the outer bend over time, eroding a river's

Yosemite Wilderness

Lehamite Falls
Yosemite Creek
Arrowhead Spire
Upper Yosemite Fall
Yosemite Point
Eagle Tower
Lower Yosemite Fall
Royal Arch Creek
North Dome
Jack Snow Creek
Snow Creek Trail
Yosemite Village
Royal Arch Cascade
Washington Column
Columbia Rock
Eagle Creek
Eagle Peak
Ahwahnee Road
The Ahwahnee Hotel
Royal Arches
Cook's Meadow
Ahwahnee Meadow
Sugar Pine Bridge
Valley Loop Trail
Mirror Lake Road
Half Dome
Three Brothers
Middle Brother
Yosemite Lodge
Sentinel Bridge
Superintendent's Bridge
Ahwahnee Bridge
Stock Bridge
Housekeeping Bridge
Housekeeping Camp
Stoneman Bridge
Stoneman Meadow
North Pines
Tenaya Bridge
Diving Board
Valley Loop Trail
Sentinel Meadow
Leidig Meadow
Lower Brother
Swinging Bridge
Lower Pines
Clark's Bridge
Curry Village
Moran Point
Union Point
Upper Pines
Staircase Falls
Ribbon Fall
El Capitan Trail
El Capitan
Northside Drive
Hirsplate Creek
El Capitan Recessional Moraine
Happy Isles Bridge
Mount Broderick
Glacier Point
Sentinel Rock
Four Mile Trail
Grizzly Peak
Big Oak Flat Road
Rockslides
Slaughterhouse Meadow
Merced River
Southside Drive
El Capitan Meadow
El Capitan Bridge
Sierra Point
Emerald Pool
Mist Trail
Vernal Fall
Nevada Fall
Liberty Cap
Sentinel Fall
Pohono Trail
Sentinel Dome
John Muir Trail
El Portal Road
140
Pohono Bridge
Bridalveil Meadow
Gunsight
Bridalveil Fall
Panorama Cliff
Illilouette Creek
Panorama Point
Illilouette Fall
Cathedral Spires
Cathedral Rocks
Former Cascades Diversion Dam Site
Old Wawona Road
41
Leaning Tower
Taft Point
The Fissures
Glacier Point Road
Stanford Point
Meadow Brook
Artist Creek
Silver Strand Falls
Crocker Point
Dewey Point
Bridalveil Creek
Pohono Trail
Sentinel Creek





0 0.5 1
Miles

Figure 3-6
Geologic/Hydrologic ORV - River Segment 2.
Yosemite Valley
Recreational WSR Corridor

- Recreational WSR Corridor Classification
- Scenic WSR Corridor Classification
- Wild WSR Corridor Classification
- Buildings
- Campground
- 100 Year Flood Boundary
- Giant Staircase
- U-Shaped Glacially Carved Canyon
- Low Gradient, Meandering River
- B Road bridge
- B Footbridge
- Waterfall
- Stream/River
- Road
- Valley Loop Trail
- Bike path
- Boardwalk
- Trail
- 100' Contour Line

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 3-6

outside banks and depositing sediment to form a new floodplain[27] on its inside banks. Channel migration across the floodplain supports several ecological processes.

Deposition of new floodplain sediment creates unvegetated banks that undergo vegetation succession. Pioneer species, seedlings, and light-loving species are able to establish, creating new stands of young vegetation in contrast to the older stands of mature shady trees on the outside banks. Madej et al. (1991) and Florsheim (2008) have argued that bank erosion and channel migration are fundamental to maintaining the processes that underpin many of the functions, forms, and landscapes that are valued in the Merced and other river corridors.

Bank erosion on outside bends creates important habitat areas, such as overhanging banks and undercut tree roots that shelter fish from predation (Florsheim et al. 2008; Sullivan et al. 1987). Over time, bank erosion causes trees to fall into the river, adding nutrients to the base of the food chain and providing hydraulic complexity that creates feeding lanes and shelter for fish and other organisms. In addition, large wood increases flow resistance, reducing overall erosion levels while creating patchworks of local pool scour and sediment deposition that further diversify aquatic habitats. When present in sufficient volume, large wood can block the channel and deflect the stream currents, leading to more dramatic avulsions in the stream channel that create oxbow lakes, abandoned high-flow channels, and wetlands. The combination of gradual migration and occasional, dramatic avulsion creates a diverse combination of habitats on the floodplain.

Condition at the Time of 1987 Designation

Free-flowing Condition (Mid-elevation Alluvial River ORV).

Although the ORV conditions assessment is based on conditions at the time of Merced Wild and Scenic River designation, it is helpful to describe changes occurring prior to this time so as to understand trends in the river condition. Between Nevada Fall and the Happy Isles Bridge, the river was naturally controlled by bedrock and massive talus boulders that made it more resistant to human impacts than the alluvial reaches downstream. Though the trails through this area were heavily used and there are three river crossings, there was less direct access to the river banks than on the more approachable reaches downstream. The free-flowing condition of the river was largely intact, with only minor constrictions at the Nevada Fall Bridge, the Happy Isles Bridge, the Happy Isles Gaging Station footbridge, and two footbridges on the Mist Trail. From Happy Isles Bridge to Clark's Bridge, the channel had a gradient of 1% and was confined on the right bank by moraines for much of its length. Relatively speaking, this reach was sparsely used by visitors to the park and was generally stable at the time of designation (Madej et al. 1991).

Below Clark's Bridge, the river gradient dropped to 0.16% (Madej et al. 1991) and became a meandering alluvial system. Although the alluvial reach of the Merced River across the flat, heavily visited portion of Yosemite Valley was relatively free-flowing compared to most rivers in California, this segment was the most impacted reach of the river within Yosemite National Park, especially within the east Valley floor between Clark's Bridge and Sentinel Bridge. Between the Euro-American discovery of the Valley in 1851 and the Merced River's designation as Wild and Scenic in 1987, the river in this segment had been somewhat modified compared to other segments in the park.

In 1879, large boulders were blasted to deepen and widen the river gap through the El Capitan moraine,

27 As defined in this report, a floodplain is the land adjacent to the river that is inundated periodically during high water. Floodplains contain several geomorphic features that are important to river health, such as oxbows, point bars, meander scrolls, overbank deposits, and logjams. The term "floodplain" is a geomorphic term and does not refer to a regulatory boundary, such as the 100-year floodplain.

which lowered the base level of the Merced River (Milestone 1978). As a result, the extent and frequency of flooding in the upstream meadows were reduced within approximately three to four miles of the moraine (approximately up to Superintendent's Bridge), leading to drier conditions and the loss of wetlands.

Large wood, such as downed trees and logjams, had been removed from the river since the 1870s to reduce flood risk near bridges and to facilitate road construction and river recreation. In the 1970s, park policy dictated that the channel should be cleared of wood from Happy Isles to Pohono Bridge (Madej et al. 1991). The removal of large wood contributed to channel simplification, creating a more homogeneous river. The practice has encouraged faster, more erosive flows and promoted vertical channel erosion (downcutting) rather than point bar creation, lateral migration, and avulsion. It has also removed a source of nutrients, cover, and substrate for aquatic organisms (Montgomery and Piégay 2003). Madej et al. (1994) conducted an inventory of large wood that provides the best picture of wood loading around the time of designation in 1987. They found 12 pieces of wood per kilometer in the upper study reach (between Clarks Bridge and Sentinel Bridge) and 29 pieces/km in the lower reach (comprising the 1.6 miles upstream of El Capitan Bridge). Cardno ENTRIX (2011) repeated this survey in 2010 (discussed below) and found that the level of wood loading reported in 1994 was 7-17% of the levels found in natural systems within the Douglas fir-ponderosa pine forest of the eastern Cascades (Fox and Bolton 2007). Current practice within the rafting recreation zone (between Stoneman Bridge and Sentinel Beach Picnic Area) is to leave wood in the river but to move it as needed to create safe lanes of travel. Outside this zone, wood is manipulated only if it directly impacts infrastructure (Roche 2011b).

Evidence such as historical maps and floodplain topography suggests that the Merced River has always had a high rate of lateral erosion, which may have increased in response to human activities, such as trampling along the banks. Between 1879 and the early 1970s, NPS performed extensive bank stabilization to prevent channel migration near campsites and infrastructure. By 1987, 25% of the Merced River bank had undergone bank revetment (i.e., lined with riprap) between Clark's Bridge and Sentinel Bridge, the area with the greatest infrastructure and human presence. In the west Valley (downstream of Swinging Bridge), only 2% of the channel is riprapped. Riprap, though successful in preventing channel erosion, inhibits the free-flowing condition of the river by preventing natural stream processes such as lateral migration and point bar formation (Florshiem et al. 2008; Schmetterling et al. 2001). Between 1919 and 1986, visitor trampling along the banks and human use of the banks as access points to the river between Clark's Bridge and Sentinel Bridge had damaged riparian vegetation, which allowed banks to widen by an average of 27% along this reach and by over 100% in some locations. At the time of designation, 39% of the Merced River in Yosemite Valley was actively eroding, even though 25% of the eroding channel had been lined with riprap in an effort to control bank erosion. Downstream in the west Valley, 25% of the banks were actively eroding and only 2% were lined with riprap, allowing more natural channel dynamics. Madej et al. (1991) found a strong association between levels of human use around campsites and river access points and the loss of riparian vegetation cover and accelerated bank erosion.

Eleven bridges spanned the Merced River between Happy Isles and the Pohono Bridge at the time of designation. All of these bridges constricted flow to some degree, but hydraulic constrictions were especially pronounced at the five arch bridges built in the 1920s (Clark's Bridge, Ahwahnee Bridge, Sugar Pine Bridge, Stoneman Bridge, and Sentinel Bridge) as well as at Housekeeping Bridge. The locations of these bridges are shown in Figure 3-6. Milestone (1978) found the average constriction to be almost 50 feet, or 40% of the natural channel width. These bridges created backwaters and excessive sediment deposition upstream, resulting in more rapid scour downstream. Bridges also created hard points that anchored channel migration, preventing channel evolution. Some bridges—for example, Sugar Pine Bridge—created such strong confinement and upstream aggradation that they appear to have accelerated channel avulsions

along alternative flow paths that were starting to develop before the bridges were constructed. The effects of some of these bridges were exacerbated by the elevated road causeways leading to them, which intercepted and concentrated floodplain flows at high water.

At the time of designation, the Happy Isles Dam, a 6-foot-high structure spanning the river near Happy Isles, created a barrier to flow though no longer used to produce electricity or divert water.

Water Quality.

At the time of designation, water quality in Yosemite Valley was characterized as high, with minor indications of impacts from human activities. The water was generally found to be low in nutrients, salts, and suspended sediment, and high in dissolved oxygen. Occasional concentrations above freshwater criteria were noted for lead, cadmium, and mercury (NPS 1994). Given the proximity of the river to development, these pollutants may have originated as runoff from impervious surfaces (such as parking lots and roads) or leakage from underground tanks or landfills.

Geologic Condition

Yosemite Valley contains one Geologic ORV, the Giant Staircase, as shown in Figure 3-6.The Giant Staircase, which includes Vernal and Nevada Falls, is one of the finest examples of stair-step river morphology in the country (Figure 3-7). The abrupt elevation changes of this feature illustrate the variability of the Merced River's hydrology. The Giant Staircase is a large-scale geologic feature created by the combined actions of past glaciers and local differences in the resistance of the underlying granite rock to erosion. The ORV element had not been perceptibly modified (e.g., alteration of topography via quarrying or blasting) at the time of designation.

Current Condition

Free-flowing Condition (Mid-level Alluvial River ORV).

Since the Merced Wild and Scenic River designation, localized riverbank restoration projects have been implemented in this segment at Housekeeping Camp, North Pines Campground, Sentinel Bridge, the former Lower River Campground, and the original El Capitan Picnic Area. The El Capitan Picnic Area has been relocated farther from the river as part of these restoration projects. Restoration techniques have included soil decompaction, revegetation, bioengineering stabilization, riprap removal, and installation of fencing to protect restored areas. In addition, the Happy Isles dam, present at the time of designation, was removed. These actions eliminated some causes of changes to the alluvial processes; however, the fundamental causes of channellization remain, including the removal of large wood from the channel, bank revetment, bridge confinement, and continued bank erosion. Through these restoration projects, approximately 1,700 cubic yards of riprap have been removed from the banks of the Merced River, 2,600 feet of biotechnical bank stabilization have been installed, and 15,000 feet of fencing have been installed (numbers estimated from Cardno ENTRIX 2011). The installation of riprap largely ceased in the early 1970s, and no new hardened bank stabilization has been added since the time of designation. Since 1987, the river has undermined riprap in some locations, and bank erosion is occurring behind the lines of riprap.

Large wood continues to be managed, although less aggressively than at the time of designation. The current maintenance practice is to move large wood that threatens boaters from the center of the channel to the edges where possible (Roche 2011a), although this practice is not official park policy. Cardno ENTRIX (2011) repeated the large wood loading study of Madej et al. (1994) and found that in the upper reach wood loading had increased from 19 to 70 pieces per mile, while in the lower reach the load had increased from 47

to 97 pieces per mile. This increase was attributed to a combination of changes in NPS management and bank erosion and wood recruitment resulting from the 1997 flood. Within the Valley, wood loading varies, with the highest levels found in the Happy Isles reach. However, for the Valley as a whole, large wood loading is still below levels found in comparable natural settings, with a level of approximately 26-35% of that found in a similar study of unmanaged watersheds in the eastern Cascades (Cardno ENTRIX 2011).

Hydraulic restrictions due to bridges remain similar to the levels that existed at the time of designation. One bridge (the Happy Isles Gage Bridge) was removed from the channel following the 1997 flood, and Sentinel Bridge was reconstructed immediately upstream of its original location. Anecdotal evidence suggests that deposition upstream of bridges—notably at Sugar Pine Bridge—has continued. This has created conditions that make channel avulsion around the bridge more likely than was the case in 1987. Large scour holes still exist near bridges in the Valley.

This segment has undergone further bank erosion and widening since the time of designation in 1987. Erosion has occurred primarily on the outside of meander bends, with the most significant location being near Sentinel Beach Picnic Area. Channel widening also occurred through erosion of both banks between Swinging Bridge and El Capitan Picnic Area and on the outer bends between El Capitan Picnic Area and El Capitan Meadow (Cardno ENTRIX 2011).

Water Quality.

In recent years, several studies have been conducted on water quality in Yosemite Valley. Water quality remains high, with most water quality constituents measured near natural background levels. Bacteria levels have been higher in the vicinity of Sentinel Bridge and Pohono Bridge than elsewhere in the watershed, but those levels are well below public health limits (Clow et al. 2011). Nutrient concentrations are very low (Brown and Short 1999) and have been near background levels for similar undeveloped areas (Clow et al. 2011). Nitrogen concentrations are lower in Yosemite Valley than in the watershed above Nevada Fall, which is consistent with the effects of atmospherically deposited nitrogen and the lower rate of nitrogen assimilation that occurs at higher elevations. Phosphorus levels are higher in Yosemite Valley than levels above Nevada Fall, reflecting typical patterns of phosphorus weathering due to increased drainage area size (Clow et al. 2011). Dissolved oxygen levels are very high, with most samples near 100% saturation (Brown and Short 1999). Nine to fourteen percent of water quality samples in Yosemite Valley indicate some presence of petroleum hydrocarbons (Peavler et al. 2008), most likely due to stormwater runoff from parking lots and roads; however, concentrations were well below water quality limits.[28] Since the time of designation, NPS has removed over 100 underground tanks, eliminating a potential source of contamination.

Geologic Condition. The river- and glacier-dependent landscapes along the Merced River (namely the Giant Staircase) are the result of varying geologic processes operating over immense spatial and time scales. The ORV elements created by geologic processes have not been perceptibly modified by human intervention since the time of designation.

Preliminary Management Considerations

The preliminary management considerations associated with the Geologic/Hydrologic ORV in segment 2 are as follows:

[28] The median concentration of samples tested for petroleum hydrocarbons was 0.023 mg/L (Peavler et al. 2008). The water quality action level for California waterbodies is 15 mg/L (California State Water Resources Control Board 2007).

Free flow/mid-level alluvial river:

- Several bridges are causing upstream deposition and downstream scour as well as creating the potential for flooding and uncontrolled channel avulsions. Table 3-2 describes the level of concern associated with each bridge as identified in an earlier study of this segment (Madej et. al. 1991).
- Large wood removal can affect channel migration and avulsion as well as many aquatic biological processes.
- Extensive bank hardening affects the free-flowing condition of the Merced River and artificially maintains the river in its existing shape.
- Trampling of riparian vegetation in the East Valley contributes to bank erosion, channel widening, loss of shade, increased water temperature, and other biological issues.
- Bank erosion is particularly focused near campsites and points where recreational users access the river.

Photo Credit: Mike Yochim

Figure 3-7
The Giant Staircase along the Merced River

River Segment 3: Merced Gorge

Once the Merced River flows out of Yosemite Valley, it enters the Merced Gorge, dropping about 2,000 feet over a distance of six miles. This segment is largely undeveloped, except for El Portal Road – which parallels the Gorge for its entire length – as well as other small facilities. These facilities include the electrical switching station, the Cascades Picnic Area, Arch Rock Entrance Station, and associated facilities. The Merced Gorge is characterized by steep boulder cascades and large step-pools.

Condition at the Time of 1987 Designation

Free-flowing Condition.

At the time of designation, the Cascades Diversion Dam, a 17-foot-high structure about 1 mile downstream of Pohono Bridge, impeded the free-flowing condition of the river. This structure was previously used for

small-scale electricity generation. This segment was otherwise free of impoundments that would impede flow or otherwise alter the free-flowing condition of the river.

Water Quality.

Limited water quality data were collected in the Merced Gorge, but the data indicated that water quality characteristics at the time of designation were similar to those in the Merced River in Yosemite Valley.

Geologic Condition.

There are no identified Geologic ORVs in this river segment.

Current Condition

Free-flowing Condition.

Cascades Diversion Dam was removed in 2004, restoring free-flowing conditions to this segment. Removal of the dam was followed by native vegetation planting and removal of an abandoned transformer.

During the 1997 flood, El Portal Road suffered significant damage when the Merced River eroded the road's embankments. After the flood, about 7.5 miles of the roadway were reinforced with riprap. There are no structures or other impediments in this segment that affect the free-flowing condition of the river.

Water Quality.

Water quality in the Merced Gorge is exceptionally high. Nutrient concentrations are very low (Brown and Short 1999) and have been found to be near the background levels in similar undeveloped areas (Clow et al. 2011). Dissolved oxygen levels are very high, with most samples near 100% saturation (Brown and Short 1999).

Preliminary Management Considerations

The preliminary management consideration associated with the Geologic/Hydrologic ORV in segment 3 is to design future embankment protection with the natural processes of the river in mind.

River Segment 4: El Portal

Through El Portal, the Merced River begins to lower in gradient and begins to deposit coarse boulders and cobbles that have been transported from upstream. As a result, the morphology of the river transitions rapidly from steep boulder cascades to step pools and from step-pools to a pool-riffle system. Here, the river begins to meander across boulder bars and riffles and becomes more longitudinally dynamic than in the Merced Gorge.

Condition at the Time of 1987 Designation

Free-flowing Condition.

In El Portal, a small deflection bar was located on the left bank of the Merced River, just downstream from the El Portal Road (Highway 140) bridge (Figure 3-8). This approximately 300-foot-long deflection bar was built to protect the Trailer Court area from flooding by pushing floodwaters away to the river's right.

Highway 140 had also cut off the floodplain and a historical meander, creating Odgers' Pond near El Portal. These constrictions somewhat increased flow velocities and reduced channel complexity, active floodplain inundation, and backwater habitat.

Other modifications to the river in this segment included several remnant rock diversions and the Greenmeyer Sand Pit, which was used to mine sand from the Merced River for park operational needs until 1997. In the course of developing the area, fill was added to secondary channels and the floodplain, including large boulders along the river to build a worksite and protect the site from flooding. A small concrete diversion structure just upstream of the area was used to divert flows and sediment to the work area.

Bridges on the Merced River near El Portal included the El Portal Road Bridge and the Foresta Road Bridge. Neither of these bridges created significant impoundments that affected the free-flowing condition of the river.

Water Quality.

At the time of designation, water quality in the Merced River in this segment was characterized as high, with minor indications of impacts from human activities. The water was generally found to be low in nutrients, salts, and suspended sediment and high in dissolved oxygen (NPS 1994). Elevated levels of nutrients and metals were measured below the El Portal Wastewater Treatment Plant, but water quality was still within established limits.

Geologic Condition.

When river gradients drop, rivers lose the energy needed to transport larger sediments and boulders. In such areas, bar-type deposits, such as the large boulder bar at the east end of El Portal, are built up. This is no ordinary boulder bar, however, for it contains massive boulders over a meter in diameter and weighing many tons. It is the combination of boulder availability, the steepness of the river in the gorge, the major change in gradient at El Portal, and the size of the Merced's peak floods that enables the river to build such a boulder bar.

Current Condition

Free-flowing Condition.

The condition of the river remains about the same as conditions at the time of designation. The river is still confined by roads and revetment, which in places encroach into the historical channel bed. The small deflection bar built to protect the Trailer Court still exists, as do the El Portal Road berm, remnant rock diversions, and the footprint of the Greenemeyer sand pit.

Water Quality.

Water quality in this segment is considered to be high. Bacteria levels are generally low, and dissolved oxygen is near saturation (Peavler et al. 2008). Nutrient concentrations are slightly elevated near the El Portal Wastewater Treatment Plant, especially during periods of low streamflow (Peavler et al. 2008; Clow et al. 2011).

Geologic Condition.

As illustrated by the January 1997 flood, the Merced continues to sort and build this bar, providing evidence

in all seasons of its potential power.

Preliminary Management Considerations

The preliminary management considerations associated with the Geologic/Hydrologic ORV in segment 4 are:

Free-flowing conditions for segment 4:

- Riprap associated with California State Highway 140 and the Trailer Court may affect river function in very high flows.

Water Quality for segments 4 (and 6, 7 and 8):

- Water quality in these river segments is high. The National Park Service will continue to protect water quality by monitoring and identifying potential pollution sources

El Portal Boulder Bar

This boulder bar is located on the Merced River across from and just upstream of the El Portal General Store (Figure 3-8). The boulder bar is an exposed mid-channel bar composed of large boulders and cobbles.

Condition at the Time of 1987 Designation. The boulder bar along the Merced River in El Portal is a dynamic geomorphic feature that results from the pronounced change in river gradient that occurs just downstream of the park boundary. Aerial photographs (digital orthophoto quarter quads) dating from 1993 show that the boulder bar was present at that time, and therefore almost certainly was present in 1987 at the time of Wild and Scenic designation. Aerial photographs dating from 1997 and thereafter clearly show that the boulder bar was extensively modified during the 1997 flood; the river channel migrated south by tens of meters, the southern riverbank was eroded, and the boulder bar surface experienced erosion and deposition of boulders. Boulder bars are dynamic geomorphic features that are modified frequently over geologic timescales by high-discharge flood events. The 1997 flood on the Merced River was the most recent flood to have modified the boulder bar, but earlier floods (for example, winter floods in 1964, 1955, 1950, and 1937) probably also modified the boulder bar.

Current Condition. The boulder bar became prominent after the 1997 flood, when vegetation was removed by the high velocity of flow from that storm and large boulders were transported from upstream. In high energy rivers, such as the Merced River, bars tend to go through cycles of deposition, colonization by vegetation leading to semi-stable "islands," and removal of vegetation during floods. Once vegetation is removed, the bar becomes less stable and the channel often avulses into a former abandoned course or cuts a new channel across the bar. The 1997 flood likely stripped the vegetation and fine sediment off the bar, exposing the underlying boulders and potentially depositing new boulders. The excavation and deposition reactivated the bar, leading to an avulsion in the main channel from the north side of the floodplain to the south side. Because of this increase in sinuosity in the avulsed reach, the channel now impinges more acutely onto the north bank (alongside El Portal Road) where the channel returns to its former north side course.

Preliminary Management Considerations

There are no preliminary management considerations related to the El Portal boulder bar.

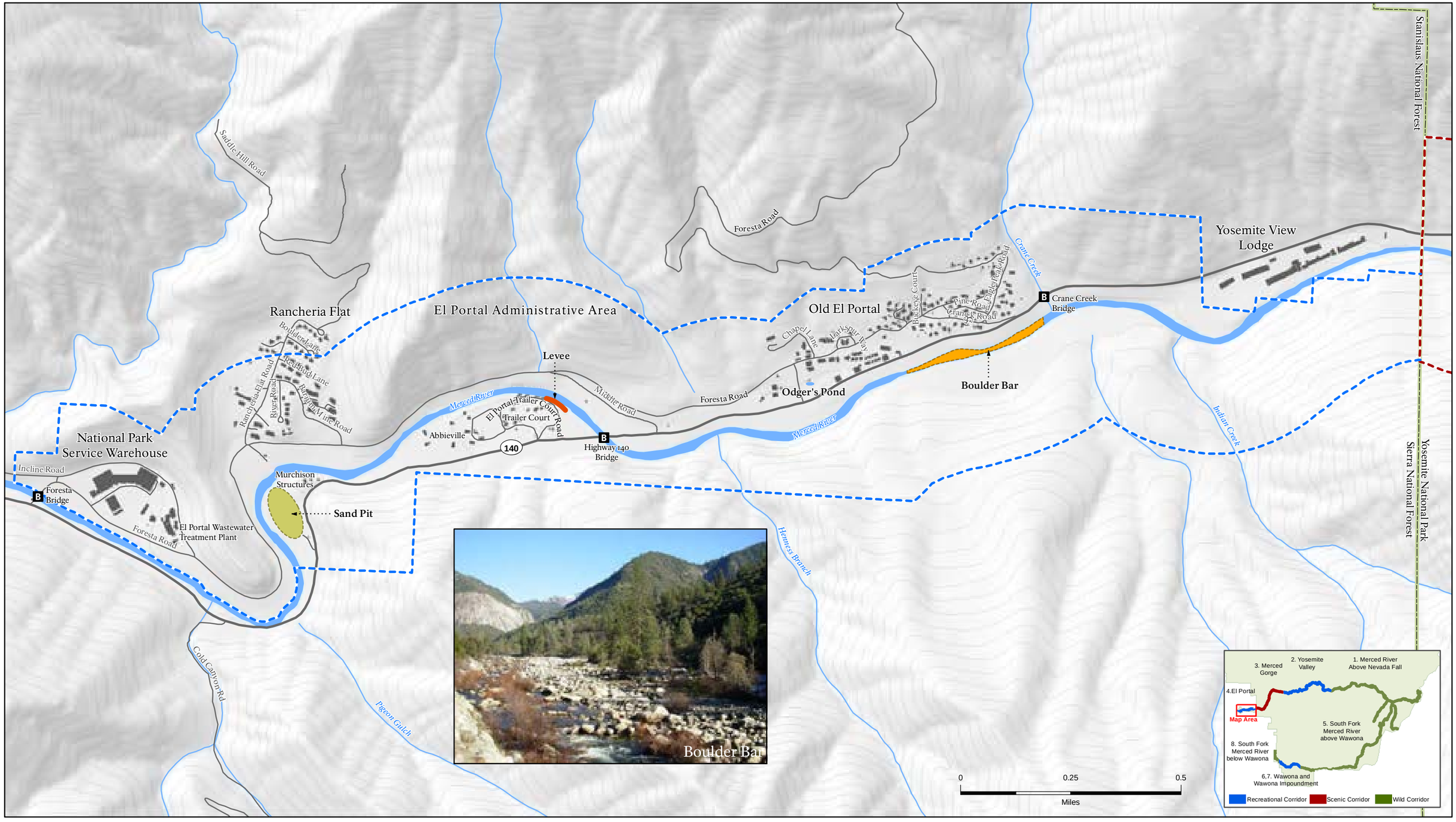


Figure 3-8
Geologic/Hydrologic ORV - River Segment 4. El Portal
Recreational WSR Corridor

Recreational WSR Corridor Classification
Scenic WSR Corridor Classification
Building
Yosemite National Park Boundary
Highway 140
Road
Stream/River
100' Contour Line
B Road Bridge

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 3-8

River Segments 6, 7, 8: Wawona Impoundment, Wawona, and South Fork Merced River below Wawona

In the Wawona area, the South Fork Merced River transitions out of its steep canyon and enters a large floodplain meadow, which is part of an alluvial valley. In this area the river morphology transitions from step-pools and boulder cascades to a meandering river with substantial gravel bars. This area is the most accessible area of the South Fork, with the highest levels of visitor use occurring at the developed Wawona area. Development in this area includes employee housing, approximately 300 privately-owned residences, as well as the Wawona Hotel. Other developed areas in this segment include the Wawona Golf Course, the Pioneer Yosemite History Center, the Wawona Stable, the store and gift shop, the Wawona Post Office, and the Wawona Campground.

Condition at the Time of 1987 Designation

Free-flowing Condition.

In the Wawona area, a small impoundment at the intake of Wawona's surface water supply was located near the end of Forest Drive. By the time of designation, the pool had filled with small cobbles, sands, and other sediments; however, this impoundment was not a major source of sediment and did not act as a significant barrier to river flow and dynamics. In 1987, NPS implemented the *Wawona Water Conservation Plan*, which set the rate of diversion from the Wawona water intake at 0.59 cubic feet per second (cfs) (NPS 1987), and water was diverted for domestic and irrigation uses. To protect instream flows for aquatic habitat, the plan enacted mandatory water conservation whenever the river reached flows of less than 6 cfs. At flows of less than 6 cfs, diversions were limited to 10% of the river flow. No other diversions took place on the South Fork Merced River.

Bridges on the South Fork Merced included the Swinging Bridge, just upstream of Wawona; the historic Wawona Covered Bridge, a timber-framed covered bridge; and the South Fork Bridge (Wawona Road). At the time of designation, the South Fork Bridge was a narrow, somewhat hazardous bridge. The unreinforced masonry cobble abutments and piers impeded the flow of the South Fork Merced and created local scour holes.

Water Quality.

At the time of designation, water quality in the Merced River in these three river segments was characterized as high, with minor indications of impacts from human activities. The water was generally found to be low in nutrients, salts, and suspended sediment and high in dissolved oxygen (NPS 1994).

Geologic Condition.

There are no identified Geologic ORVs in these river segments.

Current Condition

Free-flowing Condition.

The 1997 flood caused additional scour at the South Fork Bridge, and concern regarding the bridge's stability led NPS to replace it. The South Fork Bridge was closed, and a temporary bridge was used between 1998 and 2006 while a new bridge was studied and constructed. The former South Fork Bridge and the

temporary bridge have been demolished, and the new South Fork Bridge is now in place. As established in the Wild and Scenic River Act Section 7 determination process, this new bridge was evaluated for direct effects on the river and was found not to represent a significant impediment to the free-flowing condition of the river during most flow conditions. No other structures have been placed in the river since the time of designation.

Water Quality.

Water quality in these segments is considered to be high. Bacteria levels are generally low, and dissolved oxygen is near saturation (Peavler et al. 2008). Nutrient concentrations are slightly elevated near the Wawona Wastewater Treatment Plant, especially during periods of low streamflow (Peavler et al. 2008; Clow et al. 2011).

Elevated phosphorus levels were detected on the South Fork Merced River downstream from the Wawona Campground and may be due to excessive erosion at the campground. The presence of hydrocarbons was found in 11% of water quality samples in Wawona (Peavler et al. 2008).

Preliminary Management Considerations

The preliminary management consideration associated with the Geologic/Hydrologic ORV in segments 6, 7, and 8 is to continue to protect water quality by monitoring and identifying potential pollution sources.

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4. SCENIC VALUES

Scenic Outstandingly Remarkable Values

Throughout its length, the Merced River flows through a scenic landscape that has few parallels. Views from the river or its banks include El Capitan (Photo 4-1), Half Dome (Photo 4-2), Triple Divide Peak, and many other landmarks. The river provides a natural complement to Yosemite's world-renowned scenery. Depending on the stretch of river, the Merced manifests itself as the foreground for a flat valley, a rushing and boulder-strewn river, towering waterfalls, or serene lakes.

River Segment 1: Merced River above Nevada Fall

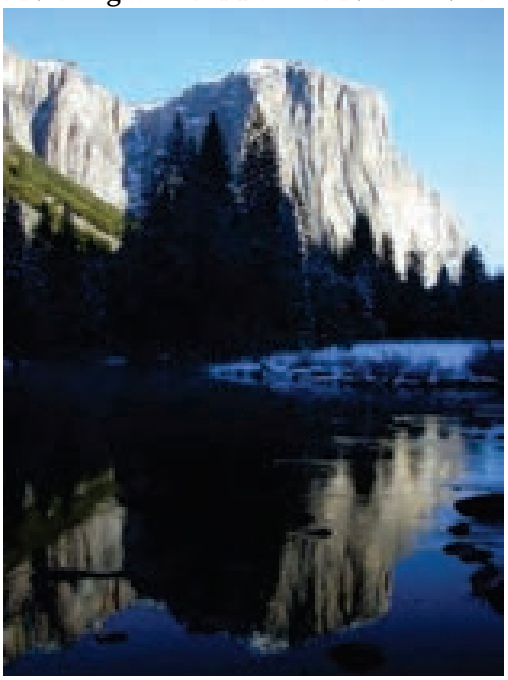


PHOTO 4-1: EL CAPITAN-2009 (YOCHIM 2009)

PHOTO 4-2: HALF DOME-2010 (YOCHIM 2010)

Visitors to this wilderness segment experience scenic views of serene montane lakes, pristine meadows, slickrock cascades, and high Sierra peaks.

Starting at the headwaters, the Merced River passes through chains of "paternoster" lakes[29], enters the upper montane forest, and becomes walled in by a classic U-shaped glacial valley. Scenic landmarks visible from the river or its banks include Washburn and Merced Lakes, Echo Valley, Bunnell Point, and Little Yosemite Valley. The long river segment of great visual variety and its uncompromised natural setting provide diverse, exceptional scenery—all with the river in the foreground.

[29] Paternoster lakes are a series of glacial lakes connected by a single stream or braided stream system.

River Segment 2: Yosemite Valley

Visitors to Yosemite Valley experience scenic views of some of the world's most iconic scenery, with the river and meadows forming a placid foreground to towering cliffs and waterfalls.

The river enters Yosemite Valley at Nevada Fall, flowing through Emerald Pool and then over Vernal Fall. Once in the flat valley, the Merced provides the foreground to many of Yosemite's most famous landmarks. From the river or its banks, views consist of Yosemite Falls, Bridalveil Fall, El Capitan, Half Dome, and other named and unnamed parts of the cliffs and hanging valleys rimming the valley. Meandering through a sequence of compound oxbows, wetlands, and meadows, the river and its related features provide broadened panoramas. Throughout the valley, views from the river or its banks encompass the lower montane forest as it rises up to sheer rock faces of granite cliffs and talus slopes with a flat valley bottom serving as a contrasting foreground. The juxtaposition of granite domes and waterfalls is unique, as is the concentration of river-related views found in Yosemite Valley.

River Segment 3: Merced Gorge

The Merced River drops 2,000 feet over 14 miles—a continuous cascade under spectacular Sierra granite outcrops and domes.

Descending from Yosemite Valley, the river becomes a continuous cascade in a narrow gorge littered by massive boulders. Arch and Elephant Rocks and other landmarks rise above, all visible from the river or its banks. Dropping 2,000 feet in 14 miles, canyon walls rise steeply from the river and have many seasonal waterfalls cascading down to the river. Spring and fall bring special parades of colors, from redbuds and other plants warmly flowering in spring to bigleaf maples and other trees turning bright colors in fall.

Segments 5 and 8: South Fork Merced River, both above and below Wawona

The South Fork Merced River passes through a vast area of natural scenic beauty.

The South Fork Merced River in these stretches is largely inaccessible, with just a few trail crossings above Wawona and none below it. The scenery from the river or its banks is that of an undeveloped Sierra Nevada river valley, with views dominated by forest-cloaked hills, distant peaks, and an untamed river. These are some of the wildest views possible in the Sierra Nevada.

Scenic ORV Conditions

Scenic views from the Merced River and its banks are distinctive. This landscape includes distant, dramatic vistas of mountains and waterfalls; and close, beautiful views of the forests and gorges. The Merced River offers a cumulative visual experience with a varied pattern of topography and vegetation, which is unsurpassed in the United States. This sequence of features is a unique experience that rises above that of enjoying any one viewpoint: the juxtaposition of individual features with the foreground and background, the interface of different surfaces, and the interplay of light as it reflects off the various colors and textures of this dramatic and world-famous visual landscape.

The following common conditions can serve as indicators to assess changes in the Scenic Outstandingly Remarkable Values (ORVs):

1)Facilities and Other Human-made Structures: National Park Service (NPS) and concessioner maintenance and warehouse facilities, roads and parking areas, campgrounds, and picnic areas can be considered visual intrusions where the placement of human-made structures block or otherwise affect the quality of scenic resources.

2)Visitor Access and Use Levels/Perception of Crowding: When visitor use levels exceed a facility's service capacity, cause undesirable traffic conditions, or result in a sense of crowding, the visitors' ability to view scenic resources and experience the scenery of the Merced River corridor may be impacted.

3)Vegetation Management: Another factor that can affect the experience of visual resources seen from the Merced River or its banks is the change in vegetation patterns caused by humans since early Euro-American settlers entered Yosemite Valley (NPS 2010a).

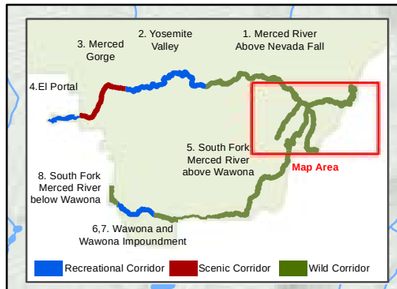
4)Air Quality and Climate Change: Fine particles of anthropogenic origin in the park have long approached levels recorded in urban areas due to the transport of these air pollutants from surrounding agricultural and urban areas (NPS 2000). These pollutants reduce visibility in Yosemite, particularly in the summer months. Visibility can also be reduced periodically by smoke from wildfires, prescribed fires, or campfires.

Warming temperatures due to climate change are already causing an earlier snowmelt, earlier stream peak flows, earlier drying of intermittent streams and seasonal meadows, and lower late-season groundwater levels (Panek et al. n.d.). Continued climate change could alter vegetation, cause a decline of large-diameter trees (Lutz et al. 2009), change the frequency of wildfires, and alter river flows in ways that could affect the scenery.

River Segment 1: Merced River above Nevada Fall

As described above, scenic landmarks visible from the river and its banks in this segment include Washburn and Merced Lakes (Photo 4-3), Echo Valley, Bunnell Point, and Little Yosemite Valley (Figures 4-1 and 4-2), and many other named and unnamed scenic landmarks.

PHOTO 4-3: MERCED LAKE-2010 (YOCHIM 2010)



Washburn Lake
Gray Peak Fork
Lyell Fork Merced River
Rodgers Peak
Electra Peak
Mount Ansel Adams
Triple Peak Fork Merced River
Red Peak Fork Merced River
Foerster Peak
Foerster Creek
Harriet Lake
Long Mountain
Merced Peak Fork Merced River
Gray Peak
Yosemite Wilderness
Red Creek
Red Peak
Isberg Peak
Isberg Pass Trail
Ansel Adams Wilderness
Ottoway Creek
Ottoway Peak
Edna Lake
Merced Peak
Merced River Watershed
South Fork Merced River Watershed
Triple Divide Peak
Long Creek
North Fork Saint Joaquin River
Sadler Peak
0 0.5 1
Miles

Figure 4-1
Scenic ORV - River Segment 1. Merced River Above Nevada Fall
Wild WSR Corridor

Wild WSR Corridor Classification
Yosemite National Park Boundary
Lake
Watershed Boundary
Trail
Stream/River
100' Contour Line

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 4-1

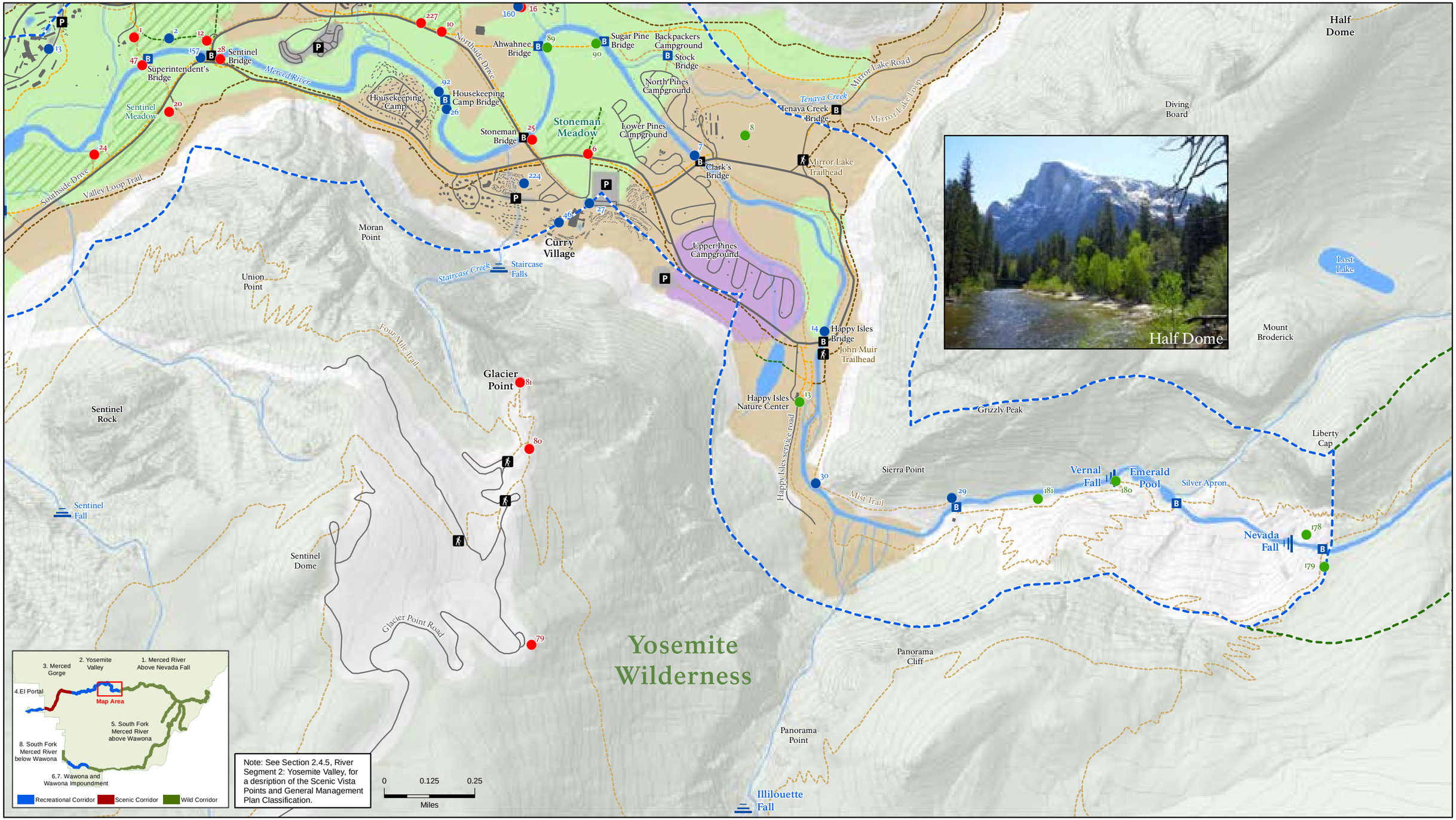


Figure 4-3
Scenic ORV - River Segment 2. Yosemite Valley - Curry Village, Pines Campgrounds, and Housekeeping Camp Recreational WSR Corridor

Scenic Vista Points:
- High Value
- Medium Value
- Low Value

General Management Plan Classification:
- A- Scenic
- B- Scenic
- C- Scenic

- Recreational WSR Corridor Classification
- Wild WSR Corridor Classification
- Monitored Meadow
- Building
- Waterfall
- Road bridge
- Footbridge
- Parking Lot
- Trailhead
- 100' Contour Line
- Road
- Stream/River
- Valley Loop Trail
- Bike Path
- Boardwalk
- Trail

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 4-3

Condition at the Time of 1987 Designation

No formal visual resource studies have been performed for this segment of the Merced River since its designation as Wild and Scenic. At the time of designation, this river segment flowed through a natural setting with few human-made features. While wilderness campground use at the time of designation was high, the generally low visitor use in the segment enhanced its scenic quality (NPS 2000). During the 1987 operating season (May 13 to October 10), there were 11,214 overnight visitors, for an average of 75 campers per night at the Little Yosemite Valley Backpackers' Campground and the Moraine Dome Campground. The average size of groups at these campgrounds was approximately 3.27 people (NPS 1987).

Only five areas with structures or campsites were identified along this river segment at the time of designation—the Merced Lake High Sierra Camp and associated stock corral, the Little Yosemite Valley Backpackers Campground and associated composting toilet, the Little Yosemite Valley Ranger Station, the Moraine Dome Backpackers' Campground, and the Merced Lake Backpackers' Campground.[30] Dispersed camping was allowed elsewhere.

Current Condition

Views from the river and its banks along this segment continue to have high aesthetic value. Both the Merced Lake High Sierra Camp (Photos 4-4 and 4-5) and Little Yosemite Valley campground remain. In the 2000s, the operators of the High Sierra Camps delineated camp footpaths and restored all areas between footpaths, substantially improving the appearance, although some social trails nearby are still present. Around 1992, the Little Yosemite Valley Campground and Little Yosemite Valley Ranger Station were moved farther from the river and to the east. The updated backpackers' campground and ranger camp are larger and include semi-permanent tents and a water system at the ranger camp. Scenic vistas can be obscured by regional air pollution, which results in occasional haze during the summer months (NPS and Colorado State University 2002).

Between 1987 and 2006, annual overnight wilderness use was typically below or comparable to the 1987 visitation (NPS 2011a). As previously shown in Figure 2-1 (in Section 2. Recreational Values), Yosemite wilderness overnight visitation has increased substantially since 2006, exceeding the 1987 level of overnight use (NPS 2011a).

Preliminary Management Considerations

The preliminary management considerations associated with the Scenic ORV in segment 1 are:

- Human structures, both temporary and permanent, at Merced Lake Ranger Station and Little Yosemite Valley may affect river-related scenic resources
- Crowding in and near the backcountry campgrounds, which operate near capacity all summer, may affect river-related scenic resources

30 The Merced Lake Ranger Station is not within ¼ mile of the Merced River; therefore, it is not included in this discussion.

PHOTO 4-4: MERCED LAKE HIGH SIERRA CAMP-2010 (YOCHIM 2010)

PHOTO 4-5: MERCED LAKE HIGH SIERRA CAMP-2010 (YOCHIM 2010)

River Segment 2: Yosemite Valley

The river enters Yosemite Valley at Nevada Fall, flowing through Emerald Pool and then over Vernal Fall. Once in the flat valley, the Merced provides the foreground to many of Yosemite's most famous landmarks. From the river or its banks, views consist of Yosemite Falls, Bridalveil Fall, El Capitan, Half Dome, and other named and unnamed parts of the cliffs and hanging valleys rimming the valley (Figures 4-3 through 4-5) (Photos 4-6 through 4-8).

Condition at the Time of 1987 Designation

NPS conducted an analysis in the late 1970s during development of the *General Management Plan* to determine existing and historic viewing conditions within Yosemite Valley and to identify the landscape features most visitors look for and are able to distinguish (NPS 1980). Based on this study, the 11 most important features within Yosemite Valley were Half Dome, Yosemite Falls, El Capitan, Bridalveil Fall, Three Brothers, Cathedral Rocks and Spires, Sentinel Rock, Glacier Point, North Dome, Washington Column, and Royal Arches. The study also evaluated all points from which these features could be seen (assuming no vegetation or structures obstructed the view) to establish the scenic viewing potential of different locations on the Valley floor. Existing viewpoints were identified, and the quality of their views and their proximity to roads and trails were noted. All of the identified "most important features" included in the *General Management Plan* analysis are visible from various sections of the Merced River through Yosemite Valley.

The viewpoint analysis conducted for the *General Management Plan* identified areas within Yosemite Valley that were consistently selected by eminent early photographers and painters as the best areas to pursue their activities. The Merced River is featured prominently in many representations of the Valley as both a foreground subject within the corridor and scenic feature from outside the corridor. Once the existing and historical viewpoints were established for the *General Management Plan* viewpoint analysis, the Valley was classified according to the following criteria:

A-Scenic: Areas included in scenic views commonly chosen by eminent early photographers and painters or included in the most significant scenic views that exist today (included all meadows and the entire length of the Merced River in the Valley).

B-Scenic: Areas included in scenic views less commonly chosen by historic photographers and painters or that compose less-significant modern views based on park management observations.

C-Scenic: Areas of minor scenic quality and areas that can absorb visual intrusion without detracting from either primary or secondary views.

The viewpoint analysis resulted in the development of the Yosemite Valley Scenic Analysis map (Figures 4-3 through 4-5, Figure 4-3). This map, which is a compilation of the Yosemite Valley historic and existing viewpoint analyses presented in the *General Management Plan*, provides a generally accurate depiction of conditions at the time of Merced Wild and Scenic River designation.

In addition to the viewpoints included in the *General Management Plan* analysis, other important scenic resources that could be seen from the river or its banks in Yosemite Valley included Nevada, Illilouette, Vernal, and Ribbon falls; the cliffs at Yosemite Point/Lost Arrow Spire; and the scenic interface of river, rock, meadow, and forest throughout the Valley.

Photo 4-6: Merced River in Yosemite Valley from Valley View-2010 (Yochim 2010)

Photo 4-7: Yosemite Falls-2010 (Yochim 2010)

Photo 4-8: Half Dome from Sentinel Meadow-2010 (Yochim 2010)

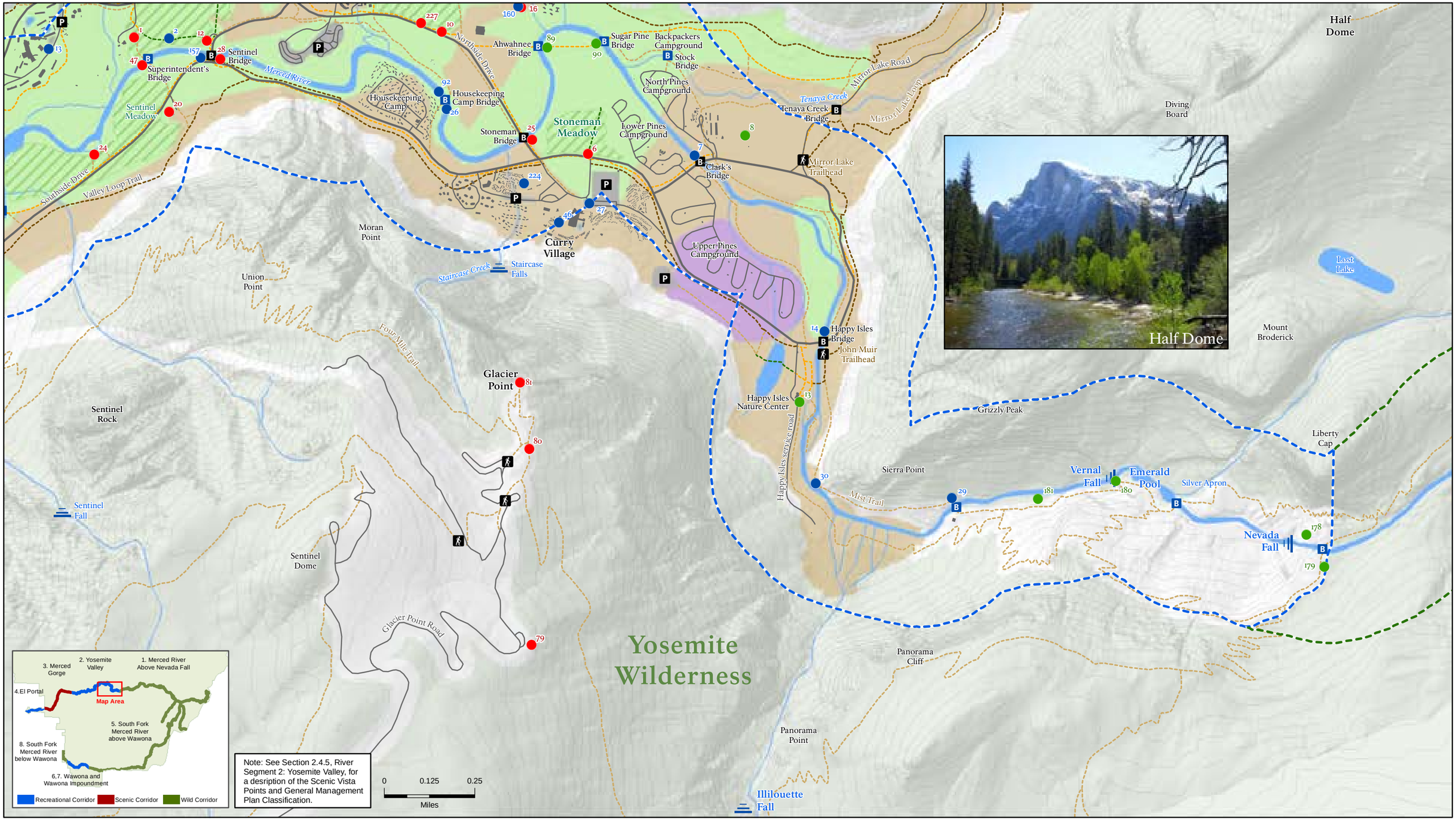


Figure 4-3
Scenic ORV - River Segment 2. Yosemite Valley - Curry Village, Pines Campgrounds, and Housekeeping Camp Recreational WSR Corridor

Scenic Vista Points:
- High Value
- Medium Value
- Low Value

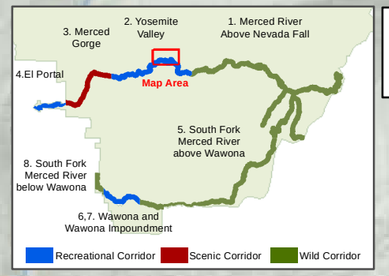
General Management Plan Classification:
- A- Scenic
- B- Scenic
- C- Scenic

- Recreational WSR Corridor Classification
- Wild WSR Corridor Classification
- Monitored Meadow
- Building
- Waterfall
- Road bridge
- Footbridge
- Parking Lot
- Trailhead
- 100' Contour Line
- Road
- Stream/River
- Valley Loop Trail
- Bike Path
- Boardwalk
- Trail

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 4-3



Note: See Section 2.4.5, River Segment 2: Yosemite Valley, for a desription of the Scenic Vista Points and General Management Plan Classification.

Upper Yosemite Fall
Lost ArrowSpire
Yosemite Point
North Dome
Yosemite Wilderness
Lower Yosemite Fall
Yosemite Village
Tenaya Way
Cable Cliff Court
Boulder Lane
Lost Arrow Drive
Lost Arrow Drive
Oak Lane
Cedar Lane
Upper Yosemite Falls Trail
Lower Yosemite Falls Trail
Royal Arch Creek
Royal Arch Cascade
Church Bowl Picnic Area
11
Valley Loop Trail
Ahwahnee Road
Ahwahnee Bike Path
Washington Column
Royal Arches
Lower Yosemite Fall Picnic Area
17
158
Northside Drive
Cooks Meadow Boardwalk
Cooks Meadow
Sentinel Crossover
Village Drive
Tecoya Road
Ahwahnee Meadow
The Ahwahnee Hotel
228
161
159
160
16
227
10
Yosemite Lodge
1
2
12
19
Camp 6 Road
Housekeeping Bridge Trail
Northside Drive
Ahwahnee Bridge
89
90
Sugar Pine Bridge
Backpackers Campground
Stock Bridge
Upper Yosemite Falls Trailhead
157
Superintendent's Bridge
Sentinel Bridge
47
28
Yosemite Lodge Road
Merced River
Southside Drive
Housekeeping Camp
North Pines Campground
Camp 4
Sentinel Meadow
20
92
Housekeeping Camp Bridge
26
Tenaya Creek Bridge
Stoneman Bridge
25
Stoneman Meadow
Stoneman Boardwalk
Lower Pines Campground
8
Sentinel Boardwalk
24
6
7
Clark's Bridge
224
0
0.125
0.25
Miles

Figure 4-4
Scenic ORV - River Segment 2. Yosemite Valley
Yosemite Lodge, Yosemite Village, and The Ahwahnee
Recreational WSR Corridor

Scenic Vista Points:
- High Value
- Medium Value
- Low Value

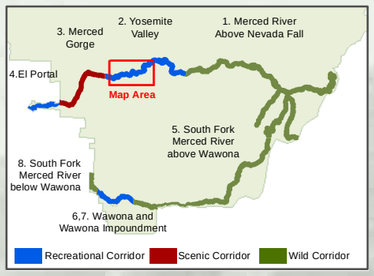
General Management Plan Classification:
- A- Scenic
- B- Scenic
- C- Scenic

- Recreational WSR Corridor Classification
- Building
- Monitored Meadow
- Hanging Valley
- 100' Contour Line
- Stream/River
- Road
- Valley Loop Trail
- Bike path
- Boardwalk
- Trail
- Road bridge
- Footbridge
- Trailhead
- Parking Lot
- Picnic Area
- Waterfall

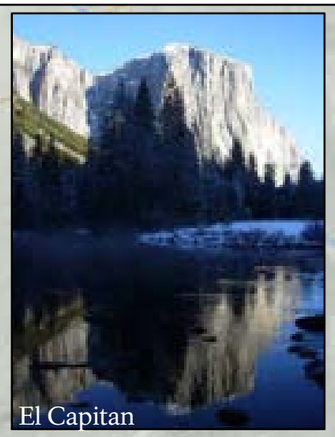
National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 4-4



Note: See Section 2.4.5, River Segment 2: Yosemite Valley, for a desription of the Scenic Vista Points and General Management Plan Classification.



Yosemite Wilderness

El Capitan Trail

Ribbon Fall

El Capitan

Three Brothers

Lower Brother

Eagle Creek

Leidig Meadow

Sentinel Boardwalk

Swinging Bridge Picnic Area

Sentinel Beach

Sentinel Beach Picnic Area

Four Mile Trailhead

Yellow Pine Campground Road

Four Mile Trail

Sentinel Creek

Sentinel Rock

Ribbon Creek

Northside Drive

Slaughterhouse Meadow

El Capitan Picnic Area

Valley Loop Trail

Southside Drive

Cathedral Beach

El Capitan Bridge

El Capitan Meadow

Cathedral Beach Picnic Area

Sentinel Fall

Old Big Oak Flat Road

Merced River

Pohono Trail

El Portal Road

Bridalveil Meadow

Pohono Bridge

Bridalveil Trail

Bridalveil Parking Lot

Bridalveil Fall

Cathedral Rocks

Cathedral Spires

Wawona Road

Old Wawona Road

Leaning Tower

Taft Point

Stanford Point

Meadow Brook

Bridalveil Creek

Poh ono Trail

0 0.25 0.5 Miles

Figure 4-5
Scenic ORV - River Segment 2. Yosemite Valley
El Capitan Meadow, Cathedral Beach, and Sentinel Beach
Recreational WSR Corridor

Scenic Vista Points:
- High Value
- Medium Value
- Low Value
- Not Scored

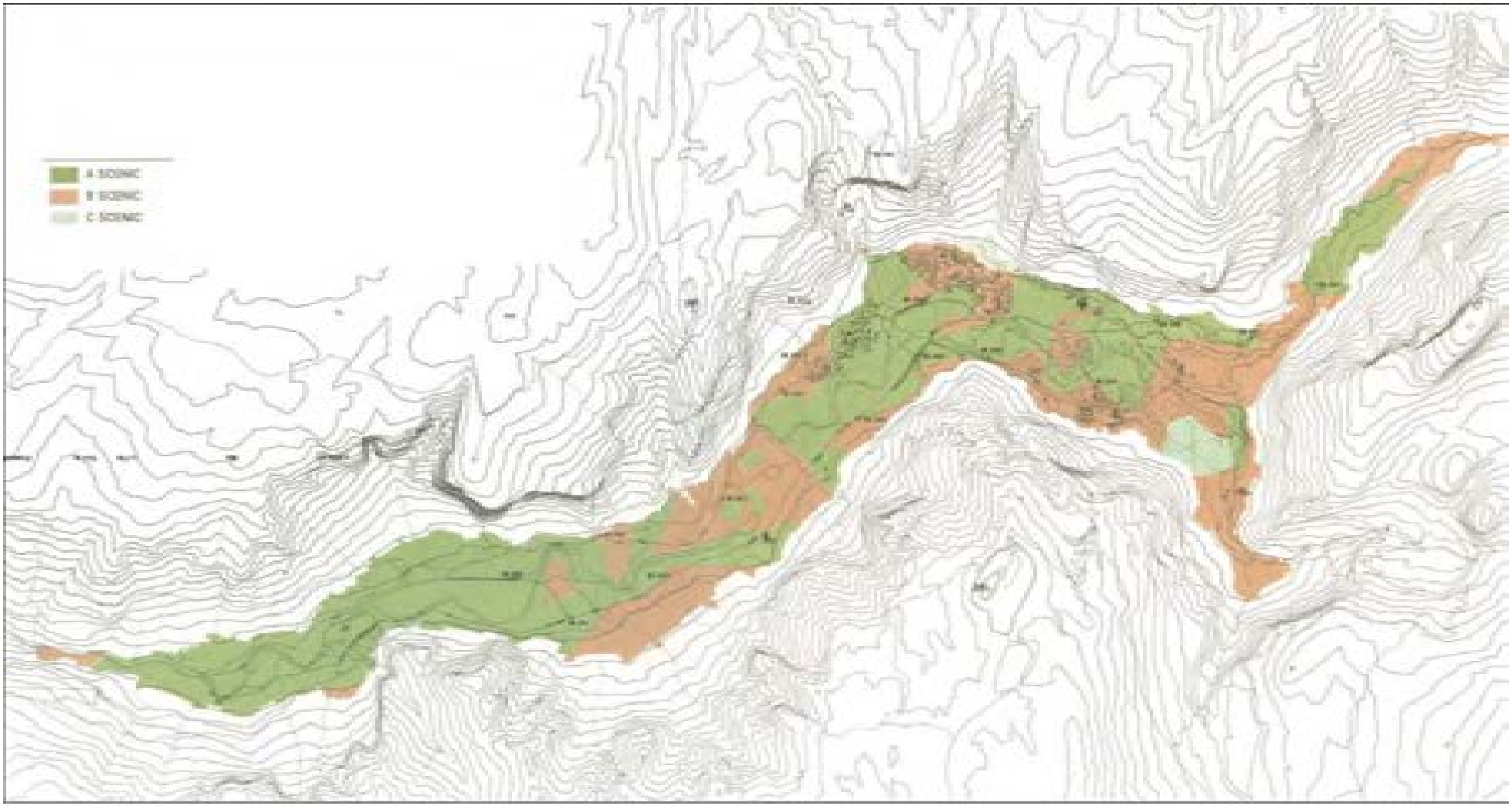
General Management Plan Classification:
- A- Scenic
- B- Scenic

- Recreational WSR Corridor Classification
- Monitored Meadow
- Hanging Valley
- Stream/River
- Road
- 100' Contour Line
- Valley Loop Trail
- Bike Path
- Boardwalk
- Trail
- Waterfall
- Trailhead
- Road bridge
- Picnic Area
- Parking Lot

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 4-5



Data Source: National Park Service, 1978

Prepared for:
National Park Service
Department of the Interior

Prepared by:
MIG, Inc.
Environmental Science Associates
January 2000

Figure 4-6
Yosemite Valley Scenic Analysis

Draft Merced Wild and Scenic Rivers
Comprehensive Management Plan/EIS

Also identified in the viewpoint analysis were visual intrusions in the Valley caused by human-made features and vegetation that blocked views. The study included 155 acres classified as A-Scenic, 222 acres classified as B-Scenic, and 28 acres classified as C-Scenic. The major visual intrusions were roads and traffic through Ahwahnee Meadow, Stoneman Meadow, and other meadows when viewing Half Dome from the Valley floor (including from lands within the Merced River corridor), NPS and concessioner maintenance and warehouse facilities, Camp 6, Housekeeping Camp, and Curry Village. Of the 155 acres of affected A-Scenic resources, 5 acres were within the Merced River corridor in the West Valley. This acreage included the Bridalveil Fall parking lot and the Cathedral Beach and El Capitan Picnic areas (NPS 1980).

Current Condition

Views from the river and its banks in Yosemite Valley continue to retain high aesthetic value. However, the built and natural environments have changed somewhat since the river was designated as Wild and Scenic and the Yosemite Valley segment was classified as Recreational. These changes include those associated with damaged and removed structures, meadow and riparian conditions, park visitation patterns, and altered conditions at scenic viewpoints, as described below.

Since 1987, the biggest change in views within the Yosemite Valley segment was caused by the 1997 flood, which damaged or destroyed approximately half of the lodging units at Yosemite Lodge (which were subsequently removed) as well as many campgrounds within the Merced River floodplain. Other changes to the human-made environment since 1987 include installation of curbing along Northside and Southside Drives (which reduced the number of cars that could be parked in the foreground of scenic resource views), completion of the Yosemite Falls project (which removed idling buses from distant views of the falls), replacement of Sentinel Bridge, and removal of employee housing (tent cabins) at Yosemite Lodge.

Since the Merced River was designated as Wild and Scenic, NPS has restored meadows through such activities as constructing meadow boardwalks, planting native vegetation, removing non-native vegetation, and implementing monitoring programs (Section 1, Biological Values). While meadow conditions continue to experience damage associated with ongoing informal trail use, and soil disturbance, etc., overall meadow conditions have improved; as a result, direct views of meadows, as well as the contribution of foreground meadow views to iconic scenic vistas, has also improved. Constrictions related to certain bridges over the Merced River cause acceleration of water velocity at bridges with openings too small to accommodate spring floods, resulting in bank erosion. In addition, vegetation trampling associated with visitor access to river points also contributes to bank erosion. Both actions affect direct views of the river and long-range iconic views where the river is visible in the foreground (Photo 4-9).

PHOTO 4-9:SOCIAL TRAILS ALONG MERCED RIVER BANK-2010 (ESA 2010)

Preliminary Management Considerations

The preliminary management considerations associated with the Scenic ORV in segment 2 are:

- When visible from the river or its banks, visual intrusions associated with human made structures include roads and traffic through meadows and some visitor and administrative facilities
- The presence of social trails and riparian vegetation loss affects the visual landscape.
- Bank erosion continues to affect direct views from the river and its banks.

River Segment 3: Merced Gorge

Descending from Yosemite Valley, the river becomes a continuous cascade in a narrow gorge littered by massive boulders. Arch Rock, Elephant Rock, and other landmarks rise above, all visible from the river and its banks.

PHOTO 4-12: MERCED RIVER GORGE-2010 (YOCHIM 2010)

Condition at the Time of 1987 Designation

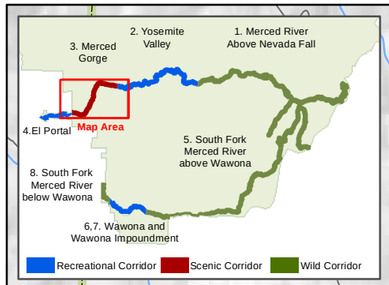
In 1987, the Cascade Diversion Dam and associated features, including the powerhouse building, were visible from the river and its bank. The dam spanned the entire river, with an intake structure on the right bank of the river, and the associated powerhouse was a short distance downstream. The dam was no longer in use, and dilapidated. The powerhouse building was still present, but no longer used to generate power, instead being used as a high voltage substation. Portions of the El Portal Road were visible from the river and its banks, particularly in the Cascades and Arch Rock areas, where the river gradient is less steep and the road is close to the river.

Current Condition

The current condition of scenery from the river and its banks in the gorge segment is largely similar to 1987. However, the scenic quality in the area of the river at the Big Oak Flat Road/El Portal Road junction has significantly improved since NPS removed the Cascades Diversion Dam and associated features in 2004 and restored the area affected by the dilapidated dam and its pool. The powerhouse remains in place, and continues to be used as a high voltage substation. Photos 4-13 through 4-15 show the Merced River area prior to dam construction, prior to dam removal, and after dam removal. The scenic quality in the vicinity of the dam returned to a natural condition within six years.

PHOTO 4-13: BEFORE CASCADES DIVERSION DAM CONSTRUCTION (FROM SOUTH BANK)-UNDATED (TAKEN CIRCA 1916 OR 1917, IMMEDIATELY PRIOR TO DAM CONSTRUCTION) (NPS UNDATED)

PHOTO 4-14: BEFORE DAM REMOVAL (FROM NORTH BANK)-2001 (NPS 2001)



Note: See Section 2.4.5, River Segment 2: Yosemite Valley, for a desription of the Scenic Vista Points.

Figure 4-7
Scenic ORV - River Segment 3.
Merced Gorge
Scenic WSR Corridor

Scenic Vista Points:
- High Value
- Medium Value
- Low Value

- Scenic WSR Corridor Classification
- Recreational WSR Corridor Classification
- Yosemite National Park Boundary

- Trail
- Stream/River
- Highway
- Road
- 100' Contour Line

- Picnic Area
- Trailhead
- Road bridge
- Waterfall

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 4-7

PHOTO 4-15: AFTER DAM REMOVAL (FROM NORTH BANK)-2010 (ESA 2010)

Preliminary Management Considerations

There are no preliminary management considerations associated with the Scenic ORV in segment 3.

River Segments 5 and 8: South Fork Merced River above and below Wawona

As described above, the South Fork Merced River in these stretches is largely inaccessible, having just a few trail crossings above Wawona and none below it (Figure 4-8) (Photos 4-16 and Photo 4-17).

Condition at the Time of 1987 Designation

Although no formal visual resource studies had been conducted for this portion of the Merced River, the wilderness segments of the South Fork Merced were largely natural and undisturbed at the time of designation and included few roads and trails.

Scenery that could be directly viewed from within the Merced River or its banks above Wawona was limited primarily to views of the South Fork itself at trail crossings, as well as longer-range views from the trails to Breeze Lake, Chain Lakes, Buck Camp, and Wawona Point areas (Photo 4-18). Views from the river corridor included distant views of forests and granite features such as Wawona Dome. The Merced River corridor below Wawona was limited to brief views by motorists on Wawona Road.

Current Condition

Views from the river, banks, and trails along the South Fork Merced River, both above and below Wawona, continue to have high aesthetic value, as they did at the time of designation.

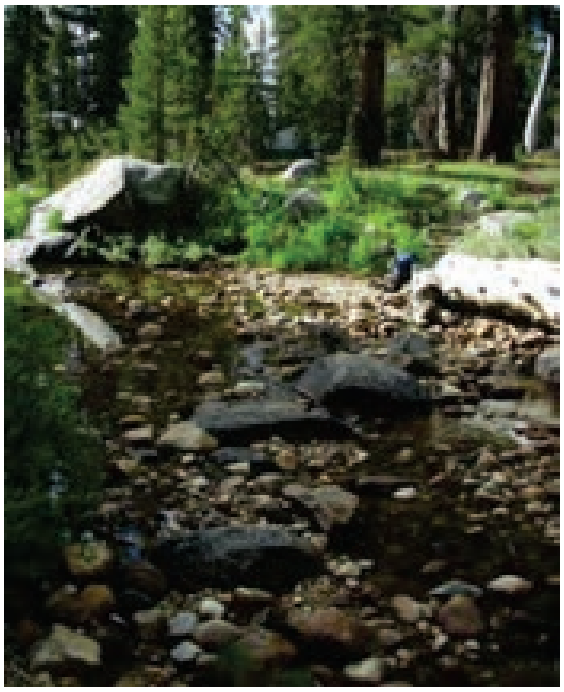


PHOTO 4-16: SOUTH FORK MERCED RIVER ABOVE WAWONA CROSSING-2010 (YOCHIM 2010)

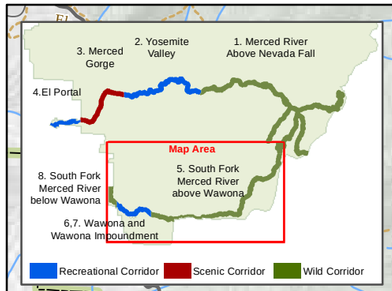
PHOTO 4-17: SOUTH FORK MERCED RIVER-2010 (YOCHIM 2010)

PHOTO 4-18: SOUTH FORK MERCED RIVER ABOVE WAWONA FROM A RIDGE BETWEEN CHAIN LAKES AND BREEZE LAKE (YOCHIM 2010)

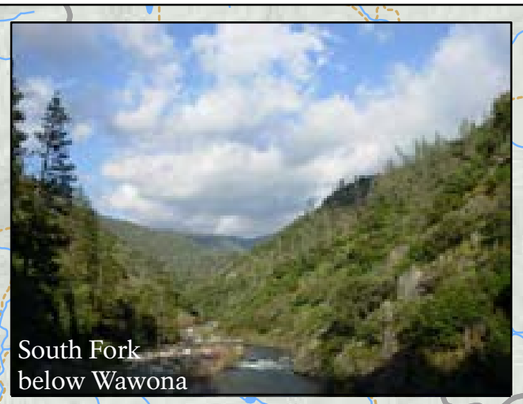
One scenic viewpoint within the South Fork below Wawona segment and one viewpoint that provides views of the South Fork above Wawona segment 5 were evaluated as part of the Scenic Vista Management Plan, as described above.

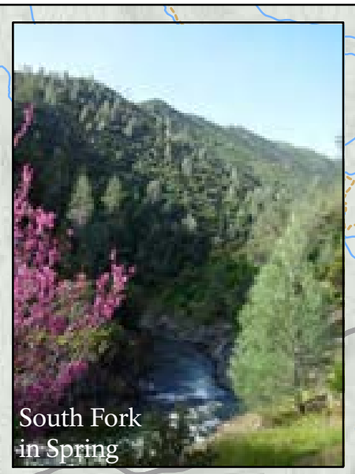
Preliminary Management Considerations

There are no preliminary management considerations associated with the Scenic ORV in segments 5 and 8.



*Note: See Section 2.4.5, River Segment 2: Yosemite Valley, for a desription of the Scenic Vista Points.


South Fork below Wawona


South Fork in Spring

Yosemite Wilderness

Ansel Adams Wilderness

Bridalveil Creek
Ostrander Lake
Merced River Watershed
South Fork Merced River Watershed
Buena Vista Creek
Buena Vista Peak
Mount Bruce
Ottoway Peak
Edna Lake
Merced Peak
Triple Divide Peak
Moraine Meadows
Moraine Mountain
Fernandez Pass
Bishop Creek Trail
Bishop Creek Trailhead
Alder Creek Trailhead
Chilnualna Creek
Segment 8: South Fork Merced River below Wawona
Segment 7: Wawona
61
Alder Creek Trail
Chilnualna Falls Trail
Wawona Dome
Chilnualna Falls Trailhead
Segment 6: Wawona Impoundment
Wawona Campground
Forest Drive
Alder Creek Trailhead
Wawona Point Trailhead
Wawona Meadow Loop Trail
Wawona Road
Chow-chilla Mountain Road
41
Wawona Point
149
South Entrance Station
Mariposa Grove Trailhead
Crescent Creek
Johnson Creek
Buck Creek
Buck Camp
Segment 5: South Fork Merced River above Wawona
Raymer Creek
Star Lakes
Mount Raymond
Iron Creek Trail
Iron Creek
Grizzly Creek
Sky Ranch Road
Chiquito Creek
Quartz Mountain Trailhead
Quartz Mountain
Yosemite National Park
Chiquito Lake
Giveits Creek
South Fork Merced River
Breeze Lake
Chain Lakes
Gale Peak
Sing Peak
Redtop
Madera Peak
Portuguese Creek
0
0.5
1
Miles

Figure 4-8
Scenic ORV - River Segments 5 and 8
South Fork Merced River Above and Below Wawona
Wild WSR Corridor

Scenic Vista Points:
- High Value
- Low Value

- Wild WSR Corridor Classification
- Recreational WSR Corridor Classification
- Yosemite National Park Boundary
- Watershed Boundary
- Lakes
- Trail
- Stream/River
- Highway 41
- Road
- 100' Contour Line
- Trailhead

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	6/2/11
File:	Figure 4-8

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5. CULTURAL VALUES

Cultural Outstandingly Remarkable Values

The continuum of human use along the Merced River and South Fork Merced River encompasses millennia of diverse peoples, cultures, and uses. American Indian and late 19th-century American cultures flourished along these rivers because they provided reliable, year-round water in extraordinary settings. Evidence that reflects trade, travel, and settlement patterns abounds in an intricate and interconnected landscape of archeological sites representing this cultural history. The ongoing cultural traditions of contemporary American Indian and other ethnic heritages are linked through space and time to their respective prehistoric and historic pasts via these ethnographic and cultural landscapes. Therefore, this landscape holds outstandingly remarkable scientific, interpretive, and cultural value for traditionally associated peoples and the public.

The Cultural ORVs designated for the Merced Wild and Scenic River include the El Portal Archeological District, Yosemite Valley Archeological District and ethnographic resources, U.S. Army Calvary Camp A.E. Wood, the Wawona Archeological District, the Wawona Covered Bridge, and a series of regionally rare American Indian rock-ring sites. These resources—including archeological sites, natural and cultural features of traditional significance to contemporary American Indian tribes and groups, and features of the historical built environment—are located primarily within the immediate shorelands of the river (within a quarter mile of the ordinary high-water mark on either side) and owe their location and existence to the presence of the river, thereby meeting the benchmark of being river-dependent.

The characteristics that illustrate the integrity of the Cultural ORVs are discussed below in terms of why the districts and other resources in the river segments qualify as outstandingly remarkable, as defined by the Interagency Wild and Scenic Rivers Coordinating Council (1999). This section analyzes the overall condition of archeological, traditional, cultural, and architectural resources within each river segment on a broad scale, although localized incidents of resource damage or loss of integrity may be noted to provide examples.

River Segment 2: Yosemite Valley

In Yosemite Valley, the Merced River has sustained human life, both through its waters and the biodiversity it sustains, in times past and present. Archeological sites and ongoing cultural attachments indicate a long, treasured, and regionally or nationally rare connection to and dependence on this river.

Yosemite Valley American Indian ethnographic resources include a linked landscape of specifically mapped, traditional-use plant populations and other ongoing cultural practices.

Traditionally associated American Indian tribes and groups associate strong cultural and spiritual values with the river and Yosemite Valley. These values are reflected in the abundance of names and stories attached to geologic and other significant features in the Merced River corridor. The ethnographic resources here include river-related and traditionally-used plant species and the village sites of Wahhoga and Ahwahnee. These American Indian communities maintain their cultural connections to the area through ongoing traditional cultural practices and important religious ceremonies that continue to be conducted here, as they have for thousands of years.

The Yosemite Valley Archeological District is a linked landscape that contains dense concentrations of resources that represent thousands of years of human settlement along this segment of the Merced River.

Drawn by Yosemite's year-round availability of water and diversity of edible plants, people have inhabited the Valley for thousands of years, leaving behind an exemplary collection of sites in the Yosemite Valley Archeological District. Many of these pre- contact and historic-era archeological sites are identified in ethnographic literature and native oral traditions, providing a rare example of the long and continuing association of people and places. While the landscape itself provides exemplary documentation of land use practices, many of the individual sites contain exceptional information with the potential to interpret not only ancient lifeways but also cultural change at the period of contact with the outside world. In addition to their regionally—and potentially nationally—significant scientific and interpretive value, the sites have value to American Indian tribes and groups as a connection to their ancestors.

River Segment 4: El Portal

The El Portal Archeological District contains dense concentrations of resources that represent thousands of years of occupation and evidence of continuous, far-reaching traffic and trade.

El Portal's location midway between Yosemite Valley and the San Joaquin Valley made it an important place of settlement, subsistence, and trade along the Merced River. The steep, narrow canyon at El Portal includes river terraces with level lands on which villages were built. The presence of Great Basin and Pacific Coast artifacts indicates that El Portal was a location of continuous, far-reaching traffic and trade. The El Portal Archeological District contains dense concentrations of resources representing some of the oldest deposits in the Sierra foothills, with data important to interpreting regional cultural history possibly as old as 9,500 years. Particularly significant is the Johnny Wilson Ranch, a rare example of an American Indian homestead, which took advantage of the river as an irrigation source. In addition to the regionally significant scientific and interpretive value of the archeological district, the sites have value to park-associated American Indian tribes and groups as a connection to their ancestors. These groups maintain their traditional cultural practices and religious ceremonies as they have for thousands of years.

River Segment 5: South Fork Merced River above Wawona

This segment includes regionally rare evidence of indigenous settlement along the South Fork of the Merced River, including prehistoric rock ring features with wooden remains.

The South Fork Merced River above Wawona presented seasonal trade, travel, and subsistence opportunities for American Indian people. This segment shelters regionally rare prehistoric archeological sites containing substantial rock-ring features with wooden remains. These river-adjacent sites represent a settlement or land use pattern that is directly tied to the river as a water source, a wildlife corridor, or other strategic purpose. These resources hold regionally important data potential about subsistence and settlement during the summer months in the high country.

River Segment 7: Wawona

Flowing through a broad basin, the South Fork Merced provided the water and location necessary for human settlements, both prehistoric and historic. As with Yosemite Valley, there are several Cultural ORVs in this area:

In this segment, remains of the U.S. Army Cavalry Camp A. E. Wood document the unique Yosemite legacy of the African-American Buffalo Soldiers and the strategic placement of their camp near the Merced River.

Physical remnants of the African-American Buffalo Soldiers' federal protection of Yosemite National Park during the late 19th and early 20th centuries are present along the South Fork Merced River in Wawona. The South Fork served as a year-round water source for Camp A.E. Wood, the first Army headquarters in the park. These archeological remains provide evidence of the extremely rare African-American guardianship of national park lands.

The Wawona Covered Bridge is one of the few covered bridges in the region.

Built in 1868 by Galen Clark (Yosemite pioneer and park guardian), the Wawona Covered Bridge boasts state significance within transportation, entertainment, and recreation contexts. The bridge embodies a unique type of construction and is the only historic covered bridge in the NPS western region.

River Segment 5, 6, 7 and 8: South Fork Above and Below Wawona, Impoundment, and Wawona

The Wawona Archeological District encompasses numerous clusters of resources spanning thousands of years of occupation, including evidence of continuous, far-reaching traffic and trade.

Sites of human activity reaching back thousands of years are concentrated along the river. The presence of Great Basin and Pacific Coast artifacts indicates that Wawona was a location of continuous, far-reaching traffic and trade. Sites in this district contain important research information relevant to permanent and semi-permanent settlement along a particularly long, mid-elevation meandering river. In addition to the regionally significant scientific and interpretive value of the archeological district, the sites have value to park-associated American Indian tribes and groups as a connection to their ancestors. These groups retain the rights to practice their religion and ceremonies.

Cultural ORV Conditions

The characteristics of the Cultural ORV that speak to its condition are based on the same seven aspects of integrity that contribute to the National Register eligibility of each ORV element: location, design, setting, materials, workmanship, feeling, and association. *Location* is the place where the historic property was constructed or where the historic event occurred. *Design* is the combination of elements that create the form, plan, space, structure, and style of a property. *Setting* is the physical environment of a historic property. *Materials* are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property. *Workmanship* is the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory. *Feeling* is a property's expression of the aesthetic or historic sense of a particular period of time. *Association* is the direct link between an important historic event or person and a historic property (NPS 1997). Specific examples of the characteristics evidencing the integrity of the Cultural ORV include, but are not limited to:

1) *Site Integrity*: Archeological sites reflect eons of human use and cultural evolution in relation to the river. Prehistoric and historic resources in the Yosemite Valley and Wawona Archeological Districts include American Indian villages, camps, and special-purpose sites dating from at least 6,000 years

ago to a period of historical occupation. In the El Portal Archeological District, some resources are possibly as old as 9,500 years. Benchmarks of integrity for archeological sites are primarily concerned with the *in situ* preservation of intact artifacts and features (the attributes of location, design, and association discussed above), so that spatial associations between site components can be observed in surface and subsurface assemblages. The integrity of features—such as pictographs, rock rings, or rock alignments—are judged on the clarity with which the outlines of such features can be delineated. Additions of cultural elements not related to the site (e.g., modern campfire rings, trails, roads, graffiti, buildings, or structures) can negatively affect the integrity of an archeological site's setting, association, and feeling. Historical remains can provide clear evidence of former use and association and may retain integrity as archeological resources, such as the physical remains of U.S. Army Calvary Camp A.E. Wood.

2) Integrity of Association: American Indians assign strong spiritual value to the Merced River and to the Yosemite Valley through which it flows, continuing their sense of place and cultural association with the river that is both a destination and a place of refuge. American Indians have attached names and stories to geologic and other features in the Merced River corridor and consider many of these to be sacred or of spiritual significance. Villages or campsites were specifically sited to take advantage of seasonal resources, riparian plant species, or migrations of game animals along the river. Ethnographic resources such as these are evaluated for National Register eligibility based on specific criteria that do not always align with other types of National Register eligibility determinations. The integrity of the association with the community's cultural practices and beliefs is a critical consideration in assessing the condition of the ethnographic resources in Yosemite Valley.

3) Built Environment Characteristics: Conditional benchmarks for the integrity of the Wawona Covered Bridge, as the sole built-environment contributor to the Cultural ORV, include continuity of original uses, maintenance of original physical form and materials, and a feeling of related association between the bridge and contemporaneous elements.

River Segment 2: Yosemite Valley

More than 100 recorded sites in Yosemite Valley contain evidence of human occupation and land use (Hull and Moratto 1999). The Yosemite Valley Archeological District (listed on the National Register in 1978) is the largest established archeological district in the park, encompassing 8,100 acres. It reflects the wide variety of human needs that the river and Valley have accommodated since humans first entered the region (NPS n.d.) (Figure 5-1).

American Indian sites within the Yosemite Valley Archeological District are represented by milling stations (granite boulders with mortar cups or milling slicks, the most common feature documented to date), midden soils,[31] artifact scatters (including obsidian waste flakes, obsidian and ground stone tools, soapstone vessel fragments, and dietary faunal remains), rockshelters, rock art panels, artifact caches, house floors, fire hearths, and rock alignments. Prehistoric human burials, in both isolated locations and cemeteries, have been identified in Yosemite Valley.

[31] Midden soils are the those that contain moderate to dense concentrations of waste relating to human activity, such as shells and animal bones, as well as other indices of past human life and habitation. Middens mark the site of an indigenous settlement and may contain human burials related to that settlement.

C. Hart Merriam conducted a unique ethnographic study in the early 1900s, with results published in 1917. With the aid of local Miwok and Mono (Paiute) informants, Merriam was able to document 53 village sites within a 22-mile stretch of the Merced River, including 37 such sites within Yosemite Valley itself. Subsequent researchers have been able to correlate Merriam's village names and descriptions with archeological remains to a degree unique in California archeology. These village sites and others were first recorded as archeological resources through survey efforts, beginning with James Bennyhoff in the 1950s and amended by a survey led by L. Kyle Napton in 1974. Ninety-eight archeological sites of American Indian origin are listed on the 1978 National Register nomination form for the Yosemite Valley Archeological District, including 28 of Merriam's named villages. In addition to numerous sites that predate Euro-American contact (1851 in Yosemite Valley), Napton's survey documented several archeological deposits from the late 19th and early 20th centuries and showed areas of known historical development on base maps.

Yosemite Valley Ethnographic Resources. When Euro-Americans first entered Yosemite Valley in 1851, the American Indian community residing there was most likely composed of members of several regional tribal groups, including Miwok, Paiute and Mono peoples. The upland areas of the Merced River drainage were undoubtedly frequented by Miwoks, Paiutes, and at least traversed by Western Mono and Yokuts peoples (Bibby 2002). The ethnographic resources in Yosemite Valley represent a rare example of continuing connection of places and people from before Euro-American contact to the present, with the river at the heart of this cultural system. The ethnographic resources include river-related and traditionally-used plant species. American Indian communities continue to practice their religion and conduct ceremonies in Yosemite Valley as they have for generations. Important ongoing traditional cultural practices include the traditional use of important natural resources found within Yosemite Valley. These resources remain of special significance to traditionally associated American Indian peoples, who have continued to use native plants into present times (Anderson 2005). Some culturally important river-related natural resources are black oak acorns, mushrooms, tree mushrooms, wormwood, bracken fern roots, sedge roots, and deer grass. These plants have specific ethnobotanical uses and are in many cases found exclusively or primarily in the river-dependent meadows and marshes of Yosemite Valley (Heady and Zinke 1978). One defining aspect of ethnographic resources is that they possess both historical and contemporary significance to the culture with which they are associated and are vitally important in maintaining the continuing cultural identity and traditions of the group (NPS 1998).

Condition at the Time of 1987 Designation

Yosemite Valley Archeological District

The 1979 National Register nomination for the Yosemite Valley Archeological District provides baseline conditions information on the district as a whole at that time, although selected individual sites were noted as examples of impact types and degrees of impact severity. No specific data gathering or fieldwork was conducted at the time of Merced Wild and Scenic River designation, but many of the sites within the District were revisited and tested and their condition information updated for various projects prior to the 1987 designation (Mundy and Hull 1988, Hull and Kelly 1995). Condition information was not updated for all sites between the time of National Register nomination and Wild and Scenic River designation; however, those that were revisited and updated are considered a representative sample of resources within the District.

Administrative/Facility-related Impacts. Many of the most-researched archeological sites in this segment

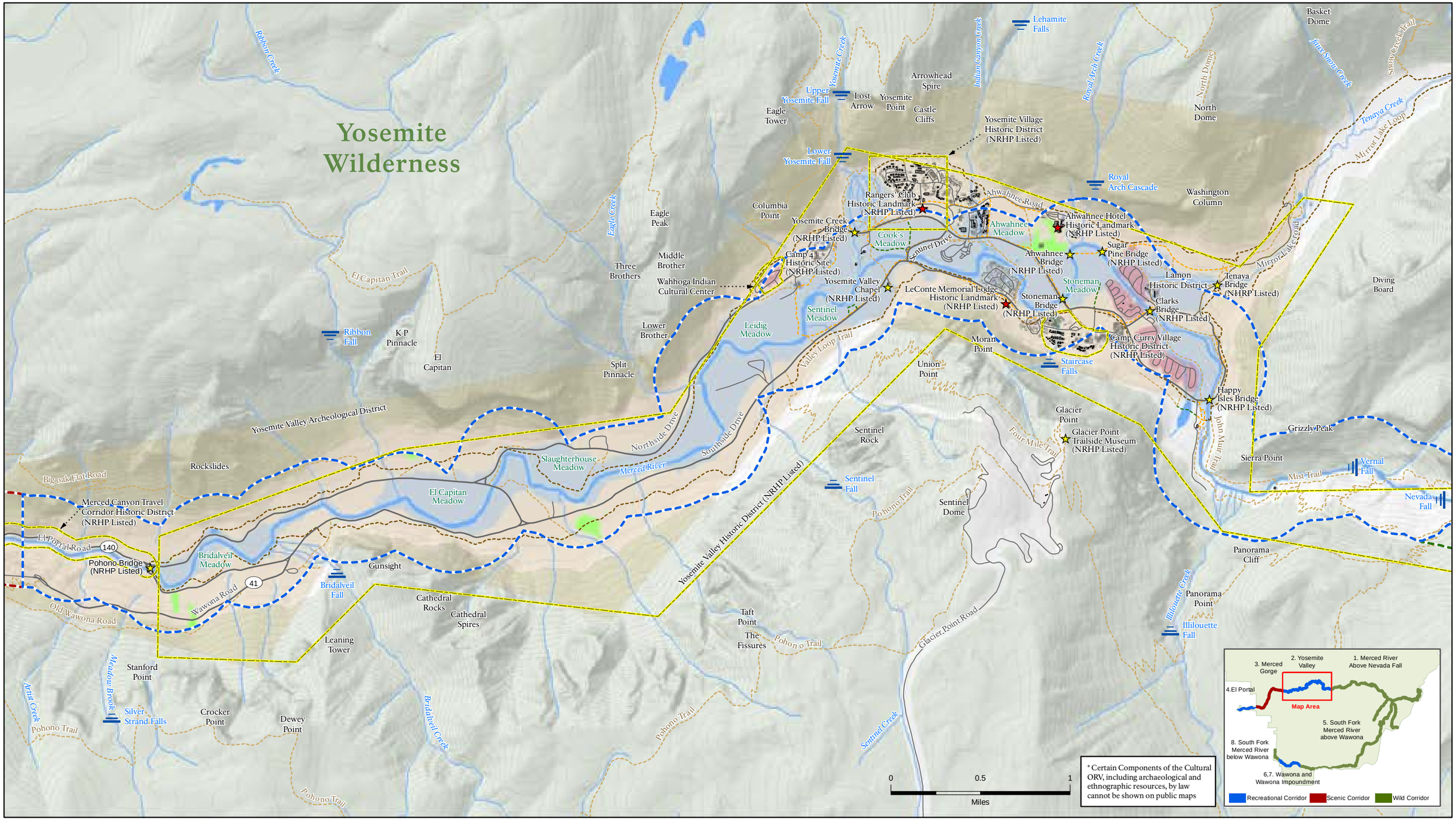
have been impacted by park-related development, often by construction of buildings and structures that are now important historic resources themselves. For example, one multi-component archeological site located immediately adjacent to the LeConte Memorial Lodge experienced impacts from construction of the lodge and an associated road in 1915 (NPS n.d.). A second site that may represent the Miwok village known as A-wah'ne (according to Merriam 1917) was severely damaged by construction of the Park Headquarters, Museum, and Visitor Center (NPS n.d.). An excavation of midden soils by J. Rasson in 1966 confirmed that much of the remaining site deposit was heavily disturbed; the site is nonetheless listed as a contributing element of the Yosemite Valley Archeological District (NPS n.d.). At least four additional sites experienced moderate to severe pre-1987 impacts due to park facilities construction and maintenance (NPS n.d.; Middleton [NPS] 2009). The majority of the impacts to these sites occurred well before the listing of the Yosemite Valley Archeological District and Cultural ORV, and the impacts were not significant enough to preclude listing. Despite the impacts, these sites have been documented to contain intact cultural deposits with information important to understanding regional precontact and historic-era American Indian lifeways.

Visitor Use-related Impacts. Visitor impacts were noted at several of the contributing Yosemite Valley Archeological District sites prior to Wild and Scenic River designation. A rockshelter at one site was damaged by unauthorized excavations in 1986; NPS's damage assessment conducted in the same year determined that – despite the degradation of integrity – the site still contained intact subsurface deposits capable of contributing important information to local research questions (Mundy and Hull 1988). Other pre-1987 visitor impacts noted at this site and at least five others included the creation of informal trails, intentional or inadvertent movement of artifacts or feature elements (such as displacement of rock alignments), soil compaction, and bouldering/rock-climbing and camping impacts that included the creation of fire rings and clearing of tent areas (Middleton [NPS] 2009, 2010). Although difficult to document, the unauthorized collection of artifacts was suspected at several sites (NPS n.d.).

Impacts from Ecological Processes. By 1987, a significant number of archeological sites had also been affected by ongoing ecological processes such as tree falls, bioturbation,[32] erosion, and rockfall. These processes, although generally minor in comparison to human-caused impacts, nonetheless had affected site conditions at the time of the Wild and Scenic River designation (Middleton [NPS] 2008, 2009, and 2010). In at least one location, erosion had exposed previously buried human remains within the district (Hull and Kelly 1995).

Despite these three major types of impacts (administrative/facilities-related, visitor use-related, and ecological processes), the recorders of the Yosemite Valley Archeological District felt confident that the sites—which included contributing elements to the district—retained generally good integrity and that "considerable amounts of original cultural deposits are left" (NPS n.d.). With the few exceptions at specific sites noted above, conditions in the National Register district were likely similar at the time of the Wild and Scenic River designation.

[32] The disturbance of soil by living things (e.g., rodent tunneling).



* Certain Components of the Cultural ORV, including archaeological and ethnographic resources, by law cannot be shown on public maps

Figure 5-1
Cultural ORV - River Segment 2.
Yosemite Valley
Recreational WSR Corridor

- Recreational WSR Corridor Classification
- Scenic WSR Corridor Classification
- Wild WSR Corridor Classification
- Building - Black outline denotes inclusion on List of Classified Structures
- Campground
- 100 Year Flood Boundary
- Yosemite Valley Archeological District
- California Black Oak Alliance
- Valley Loop Trail
- Bike Path
- Boardwalk
- Trail
- Road
- Stream/River
- 100' Contour Line
- National Register of Historic Places
- Historic Landmark
- Waterfall

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	5/23/11
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Yosemite Valley Ethnographic Resources.

Contributing elements of the ethnographic[33] resources component of the Cultural ORV (e.g., traditional plants gathering areas) had experienced various modifications by the time of designation, primarily as a result of changing and intensifying human activity in the Valley (NPS 1994) as well as discontinuation of traditional native land management practices (Bibby 1994). The land management practices of local American Indian groups prior to Euro-American contact had encouraged the growth of plant species important for food, medicine, building materials, and basketry. This was accomplished primarily through seasonal burning, but also by the use of selective pruning, tilling, timely harvesting, and propagation to encourage healthy populations of important species within ecosystems of high biodiversity (Anderson 2005). By the late 1800s, these practices had been replaced by fire suppression, clearing of vegetation for homesteading and farming, grazing of range animals, introduction of new, non-native plant species, and ever-increasing tourist traffic through the 20th century (Bibby 1994). Ponderosa pine and incense cedar dominated Valley vegetation in the late 20th century prior to the Wild and Scenic River designation, crowding out the black oak and shrinking the open meadows that once existed on the banks of the Merced River (NPS n.d.). By 1987, historical aspects of the ethnographic resources had also experienced impacts as a result of visitor use and park-related development and management decisions, such as the resettling of all remaining American Indians living in the park to the "New Indian Village" in 1931, resulting in the abandonment of traditional habitation sites within the Yosemite Valley. By 1969, this village (known to its residents as Wahhoga) was also closed, and American Indian residents were resettled outside park boundaries (Deur 2007; Kirn 2010).

Current Condition

Yosemite Valley Archeological District.

While the majority of archeological sites in Yosemite Valley retain a relatively high degree of integrity, many have been disturbed by human activity and natural processes (Hull and Kelly 1995).

NPS archeologists have spent the field seasons since 2007 revisiting selected sites within the Merced Wild and Scenic River corridor and other areas in the park, including sites that contribute to the Yosemite Valley Archeological District (Middleton [NPS] 2008, 2009, and 2010; Darko 2011). This fieldwork has provided insight into the current conditions of archeological resources within the district and the forces that continue to impact those conditions. The goal of this work is to better understand the proximity of resources to development, types of visitor use, and the preservation of site integrity so that NPS can improve monitoring and provide more targeted management of archeological resources (Middleton [NPS] 2008). Additional research is also being conducted that will hopefully allow archeologists to better quantify potential impacts associated with various recreational and other activities, such as pack stock use (Wills 2011).

The majority (47%, or 56 sites) of Yosemite Valley Archeological District sites within the Merced River corridor are rated in "good" condition. An additional 33% (39 sites) are in fair condition, and 18% (22 sites) are in poor condition. The corresponding disturbance severity levels for the visited sites show that a majority of the sites (47, 39%) have low disturbance severity, with an additional 39 (33%) showing moderate disturbance severity, and 29 (25%) displaying severe disturbances (Darko 2011). The same types of impacts that were occurring at the time of designation continue to affect site conditions now.

[33] The study of the development of culture from a combined historical and anthropological viewpoint, using written documents, oral tradition, material culture, and ethnographic data.

Administrative/Facility-related Impacts. Facilities maintenance and other operational activities—including ecological restoration, forestry activities associated with fire and fuels management, ground-disturbing construction, and trail projects—have affected more than half (approximately 29) of the 54 sites visited by NPS archeologists in the 2007-2009 field seasons. During the 2008 field season, field workers noted that one site was being used as a storage lot and staging area for park vehicles and equipment, and another was located in an actively maintained campground (constructed prior to the Wild and Scenic River designation)—both of which have likely contributed to the current lack of any observable cultural materials (Middleton [NPS] 2009). Earlier projects are also known to have impacted sites, such as an electric utility upgrade project in 1988 that caused a trench to be excavated through a previously unknown burial site. However, these are examples of more severe types of recent or ongoing impacts from facilities maintenance/park operations, and most of the post-1987 impacts in this category are minor (Middleton [NPS] 2008, 2009, and 2010). Following designation of the Yosemite Valley Archeological District, NPS has adopted management strategies—including increased consideration of archeological resources in the context of infrastructure planning (in accordance with the requirements of Section 106 of the National Historic Preservation Act)—resulting in greater protection of significant and potentially significant resources in the vicinity of new construction or other earthmoving activities (NPS n.d.). Management of archeological resources within the context of infrastructure planning and facility maintenance, including preservation of cultural values significant to contemporary associated American Indians, has been the driving force behind much of the testing and data recovery work that NPS has conducted over the past three decades.

Visitor Use Impacts. Visitor activities—such as hiking, pack stock use, camping, and bouldering/rock climbing—have resulted in impacts (including soil compaction, vegetation damage, movement of artifacts, feature disturbance, and vandalism) at 31 of the 54 sites documented in Middleton's NPS reports (2008, 2009, and 2010). Impact severity ranges from minor to severe, although most visitor-use impacts were characterized as minor or moderate. Seven sites[34] were identified during recent visits as having experienced a moderate to severe degree of impact from visitor use (Middleton [NPS] 2009, 2010).

Impacts from Ecological Processes. Recent impacts on sites within the Yosemite Valley Archeological District due to ecological processes are similar in both type and severity to those noted prior to designation of the Merced River as Wild and Scenic. Erosion, bioturbation, and treefall are the most commonly noted natural impacts on site condition. At least two sites within this segment experienced impacts from the 1997 flood (Middleton [NPS] 2009, 2010).

Archeological Research. Scientific research at known sites has increased in the period from 1987 to the present. Testing for subsurface deposits and excavation of data recovery units has increased dramatically in the park since the development of the first Yosemite National Park archeological research design (Moratto 1981). This research guides archeological investigations and site treatments related to implementation of the park's *General Management Plan*. Compliance with the National Historic Preservation Act of 1966 (as amended) is the driving factor behind many of these studies, as recognized by Moratto's (1981) research design and subsequent updates. The information gathered from these inquiries has greatly augmented the understanding of Yosemite's cultural research themes; however, excavation irreversibly damages the integrity of the resources being investigated. As is noted in the National Register nomination form for the

[34] Two of these seven sites were not included on the original National Register listing of the Yosemite Valley Archeological District, although an informal NPS recommendation of eligibility concluded that these and several other sites are likely eligible for inclusion in the district (in an anonymous notation on the National Register nomination form dated August 1997).

Yosemite Valley Archeological District, "Although professional excavation is an ultimate mitigation procedure, it is also basically destructive and should be utilized only to satisfy overriding research or management needs" (NPS n.d.).

Yosemite Valley Ethnographic Resources.

The NPS preservation mission encourages and seeks to facilitate ongoing cultural connections between traditionally associated American Indian communities and ancestral park lands and resources through the continuation of important cultural practices, religious ceremonies, and unimpeded access to sacred sites (Bibby 1994). Recognition of the ecological and ethnobotanical value of the open meadows found on the Valley floor has begun to result in restoration of these sensitive areas to conditions resembling those found in the period before intensive Euro-American influence (NPS 2010a). Several traditional use areas have been identified within Yosemite Valley, and the plant species within them are now actively being managed to encourage healthy populations of ethnobotanical resources (Bibby 1994; Deur 2007). Ongoing exhibits and activities associated with the Indian Cultural Center (located within the former community of Wahhoga, the "New Indian Village"), as well as interpretive panels throughout the Valley, serve to impart knowledge of American Indian traditional lifeways to park visitors. Three full-time Indian Cultural Demonstrators are currently on staff to share stories and demonstrate traditional practices such as basketmaking, beadwork, and traditional games.

Preliminary Management Considerations

The preliminary management considerations associated with the Cultural ORV in segment 2:

- Various types of visitor use such as hiking, stock use, camping, theft and vandalism have been shown to affect individual archeological sites in the district.
- The specifically mapped black oak woodlands in El Capitan Meadow and at the Schoolyard are declining, primarily due to lack of recruitment.

River Segment 4: El Portal

The Cultural ORV within this river segment includes archeological sites representing American Indian villages that are contributing elements of the El Portal Archeological District (listed on the National Register in 1978). El Portal's location between Yosemite Valley and the San Joaquin Valley made it an important place of settlement, subsistence, and trade along the Merced River.

The El Portal Archeological District encompasses 1,910 acres and contains 36 known sites within the Merced River corridor. These sites have sparse but intriguing evidence of use, perhaps as old as 9,500 years before present (BP), and contain data important to interpreting cultural history (Hull and Moratto 1999) (Figure 5-2). More numerous sites date to between 2500 BC and 1900 AD, with several 19th-century homesteads and settlements by American Indians. The El Portal segment may contain some of the best-preserved archeological resources from this protohistoric period reflecting American Indian cultural change as a result of contact with Euro-Americans (NPS 1976).

The steep, narrow canyon at El Portal includes river terraces with level lands on which American Indian villages were built. Prehistoric human burials, in both isolated locations and cemeteries, have been identified in El Portal. As recently as the early 1900s, local American Indian inhabitants shared the names and histories

of multiple villages within this river segment, including permanent year-round settlements with large winter populations in the 18th and 19th centuries (Merriam 1917). These sites would have included family homes, traditional roundhouses for dances and ceremonies, sweat lodges, acorn granaries, and mortars cut into the granite bedrock for processing acorns and other foods (Kroeber 1921). Surface remains include these bedrock mortars, house pits, and midden deposits with lithic debris; however, excavations have shown that sometimes sparse surface manifestations provide little indication of the potentially high density of materials contained in subsurface deposits. The presence of artifacts originating from the Great Basin and Pacific Coast indicate that El Portal was a location of continuous, far-reaching traffic and trade throughout prehistory. Eleven of the contributing sites in the El Portal Archeological District correlate with those villages named by Merriam's informants (1917). Particularly significant is the Johnny Wilson Ranch, a rare surviving example of an early 20th-century American Indian homestead and cemetery on the south side of the Merced River (Davis-King 1997). Mr. Wilson and his family occupied the 30-acre ranch, granted under the Dawes Act in 1917, until his death in 1937 (NPS 2011).

Condition at the Time of 1987 Designation

Prior to 1987, several sites in the El Portal Archeological District had sustained damage from Euro-American occupation and industry in the 19th and early 20th centuries, as well as NPS development. Notably, construction of the Yosemite Valley Railroad and Highway 140, logging, mining, concession operations, and park facility or residential construction had damaged 30% or more of eight sites listed in the district (NPS 1976). Four sites are known to have experienced particularly severe damage, most notably a large ancient village and cemetery developed for park infrastructure needs. Unauthorized collection of surface artifacts was presumed at several sites, although this type of impact is very difficult to document (NPS 1976).

However, 1959-1960 excavations carried out at one of these sites revealed that a significant amount of information was intact beneath the surface at some sites within the district (Fitzwater 1962). This assessment was confirmed by testing at a multi-component site with fairly extensive surface damage resulting from early 20th-century Euro-American occupation as well as construction of Highway 140.

Limited excavations in 1959 showed intact subsurface deposits to a depth of at least 18 inches (Middleton [NPS] 2009). It was specifically noted that some sites, such as Johnny Wilson's Ranch, were virtually undisturbed because of the difficulty in accessing their locations (NPS 1976).

Additional testing and excavation was carried out at several sites in the El Portal Archeological District prior to the Wild and Scenic designation, driven by the need for information to support planned facility development associated with implementing the park's *General Management Plan*. Work by Baumler and Carpenter (1982), Riley (1987), and others has added substantially to the body of knowledge available for use in interpreting the cultural history of the region.

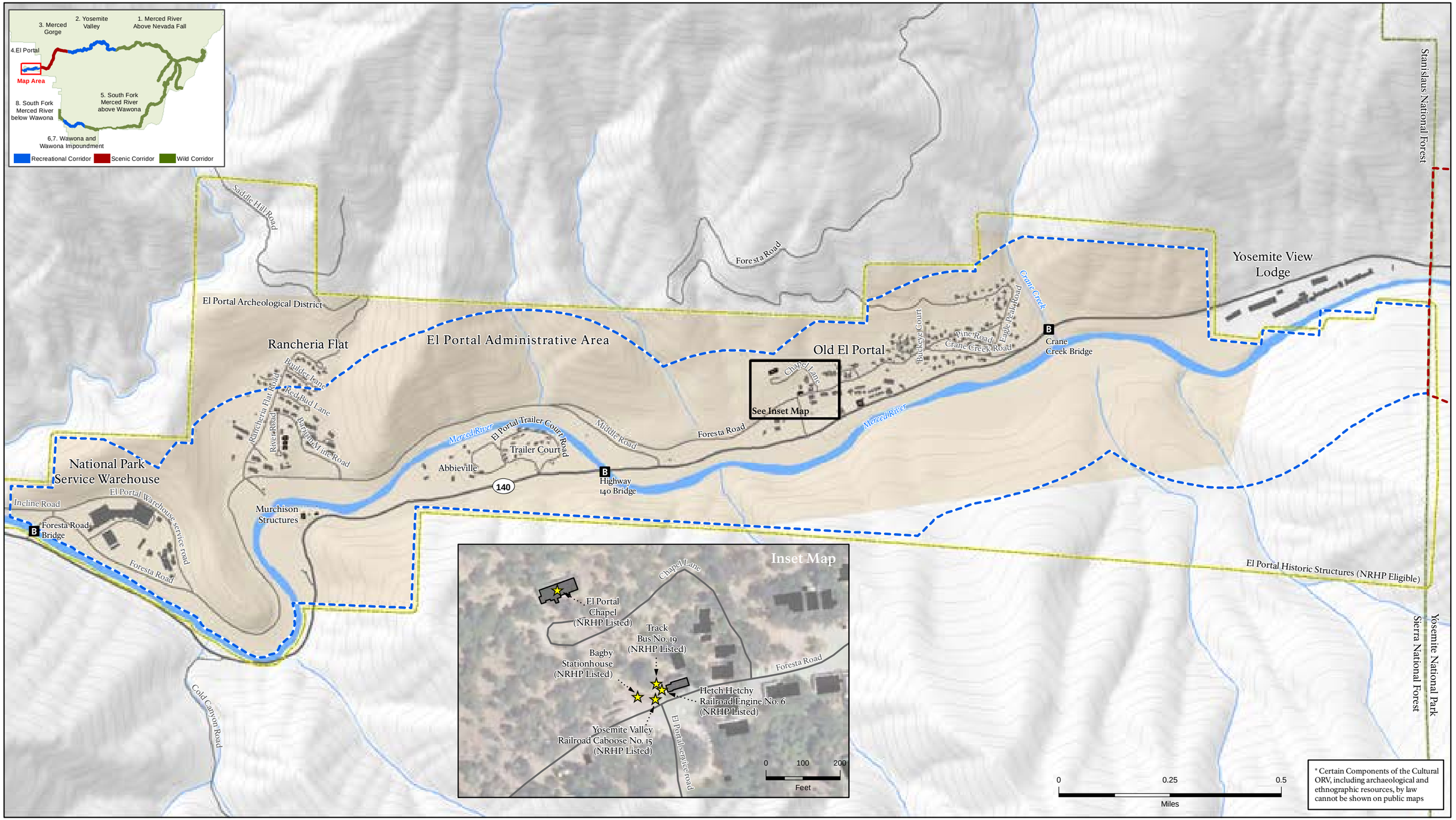

Figure 5-2

Cultural ORV - River Segment 4. El Portal

Recreational WSR Corridor

Recreational WSR Corridor Classification
Scenic WSR Corridor Classification
Archeological District
Building - Black outline denotes inclusion on List of Classified Structures
Yosemite National Park Boundary
National Register of Historic Places
B Road bridge
Highway 140
Road
100' Contour Line
Stream/River

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	5/23/11
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Current Condition

When the park's *General Management Plan* was implemented, NPS park managers called for limitations on further development in the El Portal Archeological District until in-depth studies were performed to assess the information potential of individual sites that could be damaged or destroyed by such work (NPS 1979). Consequently, the archeological sites in the El Portal Archeological District have generally been well protected since the Wild and Scenic River designation. Sixty-nine percent of the sites within the Merced River corridor have been assessed in good condition, while an additional twenty-seven percent are in fair condition. No sites are currently in poor condition, although one historic-era can scatter (not a contributing element of the archeological district) has been destroyed (Darko 2011). The disturbance severity levels for visited sites in the El Portal Archeological District generally reflect the high quality state of preservation for sites in this ORV. Eleven (42%) of the sites show low levels of disturbance, and seven more (27%) have a moderate disturbance severity (Darko 2011). Several recently visited sites in the district exhibited no natural or human-related impacts and retain excellent integrity (Middleton [NPS] 2008); however, there have been impacts at some sites related to the same activities described for the Yosemite Valley Archeological District. Eight (31%) of the El Portal sites exhibited a severe level of disturbance (Darko 2011).

Administrative/Facility-related Impacts. Continued use of the El Portal area for park infrastructure and other facilities has had minor to moderate detrimental effects on the condition of the archeological sites within this river segment, although the most severe of these impacts occurred prior to the Wild and Scenic River designation. Maintenance and upgrades of existing facilities have potentially damaged small portions of known sites, especially subsurface deposits that were not known to exist when planning activities were taking place.

Visitor Use Related Impacts. Because this area is used primarily for administrative facilities rather than public services, impacts related to visitor use have been minimal. Middleton's research into visitor-use and other impacts on archeological sites included a few examples from the El Portal Archeological District; based on this recent research, at least one site in the district exhibits evidence of moderate visitor-use impacts (e.g., social trails, piles of artifacts).

Impacts from Ecological Processes. Natural erosional processes within the steep Merced River canyon has affected artifact distribution and/or spatial patterning at a few sites, and at least one site immediately adjacent to the river experienced flood-related damage in 1997. Rodent tunneling (bioturbation) was also noted at this site and can be presumed to exist at additional sites within the district (Middleton [NPS] 2009).

Archeological Research Impacts. Studies at Johnny Wilson's Ranch and excavations at other individual sites in accordance with the General Management Plan and the park's archeological research design have revealed valuable information about historical Miwok culture and lifeways. However, data recovery inevitably destroys the portions of the sites being investigated.

Preliminary Management Considerations

The preliminary management consideration associated with the Cultural ORV in segment 4 is that residential and commercial development has occurred within the archeological district, affecting archeological sites.

River Segment 5: South Fork Merced River above Wawona

This river segment shelters regionally rare prehistoric archeological sites containing substantial rock-ring features with wooden remains. The rock-ring sites were first formally identified and reported by Knierieman (1976), who interpreted them as protohistoric Miwok deer-hunting blinds. These blinds were created to take advantage of lines of sight along the river and the local soda springs, which contained essential mineral salts attractive to deer (Knierieman 1976). Knierieman's interpretation of these features has neither been confirmed nor refuted, and the features remain enigmatic. The features were typically constructed of two or three courses of stacked rock coupled with the remains of wooden timbers that may once have formed a kind of superstructure. Associated charcoal and obsidian flaked-stone artifacts (including projectile points) have been found near some sites, reinforcing the possibility of an association with hunting activities.

Condition at the Time of 1987 Designation

Knierieman (1976) penned a short paper that described stacked rock rings with timbers within this river segment, their locations, associated artifacts, estimated temporal affiliations, and known impacts (1976). At the time, wilderness campers had reportedly destroyed at least one feature in a different area. Knierieman described the features as being in a "dilapidated condition" from natural processes.

Current Condition

A Wilderness Historic Resources Survey conducted in 1992 reported that campers had built a bonfire in one of the rock-ring features near the soda springs, destroying any remnants of the wooden timbers (Snyder 1992). No impacts were noted at a second rock-ring feature. Revisitation and formal documentation as part of the park's archeological assessment program in 2000 (Quinn 2001) and 2002 (Jackson and Hagen 2007) reported two of the sites in fair and good condition, with natural erosional processes and vegetation growth the only sources of impacts. A 2005 visit of the sites noted that one of the features had been partially rearranged by campers to create campfire rings and a rock "table;" this was the same feature at which Snyder had earlier reported a bonfire (Montague 2005). Garbage was also noted at this feature, approximately 10 meters from a hiking trail.

Preliminary Management Considerations

The preliminary management consideration associated with the Cultural ORV in segment 5 is that one site located close to the trail is at a higher risk of impacts from hikers, campers, and other park visitors (Montague 2005).

River Segment 7: Wawona

U.S. Army Cavalry Camp A.E. Wood. From 1891 until 1916, the U.S. Army stationed troops at Yosemite during the summer months to administer the fledgling park, enforce prohibitions on grazing and other incompatible uses, and construct much of the original park infrastructure (California Military Museum n.d.). Captain Abram Epperson Woods was the first leader of the cavalry units assigned to this post and became acting park superintendent from 1891 until his death in 1894 (Sargent 1961). The camp near Wawona that bears his name was the headquarters for summer cavalry troops until 1906. For three summers (in 1899, 1903, and 1904), the troops assigned to protect Yosemite were African-American infantry (24th)

and cavalry (9th) units known colloquially as the "Buffalo Soldiers" (USDI 1906). During their tenure as Yosemite's guardians, these soldiers policed the backcountry against sheepherding, game poaching, and other illegal trespass. They also built roads, trails and other improvements, such as a now-abandoned arboretum on the south side of the South Fork Merced River, west of its confluence with Big Creek (Palmer n.d.). Perhaps more significantly, these soldiers were agents of the United States government in advancing the innovative principle of preserving federal land simply for its scenic beauty. This was during a time when African-Americans were treated as second-class citizens in many parts of the nation, and their visibility was minimized as much as possible; as a consequence, their contribution to Yosemite's history has only recently begun to be recognized (Johnson n.d.). The significance of Camp A.E. Wood is heightened by the scarcity of written information on this chapter in the park's history and the rarity of physical evidence directly related to the buffalo soldiers' tenure as park guardians (Kirn 2010).

Wawona Archeological District. The National Register–listed Wawona Archeological District is 4,940 acres in size and includes at least 74 archeological sites (NPS 1978; Darko 2011), many of which are located within the river corridor (Figure 5-3). The significance of the district, as documented in 1978, lies in its ability to provide information pertaining to American Indian subsistence strategies, seasonal use of specific ecological zones, demographic patterns, and both prehistoric and historic-era occupation of the area (NPS 1978). It is likely that this and the other archeological districts in the Cultural ORV possess additional significance not recognized at the time of their National Register nominations, both in terms of archeological information potential and traditional or cultural significance to associated American

Yosemite Wilderness

Segment 8: South Fork Merced River below Wawona

Segment 7: Wawona

Segment 6: Wawona Impoundment

Segment 5: South Fork Merced River above Wawona

Sierra National Forest

Yosemite National Park

Wawona Campground Road

Wawona Campground

41

Alder Creek Trail

South Fork of the Merced River

Rush Creek

Alder Creek Trailhead

See Inset Map

Wawona Bridge B

Wawona Covered Bridge B

Wawona Hotel Historic Landmark (NRHP Listed)

Wawona Point Trailhead

Wawona Historic District (NRHP Listed)

Water Plant Road

Chilnualna Falls Road

Chilnualna Falls Trailhead

Chilnualna Falls Trail

Chilnualna Creek

Koon Hollar

Bills Hill Road

Wawona Swinging Bridge Trail

Wawona Swinging Bridge B

Wawona Meadow Loop Trail

Chowchilla Mountain Road

Wawona Road

41

Four Mile Road

Wawona Archeological District

0 0.25 0.5

Miles

* Certain Components of the Cultural ORV, including archaeological and ethnographic resources, by law cannot be shown on public maps

Inset Map

Chilnualna Falls Road

Hodgdon Homestead Cabin (NRHP Listed)

Yosemite Transportation Company Office (NRHP Listed)

Acting Superintendent's Headquarters (NRHP Listed)

Chris Jorgenson Studio (NRHP Listed)

Wawona Covered Bridge (NRHP Listed)

Forest Drive

0 100 200

Feet

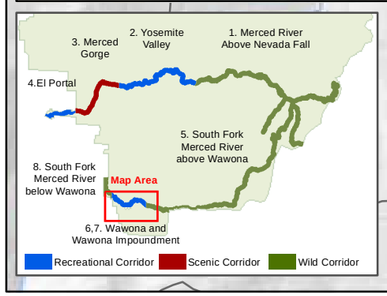

Figure 5-3
Cultural ORV - River Segment 7. Wawona
Recreational WSR Corridor

- Recreational WSR Corridor Classification
- Wild WSR Corridor Classification
- Campground
- Wawona Archeological District Boundary
- Building - Black outline denotes inclusion on List of Classified Structures
- Yosemite National Park Boundary
- National Register of Historic Places
- Historic Landmark
- B Road bridge
- B Footbridge
- B Covered Bridge
- Trailhead
- 100' Contour Line
- Highway 41
- Road
- Stream/River
- Trail

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	5/23/11
File:	Figure 5-3

Indian groups. In addition, material cultural remains of previously under-reported ethnic groups such as African Americans and Chinese are important. Historic contexts for these areas of significance have yet to be developed, and while not reflected in the existing National Register nominations, the NPS recognizes these as possible aspects of significance in the Wawona Archeological District.

The prehistory of the Wawona area is similar to that of the park as a whole, although most occupation by American Indians seems to have occurred somewhat earlier than in Yosemite Valley. There has been less ethnohistoric[35] use in more recent times. Archeological sites range in size, and most include bedrock mortars and midden soil. At least 12 of the sites recorded as contributors to the district have 25 or more bedrock mortars with associated midden deposits, indicative of large village sites (NPS 1978). These sites frequently occur in clusters with close spatial association. The Wawona area is sheltered from harsh winds and extreme climatic conditions by the surrounding ranges, thus allowing for possible year-round occupation. Acorn-gathering and processing apparently took place during the early fall at times of low water, as suggested by the presence of bedrock mortars in the river channel itself, below the average mid-summer waterline. The time span of these sites is not accurately known but may range from before AD 500 to historical Miwok. One ethnohistoric-period Miwok village (Palachan) is recorded in the area, but its correlation with archeological deposits is uncertain (NPS 1978).

Wawona Covered Bridge. The community of Wawona is founded on the site of the log cabin built by Galen Clark in 1857. Clark moved to California during the Gold Rush and became a homesteader in the Yosemite Valley in 1856. Clark established a 160-acre homestead with a 12-by-16-foot cabin, called "Clark's Station" or "Clark's Crossing." Between 1857 and 1858, Clark also constructed a bridge across the South Fork Merced River as part of an early road to the Valley (Greene 1987).

Clark ran a modest hostel and did not seek to enrich himself through his association with Yosemite. In 1869, Clark—facing financial difficulties—accepted Edwin Moore as a full partner in his hotel enterprise. The Clark and Moore partnership did not last, however, and the firm of Washburn, Chapman, & Coffman purchased the South Fork hostelry in 1874. Following the dissolution of Washburn, Chapman, & Coffman, the Washburn brothers maintained ownership of Clark's hostelry and surrounding buildings (Greene 1987).

In 1875, the Washburns roofed the bridge across the South Fork Merced River and enclosed the sides to keep water and snow off the trestles. In 1900, approach spans were added to each end of this bridge, and the bridge was used until 1931, when visitor traffic was rerouted to a modern concrete bridge on the new Wawona Road.

The Civilian Conservation Corps completed general repair work, including the addition of stone masonry to the substructure in 1937 (Greene 1987). By this time, the bridge consisted of two parallel wooden trusses that were 14 feet apart. Each of these trusses had an overall length of 130 feet and a clear span of 106 feet. The timbers were hand-hewn and varied in size from 12 by 14 inches to 14 by 18 inches. The housing was 130 feet long and 26 feet high (to the top of the gable roof), and the opening at each end was 14 feet, 2 inches high and 14 feet, 2.5 inches wide (Fry 1957).

The Wawona Covered Bridge is the only covered bridge in the Sierra Nevada region. This historic structure is listed on the National Register and is one of only 13 such structures in California. Covered bridges are now uncommon in California, most having burned, rotted, or been swept away by floods. The bridge is used daily by visitors as a central feature of the Pioneer Yosemite History Center (NPS 2010b). The Wawona

[35] The study of the development of culture from a combined historical and anthropological viewpoint, using written documents, oral tradition, material culture, and ethnographic data.

Covered Bridge boasts state significance within transportation and recreation contexts. The bridge embodies the distinctive characteristic of a unique type of construction and is the only historic covered bridge in NPS's western region (Greene 1987).

Condition at the Time of 1987 Designation

U.S. Army Cavalry Camp A.E. Wood. After the departure of U.S. Army troops from Camp A.E. Wood, the area was abandoned for several years until a public campground—known as "Camp Hoyle"— was established in the same location. In 1951, the campground was enlarged, improved, and renamed Camp A.E. Wood (Sargent 1961). The Wawona Campground grew around the site, with the portion known as Camp A.E. Wood eventually incorporated into the popular camping spot. Archeological survey work conducted for the National Register nomination of the Wawona Archeological District noted the presence of significant historic-era Euro-American cultural materials but did not explicitly connect any of these remains to the early Army camp or to the African-American soldiers assigned to park duty (NPS 1978). Further evaluation of several sites in the district during 1983-1984 fieldwork revealed a wealth of military and domestic artifacts related to Camp A.E. Wood, and possibly the early homestead of 1860s settler Stephan Cunningham, located within and adjacent to the current Wawona Campground (Ervin 1984). Square-cut nails, gun cartridges (a majority dating to 1899-1905), bullets, can fragments, bottle and window glass, and rotting wood were discovered in the top 6 centimeters of one of the test excavation units. During the 1983 field season, Ervin (1984) noted that disturbances to the historic-era component of the site were mainly a result of formal campground construction and maintenance, beginning with campsite and road grading, restroom construction, and other infrastructure development in the 1940s and continuing with the burial of modern campsite trash, casual collection of artifacts, and tent trenching practices. However, Ervin (1984) concluded that despite these impacts, the historic component of the site contained important information related to the U.S. Army's use of the area and possibly to early homesteading activities, as well.

Wawona Archeological District. When it was listed on the National Register in 1979, the Wawona Archeological District had undergone very little in the way of archeological testing or excavation. The statements of significance on the National Register nomination form were based largely on surface assemblages and the potential for subsurface deposits, rather than explicit knowledge of the nature of such deposits. This potential was confirmed when Ervin (1984) carried out limited auger testing at 24 sites and performed test excavations at nine of the sites during the field seasons of 1983 and 1984 in anticipation of a water/wastewater infrastructure project. The results of this investigation proved that many sites within the Wawona Archeological District contained intact, and in some cases deeply buried, cultural deposits with the potential to reveal much about the precontact inhabitants of the area. As a result of this fieldwork, plans for the infrastructure development were modified to avoid or reduce impacts to known sites, which kept them in overall excellent condition. Although substantial historic-period development has occurred within portions of the Wawona Archeological District, Ervin (1984) concluded that impacts mainly affected surface artifact assemblages and only limited portions of subsurface deposits, leaving intact cultural materials with the potential to address important research questions related to the long history of human habitation and use of the Wawona area.

Wawona Covered Bridge. At the time of the 1987 Wild and Scenic River designation, the Wawona Covered Bridge had recently undergone structural safety improvements. NPS had dismantled and reconstructed the bridge in 1956-1957, employing hand-hewn timber construction in the same style as the original bridge (Photo 5-1). Some timbers were replaced in 1961 and again in 1983 when NPS corrected structural safety hazards following an inspection of the bridge (Greene 1987).

PHOTO 5-1: WAWONA COVERED BRIDGE 1957 (NPS 1957)

Current Condition

U.S. Army Cavalry Camp A.E. Wood. Apart from ongoing maintenance and use of the Wawona Campground, the primary influence affecting the condition of the U.S. Army Calvary Camp A.E. Wood was the extensive flooding in 1997. Flood-related impacts to this site and others in the Wawona Archeological District were assessed in 1999 and 2004 (Montague and Valdez 2004). As of the most recent assessment, Camp A.E. Wood and the other examined sites in the district still possessed intact cultural deposits, but additional investigation of these sites was needed to more fully define their horizontal and vertical extent and integrity. Additional historical research was recommended to correlate the historic-era artifacts within the Wawona Campground to the occupation of the site by the U.S. Army Calvary troops (Montague and Valdez 2004).

Wawona Archeological District. Of the 29 Wawona Archeological District sites that were visited during the 2007-2009 field seasons, 13 were estimated to have experienced severe impacts. Nine additional sites were rated as having a moderate degree of disturbance, and seven sites had a low rate of impact. Evidence of visitor use was seen at all but three of the monitored sites (Middleton [NPS] 2008, 2009, 2010). A recent summary of site conditions at all 59 of the Wawona Archeological District Sites within the Merced River Corridor found that 33% (19 sites) are in good condition, with an additional 38% (23 sites) in fair condition

(Darko 2011). Eleven of the sites are in poor condition, while four could not be relocated during an attempted field visit, and two with unknown conditions were not visited as part of the project. Darko's 2011 report corroborated the earlier estimations of disturbance severity levels, with 20 sites (35%) exhibiting a low level of disturbance, 17 (29%) having a moderate disturbance severity level, and 12 (19%) showing severe impacts. Ten (17%) of the sites within the 2011 Wawona Archeological District study area could not be assessed for disturbance severity levels.

Impacts seen at archeological sites within this ORV segment fall into largely the same categories as those noted in the Yosemite Valley and El Portal Archeological Districts: administrative/facilities-related impacts such as campground and infrastructure maintenance, visitor use impacts (including general trampling, artifact collection, and creation of informal trails), and natural impacts such as flooding and erosion.

Wawona Covered Bridge. Between 2002 and 2005, the Wawona Covered Bridge underwent a restoration effort to improve the deteriorating timber structure. Hand-hewn timbers were used to repair the structure in a manner similar to the original 19th-century construction (NPS 2005, Photo 5-2). Preservation of the bridge also included:

- Constructing shoring to support the 115,000-pound timber-frame of the bridge
- Removing the 8-inch sag from the superstructure, leveling the bridge
- Removing and replacing all seven of the deteriorated 14-square-inch by 30-foot transverse floor beams
- Repairing the bridge pier masonry in the riverbed
- Restoring the structural stability of the upstream and downstream timber-frame truss assemblies Replacing the undersized timber components to resist wind and snow loading
- Replicating hand-hewed timbers using broad axes and traditional craftsmanship from 19th-century practices

PHOTO 5-2: WAWONA COVERED BRIDGE 2005 (NPS 2005)

All bridge restoration activities were designed to meet the Secretary of the Interior's *Standards for the Treatment of Historic Properties*, thereby ensuring that the bridge retains its historical integrity. Completion of the bridge restoration project inaugurated the creation of the Pioneer Yosemite History Center, with the restored bridge as a central feature.

Preliminary Management Considerations

The preliminary management consideration associated with the Cultural ORV in segment 7 is that the sites within the Wawona Archeological District, including the remains of U.S. Army Calvary Camp A.E. Wood, are subject to ongoing impacts from park operations and facilities management, use of hiking trails (as well as informal trails), camping, bouldering/rock climbing, artifact collection, and vandalism.

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