National Park Service
U.S. Department of the Interior

Merced Wild and Scenic River Values Draft Baseline Conditions Report

April 2011

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

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DRAFT MERCED WILD AND SCENIC RIVER OUTSTANDINGLY REMARKABLE VALUES RIVER VALUES BASELINE CONDITIONS REPORT

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GLOSSARY

aggradation: general and progressive buildup of the longitudinal profile of a channel bed due to sediment deposition

alluvial reach: a reach of a stream which has formed its channel in cohesive or noncohesive materials that have been and can be transported by the stream

alluvial soil: soil containing unconsolidated mixtures of gravel, sand, clay, and silt typically deposited by streams

alluvium: sediment deposited by rivers that forms floodplains or deltas. Consists of silt, sand, clay, gravel and organic material

alpine plants: plants growing above the limit of tree growth

anthropogenic: created by people or caused by human activity

aspect (stream aspect): the direction in which a stream faces (e.g. southwest**)**

avulsion: a sudden change in the channel course that usually occurs when a stream breaks through its banks; usually associated with a flood or a catastrophic event

axial stream: the main stream of an intermontane valley, which flows along the lowest part of the valley and parallel to its long dimension, in contradistinction to the streams that flow down the mountains on either side

bank revetment: to harden or reinforce a riverbank, usually by lining with riprap

bar: an elongated deposit of alluvium within a channel, not permanently vegetated

barrow pit: a ditch dug along a roadway to furnish fill and provide drainage

bedrock: the solid rock exposed at the surface of the earth or overlain by soils and unconsolidated material

berm: a flat or raised earthen area (usually unpaved) along the side of the road

biotechnical bank stabilization: the use of vegetation to provide armoring or indirect protection (e.g. flow deflection) of stream banks

bioturbation: the disturbance of soil by living things (e.g., rodent tunneling)

boulder-cascades: a waterfall or a series of small waterfalls descending over a steep, rocky surface characterized by boulders

casual trails: see informal trails

channel cutoff: a minor avulsion where a high-sinuosity meander bend is abandoned in favor of a steeper gradient course

channel: a natural or artificial watercourse, with a defined bed and banks to confine and convey continuously or periodically flowing water

cobble: a fragment of rock whose diameter is in the range of 64 to 250 mm

compound oxbows: a combination of two oxbow shaped stream components or lakes: two meander loops which are joined in such a manner that their evolutionary relationship is apparent

conifer: Any of a variety of mostly needle-leaved or scale-leaved, primarily evergreen, cone-bearing trees or shrubs such as pines, firs, and junipers

disjunct population: an isolated population of a species whose distribution has become fragmented into two or more groups that are related but widely separated from each other geographically

dissolved oxygen: the oxygen freely available in water, which is vital to fish and other aquatic life. Dissolved oxygen levels are considered an important indicator of a water body's ability to support desirable aquatic life

drip line: the area directly under a tree, corresponding to the furthest extension of the branches of a tree

ecotone: a transition area between two adjacent habitat types

effluent discharge: outflow of treated water from a wastewater treatment plant.

endangered species: any species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that is in serious danger of becoming extinct throughout all or a significant portion of its range. Federally endangered species are officially designated by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service and published in the Federal Register. Species may also be listed under the California Endangered Species Act by the Department of Fish and Game.

endemism: 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

ethnobotanical resources: botanical resources that have cultural or ethnological significance. For example, in Yosemite Valley, such resources include black oak acorns, mushrooms, tree mushrooms, wormwood, bracken fern roots, sedge roots and deer grass

ethnographic resource: physical artifacts, features, sites, districts, or landscapes created by and/or demonstrably important to a specific living group of people linked by a common ancestry and culture

flank: the eroded area between the stream bank and the landward end of a stream stabilization countermeasure

flanking: erosion resulting from streamflow between the bank and the landward end of a stream stabilization countermeasure

floodplain: the flat or nearly flat land along a river or stream or in a tidal area that is covered by water during a flood

frontcountry: outdoor areas that are easily accessible by vehicle and mostly visited by day users.

genus: a taxonomic category above the species level, constituting a major family or subfamily

glacial till: an unsorted, unstratified mixture of varyingly-sized clay, sands and rock debris deposited by a glacier

glaciated landscape: a landscape defined by glaciation

glaciation: the condition of being covered with glaciers or masses of ice; affected by glacial action

gradient: the slope of stream bed or land surface within a given distance

groundwater: water beneath the surface of the ground held in or moving through saturated layers of soil, sediment or rock

gullying of flanks: the formation of a channel or a channel deepening caused by flanking

hanging valleys: a glacially-formed tributary valley with the floor at a higher relief than the main channel into which it flows (often accompanied by hanging waterfalls)

herbarium: a collection of dried, preserved systematically-arranged plant specimens for botanical reference and research

hydrology: the study of water, its biological, chemical, and physical properties, its reaction with the environment, and its movement on the surface of the land, in the soil and underlying rocks, and in the atmosphere

impoundment: a body of water that has been dammed or confined within an enclosure, as a reservoir.

in situ: in the natural or original position or place

incision: lowering of the channel bed by erosion

informal trails: casual trails created by visitor use; such trails are not created or maintained by NPS

intergrade: the way in which two distinct species or subspecies are connected in areas where populations are found that have the characteristics of both species or subspecies

keystone tree species: a tree species that plays a critical role in maintaining the structure of an ecological community, affecting many other organisms in an ecosystem and helping to determine the types and numbers of various other species in the community

levee: an embankment raised to prevent a river from overflowing

lithic debris: fragments of rock (typically obsidian, chert, or other smooth cryptocrystalline material) removed during the process of creating or sharpening a flaked-stone tool, i.e., flintknapping

meander: a meander in a river consists of two consecutive loops, one flowing clockwise and the other counter-clockwise

midden soils, midden deposits: a mound or layer of domestic refuse generally containing culturally darkened soils, shells and animal bones, as well as other indices of past human life and habitation; middens mark the site of a long-term indigenous settlement, and may contain human burials related to that settlement

milling stations: boulders or exposed bedrock slabs (typically granite) with mortar cups or milling slicks used for processing plant or animal resources for food, medicine, and other uses

moraine: any glacially formed accumulation of unconsolidated glacial debris (soil and rock) which can occur in currently glaciated and formerly glaciated regions, such as those areas acted upon by a past ice age

> **ground moraine**: till covered areas with irregular topography and no ridges, often forming gently rolling hills or plains
>
> **lateral moraine**: parallel ridges of debris deposited along the sides of a glacier
>
> **recessional moraine**: a series of transverse ridges running across a valley behind a terminal moraine
>
> **terminal moraine**: ridges of unconsolidated debris deposited at the snout or end of the glacier

morphology: form, shape and structure

mortar: a cup-shaped hollow in a boulder or exposed bedrock slab used in conjunction with a pestle for grinding or pounding food or medicine; most commonly used by California Indians for processing acorns and seeds, but also insects, plants used for dyes, etc.

nonpoint-source pollutant: pollutants such as hydrocarbons, fine sediment, and metals coming from a wide, non-specific source such as runoff from parking lots, roads, and campgrounds

nutrient: any element or compound, such as phosphorus, nitrogen or sulphates, that an organism needs to live and grow or a substance that is used in an organism's metabolism which must be taken in from its environment; an excess of which can fuel abnormally high organic growth in aquatic ecosystems

Outstandingly Remarkable Value (ORV): the truly exceptional qualities that merit a rivers' designation as a Wild and Scenic River; the Merced River Comprehensive Management Plan will use these values as a foundation for planning and management

oxbow: the abandoned former meander loop that remains after a stream cuts a new, shorter channel across the narrow neck of a meander; often bow-shaped or horseshoe-shaped

paternoster lakes: a series of glacial lakes connected by a single stream or braided stream system

pathogen: an organism or microorganism capable of causing disease or infection in the host plant; pathogens can include bacteria, viruses, protozoa or fungi

petroglyphs: designs or markings carved, incised, or pecked into a rock face

petroleum hydrocarbons: organic compounds found in crude oil that are composed entirely of hydrogen and carbon

phosphorus weathering: collective term for the processes by which phosphorous at or near the earth's surface is disintegrated and decomposed by the action of atmospheric agents, water, and living things

plane-bed: a horizontal bed without elevations or depressions larger than the maximum size of the exposed sediment grains

Pleistocene era: 10,000 to 1.8 million years ago

prehistoric past: the span of human occupation of a particular area that was not documented by written language; in the Central Sierra Nevada, the first written histories specific to the region date to approximately 1851, marking the end of the prehistoric period

recruitment (sapling recruitment, oak recruitment): the entry of new individual trees into an established population or community

relict meander oxbows: oxbow meanders that have receded or withdrawn, leaving dry land exposed

riffle: gravel size or larger bed sediment where the stream is shallow and swift at low flows; riffles are produced during high flows by the accumulation of large bed materials

riffle-pool morphology: a riffle-pool sequence in alluvial stream channel refers to a succession of one or more combinations of pools and riffles along the channel in the downstream direction

riparian: the land adjacent to a natural watercourse such as a river or stream; riparian areas support vegetation that provides important wildlife habitat, as well as important fish habitat when sufficient to overhang the bank

riprap: layer or facing of rock or broken concrete which is dumped or placed to protect a structure or embankment from erosion; also the rock or broken concrete suitable for such use

river morphology: a collective term for characteristics describing the form of a channel

riverine: located on or inhabiting the banks of a river; riparian

root wad: a structure used in streambank stabilization, root wads are the root mass of a tree, usually hardwoods, along with ten to fifteen feet of attached trunk

scour, pool scour, scour holes: an area of deeper water created by the scouring action of water; these generally occur downstream of obstructions or along the outside of a meander bend

sedge species: herbaceous plant within the Cyperacae family; generally found in wetland areas

shoulder seasons: before and after the period of peak visitation

sinuosity: a measure of meander "intensity"; computed as the ratio of the length of a stream measured along its centerline to the length of the valley through which the stream flows

social trails: see informal trails

soda springs: natural springs containing essential mineral salts

special-status species: special-status species have low or declining numbers; are found on the California Natural Diversity Database (CDFG); are listed as rare, threatened or endangered under the federal or state endangered species acts; species that are candidates for listing under either federal or state law; species formerly designated by the USFWS as Species of Concern or designated by CDFG as Species of Special Concern; or species protected by the federal Migratory Bird Treaty Act (16 U.S.C. 703-711)

stair-step river morphology: a river structure which descends with downstream flows, in the manner of stair steps

stock use: the use of horses, mules, burros, and llamas. Historically there have been four categories of stock use in the Yosemite backcounty: (1) NPS Administrative Use (backcounty patrols, facility maintenance and trail crew support), (2) Concessioner Use (High Sierra Camp supply support), (3) Commercial Use Authorization Use (CUA) (guided trips) and (4) private individual use
subalpine: just below timberline: between montane (pertaining to mountains [region between foothills and subalpine]) and alpine (found above timberline)

substrate: material underlying that portion of the streambed which is subject to direct action of the flow

talus shelters: shallow rockshelters created by overhanging boulders near the base of a slope

talus, talus boulders: pile of rock rubble below a cliff or slope

terminal buds: at the tip of a structure

threatened species: any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range

tributary: a stream that contributes its water to another stream or body of water

tussock-forming grasses: a kind of bunch grass that grows in tufts, clumps, or bunches rather than forming an even lawn or meadow

unreinforced masonry cobble abutments: a mass of cobble-sized masonry designed to support an arch, but has not been braced by reinforcement beams

upland: 1) Areas of higher ground; Areas elevated above the lowlands along rivers or between hills; 2) Areas that are not wetland and do not meet all three wetland criterion as defined by the U.S. Army Corps of Engineers
water table: the level below the land surface at which the subsurface material is fully saturated with water

wetland: a zone periodically or continuously submerged or having high soil moisture, which has aquatic and/or riparian vegetation components, and is maintained by water supplies significantly in excess of those otherwise available through local precipitation

Wild and Scenic River: a river that has been designated under the National Wild and Scenic Rivers Act as having distinctively unique or "outstanding remarkable values" that set it apart from all other rivers, making it worthy of special protection

MERCED WILD AND SCENIC RIVER VALUES
DRAFT BASELINE CONDITIONS REPORT

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1.0 WELCOME/ABSTRACT

Dear Yosemite Friends:

The Merced River and South Fork Merced River in Yosemite National Park are congressionally designated wild and scenic rivers, pursuant to the Wild and Scenic Rivers Act of 1968. In addition to being free flowing and having high water quality, these rivers possess 24 Outstandingly Remarkable Values (ORVs), which are those values that merited the rivers' designation as wild and scenic. Successful protection and enhancement of these values depend on an accurate understanding of their condition. This report provides that understanding by summarizing the pertinent information for the river value baseline conditions in 1987 (the year of wild and scenic designation) and 2010. Using this information, the NPS will prepare a management plan including a variety of alternatives for addressing the issues identified in this report, thereby protecting and enhancing the river values for the future.

This document represents the culmination of hundreds of hours of research and writing, describing the baseline conditions of the ORVs for which the Merced and South Fork Merced Rivers in Yosemite National Park were designated as Wild and Scenic. Yosemite National Park and its partners are currently completing several studies that more completely assess the condition of these values. Once those studies are complete, this report will be revised to reflect the best possible assessment of river value conditions.

The report, including the associated maps, is draft. We welcome your comments on this report. Please pay special attention to the following questions:

1) Do you have suggestions for ways in which this information could be organized and presented for greater clarity and understanding?
2) Is the material presented clear, concise, and adequate to support the conclusions reached?
3) Have we missed sources of information that should be considered in evaluating the condition of the Merced River ORVs?

The preferred method for receiving your comments is electronically through the Planning, Environment, and Public Comment website (http://parkplanning.nps.gov). To submit a comment, click the "Open for Public Comment" link on the left hand side of the project home screen and choose the document you wish to comment on (Draft Baseline Condition Assessment Report).

You may also submit comment to yose_planning@nps.gov or by mail to: National Park Service, Superintendent, Attn: Merced River ORV Baseline Condition Comments, P.O. Box 577, Yosemite National Park, CA 95389. Finally, faxed comments may be submitted to: 209-379-1294.

For further information regarding this plan please visit our website at http://www.nps.gov/yose/parkmgmt/mrp.htm.

Your comments will be most useful if received by April 30, 2011. Thanks for your interest in the future of the Merced River in Yosemite.

Sincerely,

Don L. Neubacher
Superintendent

1.1 INTRODUCTION

The Merced River and South Fork Merced River in California were designated wild and scenic in 1987 under the Wild and Scenic Rivers Act. Most of the Merced Wild and Scenic River is in Yosemite National Park (81 miles), with the remainder in U.S. Forest Service and Bureau of Land Management lands west of the park. The Wild and Scenic Rivers Act stipulates that federal land managers must protect and enhance[1] the values that merit a river's designation as wild and scenic. Free-flowing condition, water quality, and outstandingly remarkable values (ORVs) form the three pillars of protection under the Wild and Scenic River Act. ORVs are defined as those unique characteristics that make a river worthy of special protection. To protect and enhance these values, the act directs managers to prepare a comprehensive management plan for each wild and scenic river. The plan must begin with an accurate assessment of the current condition of those river values. The plan will then address resource protection, development of lands and facilities, user capacity, and other management practices necessary or desirable to achieve the act's purposes.

At the core of a comprehensive management plan is the identification of the river's outstandingly remarkable values. Beginning in January 2010, the National Park Service (NPS) worked to identify the ORVs for the Merced River in Yosemite National Park. To be outstandingly remarkable, a value must meet two criteria:

1. It must be river related or dependent. This means that a value must: be located in the river or on its immediate shorelands (generally within ¼ mile on either side of the river); contribute substantially to the functioning of the river ecosystem; and /or owe its location or existence to the presence of the river

2. It must be rare, unique, or exemplary at a comparative regional or national scale. As expressed by the Interagency Council in 1999, this means that such a value would be one that is a conspicuous example from among a number of similar values that are themselves uncommon or extraordinary.[2]

Presented in section 1.2 below, the 24 ORVs for the Merced River in Yosemite will form the foundation for planning and management of the river. The management plan that the NPS is in the process of writing will have a fundamental focus on the protection and enhancement of these values. The Plan will establish the management objectives for protecting and enhancing these values, the actions needed to achieve those objectives, and the standards to be enforced to ensure that the objectives are maintained over time. Finally, the Merced River Plan will also establish management objectives for preserving the river's free-flowing condition and water quality.

ORVs for the Merced are described by river segment. Rivers in the National Wild and Scenic River System are classified as wild, scenic, or recreational. These labels refer to the degree of development

[1] The Interagency Wild and Scenic Rivers Coordinating Council (Interagency Council) defines *protect* as eliminating adverse effects, while *enhance* is defined as improving conditions. The Wild and Scenic Rivers Coordinating Council is composed of members of each federal land management agency with wild and scenic rivers under its jurisdiction: the U.S. Forest Service, National Park Service, Bureau of Land Management, and U.S. Fish and Wildlife Service.

[2] Jackie Diedrich and Cassie Thomas, "The Wild & Scenic River Study Process," December 1999, available at http://www.rivers.gov/publications.html.

along the shorelines, in the watershed, and the degree of accessibility by road or trail. Classifications are defined by the act as follows:

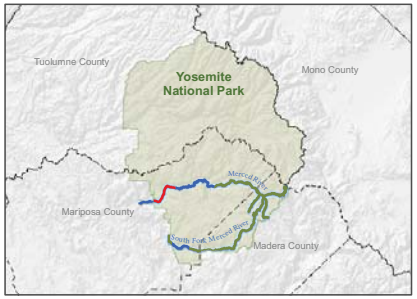
> *"Wild" river areas: Those rivers or sections of rivers that are free of impoundment and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and water unpolluted. These represent vestiges of primitive America.*
>
> *"Scenic" river areas: Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.*
>
> *"Recreational" river areas: Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.*

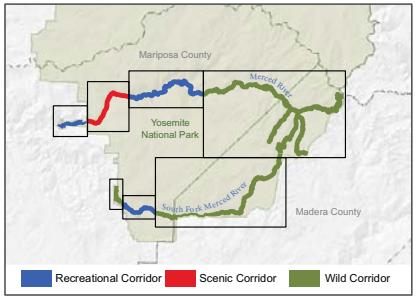
The Overview map below illustrates the segments as they are described throughout this document and also identifies the classification of each segment.

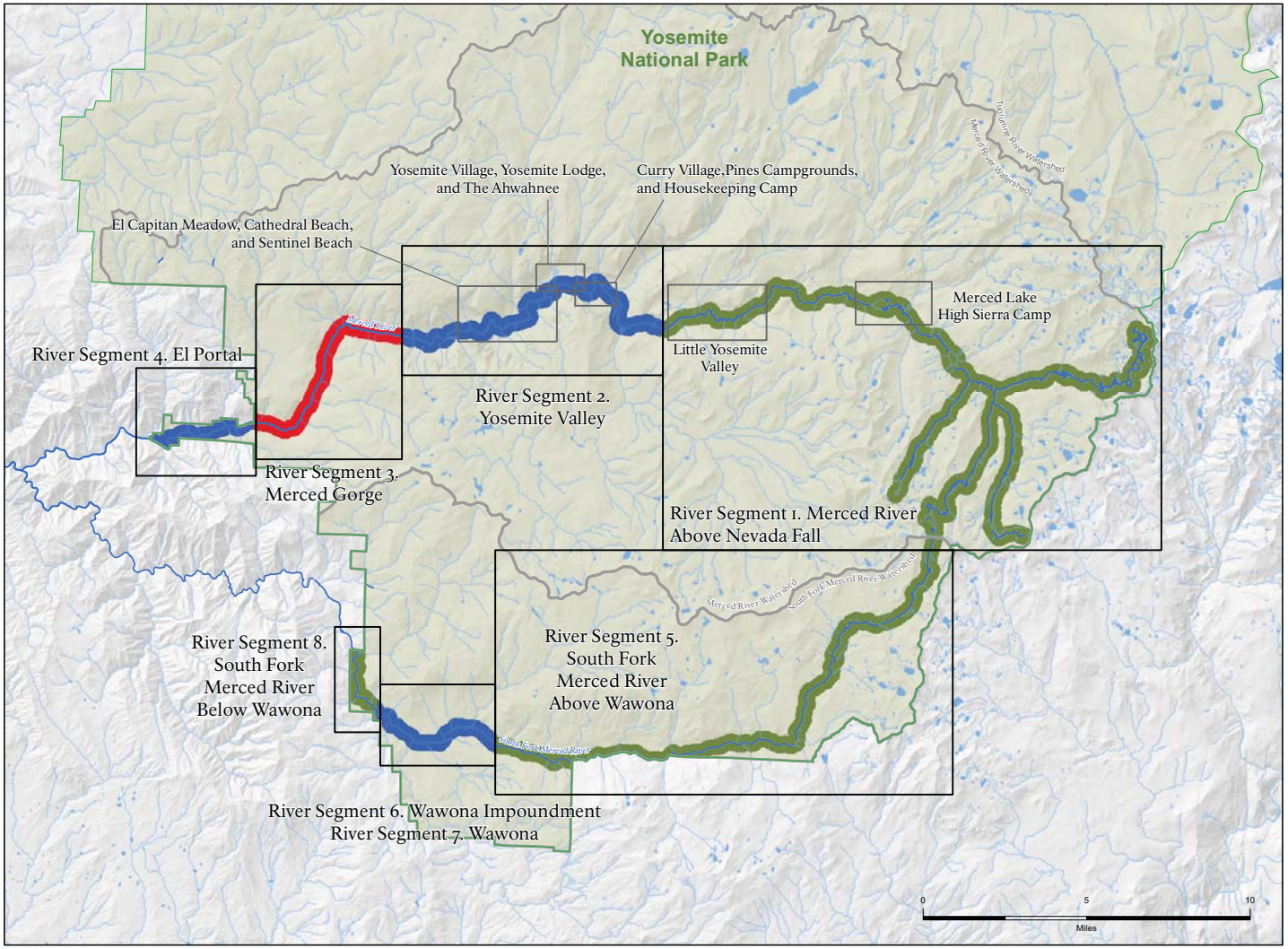
Fundamental to protecting and enhancing the ORVs is accurate, up-to-date information on the condition of the ORVs. This report assesses the Merced River values condition at the time of designation (1987) and currently (2010), using the best available science and the professional expertise of the subject matter experts familiar with the ORVs. The information provided in this report will provide a baseline for the agency's efforts, detailed in the ensuing management plan, to protect and enhance the river values.

Note that the NPS is in the process of completing several studies and monitoring reports intended to fill gaps in the knowledge base regarding the condition of the Merced's ORVs. The majority of these reports will be completed in April 2011, so this report and associated mapping will be revised by summer 2011 to reflect this forthcoming knowledge.

This report, then, begins with an overview of the river segments and ORVs, proceeds to a description of the ORVs by river segment (with a glossary of relevant terms included), and then describes the baseline condition for each of the 24 ORVs. The baseline condition discussion, which comprises the bulk of this report, is organized by kind of ORV: biological, recreational, hydrological/geologic, scenic, and then cultural, with the description of the condition within each ORV type organized further by river segment. Within each baseline condition section, the ORVs are repeated for the reader's benefit. Each baseline condition section concludes with a bibliography of the sources cited therein.







Overview of Merced Wild and Scenic River Segments and Classifications

Yosemite National Park Boundary
Watershed Boundary
Stream/River
Recreational Corridor
Scenic Corridor
Wild Corridor

* In this overview map, each box indicates a planning area with a detailed map to follow.

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	2/25/11
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1.3 MERCED RIVER ORVS

Overview of the Outstandingly Remarkable Values (ORV) of the Merced Wild and Scenic River.

Categories of ORV	Short description
Biological	The Merced River and South Fork Merced River support a suite of riparian and meadow ecosystems within Yosemite National Park, from alpine and subalpine meadows along the river stretches above Yosemite Valley and Wawona, to the Yosemite Valley meadows, to low elevation riparian and wetland habitat. 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, these habitats are river related crossroads of life in a landscape already vibrant with productive habitats.
Recreational	Yosemite is a nationally and internationally renowned destination. One of America's first national parks and a World Heritage Site, the valley was originally set aside for "public use, resort, and recreation."[3] Today, the Merced and South Fork Merced Rivers provide for exceptional outdoor river-related recreational experiences. The dramatic and picturesque setting (also described in the scenic ORV) is central to these experiences. Settings range from the undeveloped wilderness of the Upper Merced and South Fork Merced River, to Yosemite Valley's views of high granite cliffs and towering waterfalls, to Wawona, the Merced Gorge, and El Portal, where the roar and vibration of the river becomes especially apparent during spring runoff. Many first time visitors are awed and inspired by the rivers' natural wonders, forming for some a first connection to wild nature. Others are called back year after year, building long-lasting relationships and attachments to the rivers and their environs. For all visitors, the Merced and the South Fork Merced rivers are places to experience a wild and scenic river in one of America's first and most revered national parks.
Geologic/ Hydrologic	The Merced River contains geologic and hydrologic processes that continue to shape the landscape. Glacial pathways, which the river partly determined and continues to follow, resulted in the rivers' variable gradients, featuring dramatic changes in river speed and volume. The rivers flow through classic glacially carved canyons, over sheer cliffs and steep cascades exemplifying stair step river morphology and hanging valleys, through an alluvial landscape in Yosemite Valley, past a well-preserved recessional moraine, and past an exemplary boulder bar in El Portal.
Scenic	Throughout its length, the Merced River flows through a scenic landscape that has few parallels. Whether these are views from the river or its banks, and whether the views include El Capitan, Half Dome, Triple Divide Peak, or any of the other landmarks along the river, the Merced River provides a natural complement to Yosemite's world-renowned scenery. Depending on the stretch of river, the Merced provides a foreground of a flat valley, a rushing and boulder-strewn river, tall waterfalls, or serene lakes.
Cultural	The continuum of human use along the Merced River and South Fork Merced River encompasses thousands of years of diverse people, cultures, and uses. American Indian and late-Nineteenth 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 the prehistoric past, contemporary American Indian ancestral and other ethnic heritage, historic and cultural landscapes, and ongoing cultural traditions. This landscape, linked through

[3] "An Act Authorizing a Grant to the State of California of the 'Yo-Semite Valley,' and of the Land Embracing the 'Mariposa Big Tree Grove,'" 13 Stat. 325.

	time and space, holds outstandingly remarkable scientific, interpretive and cultural value for traditionally associated peoples and the public.

Following are the 24 ORVs identified for the Merced Wild and Scenic River, organized by category of ORV and then river segment.

BIOLOGICAL

Merced River above Nevada Fall and South Fork Merced River above Wawona

1) **Numerous, exquisite small meadows and relatively intact adjacent riparian habitats support a great diversity of species.**

Numerous small meadows and adjacent riparian habitats[4] occur on these stretches of river. Owing their existence to the river and its annual flooding, the meadows and rich riparian habitat within this intact riverine system support a great diversity of plant and animal species, from common species like Mule deer (*Odocoileus hemionus*) **to rare,** riparian-dependent species such as the spotted bat (*Euderma maculatum*).[5]

Yosemite Valley

2) **The large, moist meadows and associated riparian communities comprise one of the largest mid-elevation meadow complexes in the Sierra Nevada, supporting an exceptional diversity of plant and animal species.**

The large, moist, mid-elevation meadows and the associated riparian vegetation communities of Yosemite Valley owe their existence to the river processes, the high water table the river sustains, and its annual flooding. These mid-elevation meadows, most greater than 30 acres in size, and their associated riparian habitats and wildlife species are rare and unusual at a regional and national scale.[6] Yosemite Valley meadows and riparian habitats support rare and endemic species as well as an exceptional diversity of both bat and sedge species.[7] This biological diversity is a function of the variety of niches made possible by the meadows and presence of year-round water.

Wawona and South Fork Merced River below Wawona

3) **The Sierra sweet bay (*Myrica hartwegii*), a rare plant found exclusively on river banks in the central Sierra, occurs along the South Fork Merced River in these segments.**

In Wawona and downstream, the South Fork Merced River provides habitat for a rare plant, the Sierra sweet bay (*Myrica hartwegii*). This special status shrub is found in only five Sierra Nevada counties. In Yosemite, it occurs exclusively on sand bars and river banks along the South Fork Merced River downstream from Wawona and on Big Creek.

[4] Riparian areas are 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.
[5] 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.
[6] 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.
[7] It is the diversity of bat species that is exceptional, for most of the species are otherwise common.

El Portal

4) **Valley oaks (*Quercus lobata*), a regionally rare species, thrive in this area due to its high water table.**

Valley oaks (*Quercus lobata*), a keystone tree species of lowland floodplain habitats, have been eliminated from most of their range by human clearing for agriculture and other land uses. One of the largest species of oak in America, there is a disjunct but reproducing population at El Portal. With their graceful arching branches, this remnant population provides high value habitat for wildlife. Dependent on the high water table made possible by the Merced River, they are a rare glimpse into former California river and floodplain habitats.

RECREATIONAL

Merced River above Nevada Fall, and South Fork Merced River Above and Below Wawona

5) **The Merced River, spectacular High Sierra landscape, dramatic scenery, natural sounds, and abundant opportunities for solitude combine to produce a variety of exceptional wilderness-oriented recreational activities.**

Wild segments of the Merced River and South Fork Merced River flow from the heart of the Sierra Nevada, with its towering granite peaks and impressive forests. The spectacular, rugged expanses along these segments provide exemplary landscapes for wilderness experiences characterized by solitude, personal reflection, closeness to nature, independence, and self-reliance. Activities are oriented toward primitive travel, camping, exploration, and adventure.

Of the many exemplary recreational activities, a few are particularly distinctive. Hiking or backpacking close to the river gives visitors the experience of spectacular cascades that vary by season. In spring, visitors experience the sight, sound, and feeling of the powerfully crashing waters. In drier months, the beauty of delicate water plumes becomes the center of attention. Backpacking on a major segment of the John Muir Trail offers access to a multi-day Sierra Nevada wilderness trip that is internationally renowned for gorgeous riverside views, undeveloped settings, opportunities for solitude along the trail, and backcountry camping near the river. Off-trail hiking and the potential for class V kayaking along the South Fork Merced River below Wawona are other exemplary river-related recreational opportunities.

Yosemite Valley

6) **The valley's incredible setting, with striking cliffs and waterfalls towering above a meandering river and extensive moist meadows, provides the setting for a variety of active, creative, educational and interpretive, social, and reflective experiences.**

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 shaping the experience of first-time and return visitors alike. Visitors realize these experiences through a wide variety of activities occurring in and along the river. They include active pursuits such as hiking, biking, swimming, floating and water play, climbing, camping, or fishing; creative pursuits such as writing, painting, photography and other arts; and educational and interpretive pursuits. Social elements such as group camping and picnicking are integral to many activities, while others offer opportunities for solitude and reflection.

Overall, the Yosemite Valley segment offers a variety of outstandingly remarkable opportunities for frontcountry river recreation for people of all ages and abilities. The Merced 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. These experiences in turn relieve stress and promote connection to the natural world. Exemplary experiences are protected and enhanced when proximity to the river allows close contact with its resources; visitors can choose time frames and

seasons that suit activities, ranging from short day trips to multi-day opportunities. Appropriate infrastructure and services facilitate river-related activities but do not dominate the landscape or interfere with the natural setting that visitors have come to enjoy. Visitor use levels are appropriate so as not to contribute to crowding or congestion.

The Merced Gorge

7) **The rushing and cascading river, interspersed with secluded holes, provides the setting for relaxing river-related activities.**

As it plunges some 2,000 vertical feet through the Merced Gorge, the Merced River provides a dramatic backdrop for a variety of visitor activities. This segment is undeveloped except for the adjacent road. The road's proximity to the river provides for scenic driving and access to several pools, many of which are tucked away among gigantic granite boulders. These pools, beaches, and other areas are popular for activities such as swimming, fishing, and picnicking. Overall, this segment provides a largely natural setting and excellent opportunities for solitude.

El Portal and Wawona

8) **The largely natural settings of the rivers in these areas provide for memorable active, contemplative, and creative pursuits.**

The Merced River through El Portal and the South Fork Merced River through Wawona provide a primarily natural setting for visitors to easily connect with the river through a variety of active, creative, and contemplative river-related recreational pursuits. Local residents and visitors repeatedly visit road-accessible pools and beaches on these river stretches, contributing to strong place attachment. Swimming and relaxing along the river are common, providing respite from the summer heat. Similarly, fishing is popular along these segments, with various holes treasured for their combination of scenery, fishing success, and solitude. Finally, camping along the South Fork Merced River in Wawona allows visitors to be close to the river overnight. Though close to developed communities, the settings along these segments are mainly natural and for much of the year, interactions with others are infrequent.

GEOLOGIC/HYDROLOGIC

Merced River above Nevada Fall

9) **Following the path of the ancient Merced River, glaciers gouged a textbook U-shaped canyon with sheer granite walls rising steeply above.**

This segment of the Merced River is characterized by a large-scale, U-shaped glacially-carved canyon. The section of the Merced River above Bunnell Point especially illustrates the relationship between geology and river course due to its sweeping, glacially-sculpted granite canyon cradling the river.

Yosemite Valley

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:

10) **The "Giant Staircase," which includes Vernal and Nevada falls, is one of the finest examples of stair-step river morphology in the country.**

Dropping over 594-foot Nevada Fall and then 317-foot Vernal Fall, the Merced River creates what is known as the Giant Staircase. Such 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.

11) Yosemite Valley has exemplary glacial geology on display from spectacular hanging valleys to textbook recessional moraines.

Yosemite Valley owes much of its form to periodic glaciations, with the rivers of ice following the track of the prehistoric Merced River. As the glaciers scoured out Yosemite Valley, they removed the slopes across which tributaries had formed, creating side valleys that end in high cliffs above the deeper Yosemite Valley. Such "hanging valleys" often feature waterfalls, such as Bridalveil and Yosemite Falls, where the higher valley contacts the lower one. When the glaciers retreated, they occasionally paused, dropping their loads of sediment and forming recessional moraines. The best-preserved of these is the El Capitan Moraine; it is an exemplary example of such moraines.

12) From Happy Isles to the west end of the valley, the Merced River is a rare example of a 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 of this scale at this elevation (about 4,000 feet).

El Portal

13) Changing river gradients, glacial history, and powerful floods have created a boulder bar with huge boulders much larger than typically found in such deposits.

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. 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.

SCENIC

Merced River above Nevada Fall

14) Passing through serene montane lakes and slickrock cascades and by classic Sierran peaks, the Merced forms the foreground to scenes of great visual delight and variety.

Starting at the headwaters, the Merced River passes through chains of "paternoster" lakes,[8] enters the upper Montane forest, and becomes walled in by a classic U-shaped glacial valley. Scenic landmarks visible from the river and 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.

Yosemite Valley

15) Crashing over Nevada and Vernal falls and then meandering quietly under 2,000 foot cliffs, the Merced forms a placid foreground to some of the world's most iconic scenery.

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

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

most famous landmarks. From the river and its banks, views consist of Yosemite Falls, Bridalveil Fall, El Capitan, Half Dome, and other named and unnamed parts of the cliffs 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 and 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.

The Merced Gorge

16) **Descending 2,000 feet in 14 miles, the river is 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 and 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.

South Fork Merced River, both above and below Wawona

17) **Passing through an untrammeled forested wilderness, the South Fork Merced River forms the centerpiece of some of the Sierra's wildest scenery.**

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 and its banks is that of an unspoiled 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.

CULTURAL

Yosemite Valley

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

18) **Ethnographic resources in Yosemite Valley represent a rare occurrence of continuing connection of places and people from before 1851 to the present, with the river at the heart of this cultural system.**

American Indian groups associate strong spiritual values with the river and Yosemite Valley, attaching names and stories to geological and other significant features in the Merced River corridor. The ethnographic resources here include river related and traditionally used plant species, historic village sites, and spiritual areas. These groups maintain their rights to practice their religion and ceremonies here as they have for thousands of years.

19) **The Yosemite Valley Archeological District is a nearly continuous river-related archeological landscape containing dense concentrations of resources reflecting thousands of years of settlement.**

Drawn by the year-round availability of water and the diversity of plants available for sustenance in Yosemite Valley, people have inhabited the valley for thousands of years, leaving behind an exemplary collection of archeological sites in the Yosemite Valley Archeological District. Many of these precontact and historic-era archeological sites are identified in ethnographic literature and

native oral traditions, providing a particularly 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 this regional, and potentially nationally significant scientific and interpretive value, the sites have value to American Indian tribes and groups as a connection to their ancestors.

El Portal

20) With its temperate climate and abundant subsistence resources, El Portal was a crossroads of life and trade, with the river linking lifeways of peoples from the historic and prehistoric past, both in California and beyond.

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 encompasses an archeological landscape containing dense concentrations of resources representing some of the oldest deposits in the Sierra foothills, with data important to interpreting regional cultural history 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 rights to practice their religion and ceremonies as they have for thousands of years.

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:

21) Physical remnants of U.S. Army Cavalry Camp A. E. Wood document the unique Yosemite legacy of the African-American buffalo soldiers, who founded their camp near the river's strategic water source and related ecological habitat.

Physical remnants of the African-American Buffalo Soldiers' late 19th and early 20th century federal protection of Yosemite National Park are present along the South Fork Merced River in Wawona. These reflect extremely rare African American army troop guardianship of national park lands. These are represented in the archeological remains of Camp A.E. Wood, the first Army headquarters in the park, which was situated near the South Fork and its year-round water source.

22) With its year-round water and level terrain for settlement, the Wawona Archeological District is composed of dense clusters of historic and prehistoric river-related sites that present evidence of far-reaching traffic and trade.

Because there are few springs and no talus shelters in the Wawona area, 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 information relevant to research regarding 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 maintain their rights to practice their religion and ceremonies as they have for thousands of years.

23) Built to connect human developments on both sides of the South Fork Merced River, the Wawona Covered Bridge is one of few covered bridges in the region.

Built in 1868 by Yosemite's first guardian, Galen Clark, the Wawona Covered Bridge boasts state significance within transportation, entertainment, and recreation contexts. The bridge embodies the distinctive characteristic of a unique type of construction and is the only historic covered bridge in the western region of the National Park Service.

South Fork Merced River above Wawona

24) Finding seasonal trade, travel, and subsistence opportunities along the South Fork Merced River, Native Americans left behind regionally rare 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 sites are located adjacent to the river, representing a settlement or land use pattern directly tied to the river as a water source, wildlife corridor, or other strategic purpose. These resources hold regionally important data potential for providing information about subsistence and settlement during the summer months in the high country.

1.4 GLOSSARY

aggradation: general and progressive buildup of the longitudinal profile of a channel bed due to sediment deposition

alluvial reach: a reach of a stream which has formed its channel in cohesive or noncohesive materials that have been and can be transported by the stream

alluvial soil: soil containing unconsolidated mixtures of gravel, sand, clay, and silt typically deposited by streams

alluvium: sediment deposited by rivers that forms floodplains or deltas. Consists of silt, sand, clay, gravel and organic material

alpine plants: plants growing above the limit of tree growth

anthropogenic: created by people or caused by human activity

aspect (stream aspect): the direction in which a stream faces (e.g. southwest**)**

avulsion: a sudden change in the channel course that usually occurs when a stream breaks through its banks; usually associated with a flood or a catastrophic event

axial stream: the main stream of an intermontane valley, which flows along the lowest part of the valley and parallel to its long dimension, in contradistinction to the streams that flow down the mountains on either side

bank revetment: to harden or reinforce a riverbank, usually by lining with riprap

bar: an elongated deposit of alluvium within a channel, not permanently vegetated

barrow pit: a ditch dug along a roadway to furnish fill and provide drainage

bedrock: the solid rock exposed at the surface of the earth or overlain by soils and unconsolidated material

berm: a flat or raised earthen area (usually unpaved) along the side of the road

biotechnical bank stabilization: the use of vegetation to provide armoring or indirect protection (e.g. flow deflection) of stream banks

bioturbation: the disturbance of soil by living things (e.g., rodent tunneling)

boulder-cascades: a waterfall or a series of small waterfalls descending over a steep, rocky surface characterized by boulders

casual trails: see informal trails

channel cutoff: a minor avulsion where a high-sinuosity meander bend is abandoned in favor of a steeper gradient course

channel: a natural or artificial watercourse, with a defined bed and banks to confine and convey continuously or periodically flowing water

cobble: a fragment of rock whose diameter is in the range of 64 to 250 mm

compound oxbows: a combination of two oxbow shaped stream components or lakes: two meander loops which are joined in such a manner that their evolutionary relationship is apparent

conifer: Any of a variety of mostly needle-leaved or scale-leaved, primarily evergreen, cone-bearing trees or shrubs such as pines, firs, and junipers

disjunct population: an isolated population of a species whose distribution has become fragmented into two or more groups that are related but widely separated from each other geographically

dissolved oxygen: the oxygen freely available in water, which is vital to fish and other aquatic life. Dissolved oxygen levels are considered an important indicator of a water body's ability to support desirable aquatic life

drip line: the area directly under a tree, corresponding to the furthest extension of the branches of a tree

ecotone: a transition area between two adjacent habitat types

effluent discharge: outflow of treated water from a wastewater treatment plant.

endangered species: any species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that is in serious danger of becoming extinct throughout all or a significant portion of its range. Federally endangered species are officially designated by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service and published in the Federal Register. Species may also be listed under the California Endangered Species Act by the Department of Fish and Game.

endemism: 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

ethnobotanical resources: botanical resources that have cultural or ethnological significance. For example, in Yosemite Valley, such resources include black oak acorns, mushrooms, tree mushrooms, wormwood, bracken fern roots, sedge roots and deer grass

ethnographic resource: physical artifacts, features, sites, districts, or landscapes created by and/or demonstrably important to a specific living group of people linked by a common ancestry and culture

flank: the eroded area between the stream bank and the landward end of a stream stabilization countermeasure

flanking: erosion resulting from streamflow between the bank and the landward end of a stream stabilization countermeasure

floodplain: the flat or nearly flat land along a river or stream or in a tidal area that is covered by water during a flood

frontcountry: outdoor areas that are easily accessible by vehicle and mostly visited by day users.

genus: a taxonomic category above the species level, constituting a major family or subfamily

glacial till: an unsorted, unstratified mixture of varyingly-sized clay, sands and rock debris deposited by a glacier

glaciated landscape: a landscape defined by glaciation

glaciation: the condition of being covered with glaciers or masses of ice; affected by glacial action

gradient: the slope of stream bed or land surface within a given distance

groundwater: water beneath the surface of the ground held in or moving through saturated layers of soil, sediment or rock

gullying of flanks: the formation of a channel or a channel deepening caused by flanking

hanging valleys: a glacially-formed tributary valley with the floor at a higher relief than the main channel into which it flows (often accompanied by hanging waterfalls)

herbarium: a collection of dried, preserved systematically-arranged plant specimens for botanical reference and research

hydrology: the study of water, its biological, chemical, and physical properties, its reaction with the environment, and its movement on the surface of the land, in the soil and underlying rocks, and in the atmosphere

impoundment: a body of water that has been dammed or confined within an enclosure, as a reservoir.

in situ: in the natural or original position or place

incision: lowering of the channel bed by erosion

informal trails: casual trails created by visitor use; such trails are not created or maintained by NPS

intergrade: the way in which two distinct species or subspecies are connected in areas where populations are found that have the characteristics of both species or subspecies

keystone tree species: a tree species that plays a critical role in maintaining the structure of an ecological community, affecting many other organisms in an ecosystem and helping to determine the types and numbers of various other species in the community

levee: an embankment raised to prevent a river from overflowing

lithic debris: fragments of rock (typically obsidian, chert, or other smooth cryptocrystalline material) removed during the process of creating or sharpening a flaked-stone tool, i.e., flintknapping

meander: a meander in a river consists of two consecutive loops, one flowing clockwise and the other counter-clockwise

midden soils, midden deposits: a mound or layer of domestic refuse generally containing culturally darkened soils, shells and animal bones, as well as other indices of past human life and habitation; middens mark the site of a long-term indigenous settlement, and may contain human burials related to that settlement

milling stations: boulders or exposed bedrock slabs (typically granite) with mortar cups or milling slicks used for processing plant or animal resources for food, medicine, and other uses

moraine: any glacially formed accumulation of unconsolidated glacial debris (soil and rock) which can occur in currently glaciated and formerly glaciated regions, such as those areas acted upon by a past ice age

> **ground moraine**: till covered areas with irregular topography and no ridges, often forming gently rolling hills or plains
>
> **lateral moraine**: parallel ridges of debris deposited along the sides of a glacier
>
> **recessional moraine**: a series of transverse ridges running across a valley behind a terminal moraine
>
> **terminal moraine**: ridges of unconsolidated debris deposited at the snout or end of the glacier

morphology: form, shape and structure

mortar: a cup-shaped hollow in a boulder or exposed bedrock slab used in conjunction with a pestle for grinding or pounding food or medicine; most commonly used by California Indians for processing acorns and seeds, but also insects, plants used for dyes, etc.

nonpoint-source pollutant: pollutants such as hydrocarbons, fine sediment, and metals coming from a wide, non-specific source such as runoff from parking lots, roads, and campgrounds

nutrient: any element or compound, such as phosphorus, nitrogen or sulphates, that an organism needs to live and grow or a substance that is used in an organism's metabolism which must be taken in from its environment; an excess of which can fuel abnormally high organic growth in aquatic ecosystems

Outstandingly Remarkable Value (ORV): the truly exceptional qualities that merit a rivers' designation as a Wild and Scenic River; the Merced River Comprehensive Management Plan will use these values as a foundation for planning and management

oxbow: the abandoned former meander loop that remains after a stream cuts a new, shorter channel across the narrow neck of a meander; often bow-shaped or horseshoe-shaped

paternoster lakes: a series of glacial lakes connected by a single stream or braided stream system

pathogen: an organism or microorganism capable of causing disease or infection in the host plant; pathogens can include bacteria, viruses, protozoa or fungi

petroglyphs: designs or markings carved, incised, or pecked into a rock face

petroleum hydrocarbons: organic compounds found in crude oil that are composed entirely of hydrogen and carbon

phosphorus weathering: collective term for the processes by which phosphorous at or near the earth's surface is disintegrated and decomposed by the action of atmospheric agents, water, and living things

plane-bed: a horizontal bed without elevations or depressions larger than the maximum size of the exposed sediment grains

Pleistocene era: 10,000 to 1.8 million years ago

prehistoric past: the span of human occupation of a particular area that was not documented by written language; in the Central Sierra Nevada, the first written histories specific to the region date to approximately 1851, marking the end of the prehistoric period

recruitment (sapling recruitment, oak recruitment): the entry of new individual trees into an established population or community

relict meander oxbows: oxbow meanders that have receded or withdrawn, leaving dry land exposed

riffle: gravel size or larger bed sediment where the stream is shallow and swift at low flows; riffles are produced during high flows by the accumulation of large bed materials

riffle-pool morphology: a riffle-pool sequence in alluvial stream channel refers to a succession of one or more combinations of pools and riffles along the channel in the downstream direction

riparian: the land adjacent to a natural watercourse such as a river or stream; riparian areas support vegetation that provides important wildlife habitat, as well as important fish habitat when sufficient to overhang the bank

riprap: layer or facing of rock or broken concrete which is dumped or placed to protect a structure or embankment from erosion; also the rock or broken concrete suitable for such use

river morphology: a collective term for characteristics describing the form of a channel

riverine: located on or inhabiting the banks of a river; riparian

root wad: a structure used in streambank stabilization, root wads are the root mass of a tree, usually hardwoods, along with ten to fifteen feet of attached trunk

scour, pool scour, scour holes: an area of deeper water created by the scouring action of water; these generally occur downstream of obstructions or along the outside of a meander bend

sedge species: herbaceous plant within the Cyperacae family; generally found in wetland areas

shoulder seasons: before and after the period of peak visitation

sinuosity: a measure of meander "intensity"; computed as the ratio of the length of a stream measured along its centerline to the length of the valley through which the stream flows

social trails: see informal trails

soda springs: natural springs containing essential mineral salts

special-status species: special-status species have low or declining numbers; are found on the California Natural Diversity Database (CDFG); are listed as rare, threatened or endangered under the federal or state endangered species acts; species that are candidates for listing under either federal or state law; species formerly designated by the USFWS as Species of Concern or designated by CDFG as Species of Special Concern; or species protected by the federal Migratory Bird Treaty Act (16 U.S.C. 703-711)

stair-step river morphology: a river structure which descends with downstream flows, in the manner of stair steps

stock use: the use of horses, mules, burros, and llamas. Historically there have been four categories of stock use in the Yosemite backcounty: (1) NPS Administrative Use (backcounty patrols, facility maintenance and trail crew support), (2) Concessioner Use (High Sierra Camp supply support), (3) Commercial Use Authorization Use (CUA) (guided trips) and (4) private individual use
subalpine: just below timberline: between montane (pertaining to mountains [region between foothills and subalpine]) and alpine (found above timberline)

substrate: material underlying that portion of the streambed which is subject to direct action of the flow

talus shelters: shallow rockshelters created by overhanging boulders near the base of a slope

talus, talus boulders: pile of rock rubble below a cliff or slope

terminal buds: at the tip of a structure

threatened species: any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range

tributary: a stream that contributes its water to another stream or body of water

tussock-forming grasses: a kind of bunch grass that grows in tufts, clumps, or bunches rather than forming an even lawn or meadow

unreinforced masonry cobble abutments: a mass of cobble-sized masonry designed to support an arch, but has not been braced by reinforcement beams

upland: 1) Areas of higher ground; Areas elevated above the lowlands along rivers or between hills; 2) Areas that are not wetland and do not meet all three wetland criterion as defined by the U.S. Army Corps of Engineers

water table: the level below the land surface at which the subsurface material is fully saturated with water

wetland: a zone periodically or continuously submerged or having high soil moisture, which has aquatic and/or riparian vegetation components, and is maintained by water supplies significantly in excess of those otherwise available through local precipitation

Wild and Scenic River: a river that has been designated under the National Wild and Scenic Rivers Act as having distinctively unique or "outstanding remarkable values" that set it apart from all other rivers, making it worthy of special protection

2.1 BIOLOGICAL VALUES

2.1.1 Biological Outstandingly Remarkable Values

The Merced River and South Fork Merced River support a broad array of riparian and meadow ecosystems within Yosemite National Park, from alpine and subalpine meadows along the river stretches above Yosemite Valley and Wawona, to the expansive mid-elevation Yosemite Valley meadows, to dense, complex, low-elevation riparian and wetland habitats. Dependent on these habitats are a large variety of native, endemic, and/or rare plant and animal species. Sustained by periodic flooding and/or high water tables, these habitats are river-related crossroads of life in a landscape already vibrant with productive habitats.

River Segment 1: Merced River Above Nevada Fall

Numerous, exquisite small meadows and relatively intact adjacent riparian habitats[1] support a great diversity of species.

Numerous small meadows and adjacent riparian habitats are present along this stretch of river. Owing their existence to the river and its annual flooding, the meadows and rich riparian habitat within this intact riverine system support a great diversity of plant and animal species, from common species like Mule deer (*Odocoileus hemionus*) to rare, riparian-dependent species such as the spotted bat (*Euderma maculatum*).

River Segment 2: Yosemite Valley

The large, moist meadows and associated riparian communities comprise one of the largest mid-elevation meadow complexes in the Sierra Nevada, supporting an exceptional diversity of plant and animal species.

The large, moist, mid-elevation meadows and the associated riparian vegetation communities of Yosemite Valley owe their existence to the river processes, the high water table sustained by the river, and its annual flooding. These mid-elevation meadows – most over 30 acres in size – and their associated riparian habitats and wildlife species are rare and unusual at a regional and national scale.[2] Yosemite Valley meadows and riparian habitats support rare and endemic species as well as an exceptional diversity of both bat and sedge species.[3] This biological diversity is a function of the variety of niches made possible by the meadows and presence of year-round water.

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1 Riparian areas are plant communities contiguous with and affected by surface and subsurface hydrologic features; they contain distinctly different vegetative species or more vigorous growth forms than those in adjacent areas and are usually transitional between wetland and upland communities.

2 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.

3 It is the diversity of bat species that is exceptional, as most of the species are otherwise common to the Sierra Nevada.

River Segment 4: El Portal

Valley oaks (*Quercus lobata*), a regionally rare species, thrive in this area due to its high water table.

Valley oaks, a keystone tree species of lowland floodplain habitats, have been eliminated from most of their range by human clearing for agriculture and other land uses. One of the largest species of oak in America, there is a disjunct but reproducing population at El Portal. With their graceful arching branches, this remnant population provides high-value habitat for wildlife. These trees depend on the high water table of the Merced River and provide a rare glimpse into former California river and floodplain habitats.

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

The Sierra sweet bay (*Myrica hartwegii*), a rare plant found exclusively on river banks in the central Sierra Nevada, is present along the South Fork Merced River in these segments.

In Wawona and downstream, the South Fork Merced River provides habitat for a rare plant, the Sierra sweet bay. This special-status shrub is found in only five Sierra Nevada counties. In Yosemite, it occurs exclusively on sand bars and riverbanks along the South Fork Merced River downstream from Wawona and on Big Creek.

2.1.2 Features that Indicate Outstandingly Remarkable Values

The Merced River supports a mosaic of river-dependent and interrelated riparian and meadow ecosystems within Yosemite National Park. This mosaic includes numerous small meadows and adjacent riparian habitats along the Merced River above Nevada Fall, large meadow complexes such as those found in Yosemite Valley, and unique plant communities and species such as the El Portal valley oaks and the Sierra sweet bay populations. The features of the Biological ORV that indicate its quality and character include species diversity, community productivity and stability, and habitat condition, as well as how those characteristics contribute to the functioning of the river ecosystem.

The following conditions can serve as indicators to assess changes in the Biological ORV:

Species Diversity: Species diversity assesses the number of species in an ecological community as well as their relative abundance. The meadows and riparian habitats along the Merced River are rich in native species diversity, both plant and wildlife. The preservation of existing native species diversity is an important indicator of the health of an ecological community. Conversely, the presence and prevalence of invasive species is also a significant measure of ecological integrity.

Aerial Extent of Meadows: The physical extent of meadow complexes, including size and shape, provide a quantitative measurement of meadow abundance. The meadow complexes associated with the Merced River are unique in their extent; large, mid-elevation meadow complexes are a rare feature in the Sierra Nevada. Hydrological alterations, conifer encroachment, and development are stressors that may reduce the extent and ecological integrity of these meadows, with consequences to their biological, scenic and recreational value. By measuring the aerial extent of these meadows, this critical feature of the Biological ORV can be monitored.

Habitat Condition: The meadows and riparian habitats of the Merced River in Yosemite are largely in excellent condition. Habitat conditions may be measured through the relative extent they have been affected by human activities, including grazing and recreational use. Such activities may include measuring the extent of visitor or pack stock impacts to meadows and riparian complexes (i.e. social trails, grazed/trampled vegetation, streambank stability, etc.).

El Portal Valley Oaks: The population of valley oaks at the El Portal Administrative Site is geographically unique, being the only valley oaks in Yosemite. Maintaining the health and long-term stability of this population is an important component of the Biological ORV. Maintenance of population health may be measured through monitoring individual trees' structural integrity and overall condition, while long-term stability may be measured through monitoring the recruitment of new oaks.

Sierra Sweet Bay: In Yosemite, Sierra sweet bay is found only on the lower banks of the South Fork Merced River downstream from Wawona and along Big Creek. These populations add to the biological complexity associated with the Merced River, and sustaining Sierra sweet bay in the Park is essential to maintaining the integrity of the Biological ORV. Populations may be measured through surveys that quantify and qualify their size and health.

2.1.3 Literature, Data, and Monitoring Information

Biological resources have been documented and studied in Yosemite National Park for well over 150 years, since before the area was declared a national park. The majority of these early investigations were centered on Yosemite Valley. Most early accounts of the biological resources of the park consist of narrative descriptions of the flora and fauna found in the region and do not describe habitat, distribution, or trends, but they do provide a historical reference point for determining Yosemite's natural conditions at the time of the arrival of Euro-Americans. For example, Dr. Lafayette Houghton Bunnell was part of the Mariposa Battalion, whose members were the first Euro-Americans to enter Yosemite Valley in 1851. *Discovery of the Yosemite, and the Indian War of 1851, which led to that event* (Bunnell 1892) contains his account of the battalion's experiences in the Valley and also includes discussions of the region's flora and fauna. John Muir's writings describe the natural history of the Yosemite Valley and adjacent region from 1868 to the early 1900s (Muir 1890; Muir 1912).Grinnell and Storer's study of Yosemite's wildlife is summarized in *Animal Life in the Yosemite* (1924). This volume describes the results of a survey of the vertebrate natural history of the Yosemite region.

Several studies have been conducted to determine the role of historical events on Yosemite Valley's long-term vegetation patterns, including the Valley's meadows and riparian habitats. These include *The Influence of Modern Man on the Vegetation of Yosemite Valley* (Gibbens and Heady 1964), which compares the vegetation of Yosemite Valley in 1961 with that existing in the 1850s and 1860s (as depicted by early writings and photographs) and discusses the changes – both human-made and natural – that occurred over during this time period. This publication contains photographs taken in 1866 from the top of the canyon walls surrounding Yosemite Valley, which are among the earliest photographs of Valley vegetation. Similarly, *Vegetational Changes in Yosemite Valley* (Heady and Zinke 1978) used data on soil and vegetation, repeat photographs (some taken over 100 years apart), general vegetative descriptions, and historical documents to deduce anthropogenic (human-caused) impacts on the vegetation of Yosemite Valley.

Cooper and Wolf (2008) investigated the anthropogenic alteration of hydrologic processes and the resulting impacts on meadow and riparian habitats in Yosemite Valley. This study documented a significant increase in conifer tree cover (largely *Pinus ponderosa*) in the Valley's meadows during the period from 1899 to 2006 and also showed a loss of riparian species such as *Populus* and *Salix*. The study concluded that these changes likely occurred due to hydrologic alterations, among other possible factors, and also provided concepts for restoring these habitats.

Several studies have investigated the influence of human activities on meadow habitats in Yosemite National Park. Ernst (1949) provided a comprehensive picture of the park's grazing practices in 1948, suggesting remedies for perceived overuse. Sharsmith (1961) evaluated selected heavy-use areas and commented on conditions, including the effects of erosion, non-native annual grass invasion, and lodgepole pine (*Pinus contorta* var. *murrayana*) encroachment associated with trampling and concentrated grazing. Johnston (1998) describes the effect that sheep and cattle grazing had on the ecosystems of the Sierra, and Yosemite in particular, during the period between 1850 and 1900. Johnston found that "From 1860 to nearly 1900, the Sierra Nevada became a 'shepherd's empire', with cattlemen not far behind" (Johnston, 1998). Johnston goes on to quote John Muir from 1873, "It is impossible to conceive of a devastation more universal than is produced among the plants of the Sierra by sheep … The grass is eaten close and trodden until it resembles a corral…" Ballenger et al. (2010) and Cole et al. (2004) tracked meadow responses to pack-animal grazing in the Yosemite wilderness and found that meadow productivity and vegetation cover decreased as grazing utilization increased, while bare soil cover increased as utilization increased.

Information on past and current Yosemite National Park restoration projects and planning efforts was obtained from Fact Sheets provided by NPS or available online (NPS 2011a). A number of baseline condition studies are underway in the Merced River corridor with the goal of providing up-to-date assessments of ORV conditions in support of the new *Merced Wild and Scenic River Comprehensive Management Plan (Merced River Plan)*. Resultant data will be incorporated into this Baseline Conditions Report in spring 2011. Ongoing baseline condition studies include:

- Yosemite Valley Merced River and Meadows Condition Assessment, which will assess the current condition of the interrelated meadow, riparian, and aquatic environment along the alluvial reaches of the Merced River in Yosemite Valley. This tri-component assessment will evaluate river health, meadow health, and wildlife habitat along the river corridor. These studies are focused on providing current data on the extent and type of riparian vegetation, occurrence of non-native plant species, meadow fragmentation due to social trails, and wildlife present within the riparian corridor, among other parameters.

- 2010 Assessment of Meadows in the Merced River Corridor report, which will assess high-country and Yosemite Valley meadow and riparian habitat conditions.

- Surveys to assess the distribution and condition of rare plants in the Merced River corridor; and

- An evaluation of special-status wildlife distribution and condition relative to existing conditions in the river corridor.

2.1.4 River Segment 1: Merced River Above Nevada Fall

The upper Merced River watershed is characterized by steep canyons, broad interstream areas of glacially smoothed granite, lakes and meadows, and thin, granitic soils. Much of the Merced River above Nevada Fall is bordered by a narrow riparian zone influenced by stream gradient, slope, sedimentation, and aspect (**Figures 2.1-1** and **2.1-2**). 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 exchanges of energy, nutrients, and species. 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. Floodwater and subsequent groundwater levels are the main determinants of the type and productivity of the vegetation in riparian zones (Mitsch and Gooselink 1986).

Numerous small meadows and adjacent riparian habitat are present in the upper reaches of the Merced River above Nevada Fall (NPS 1997). High-elevation meadows within the river corridor typically occur on fine-textured, permanently to semi-permanently wet soils and are typically associated with seeps, lake margins, or topographic depressions. Vegetation consists of low-growing, native, tussock-forming grasses, sedges, rushes, and perennial herbs. Within the alpine zone (generally above 10,000 feet—the highest portion of the Merced River's headwaters), meadows form thin margins around small glacial lakes. At slightly lower elevations (such as Merced and Washburn Lakes), meadows form a transition zone from the aquatic environment to 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 flooding regime of the Merced River (NPS 1997; Sawyer et al. 2009).

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. 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).

Condition at the Time of 1987 Designation. Little information exists regarding the condition of meadows and riparian habitat along 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 intrusion into the wilderness reaches of the Merced River has been ongoing for thousands of years, these upper reaches of the river and its associated meadow and riparian habitats remained intact and relatively free from disturbance. At the time of designation, disturbances to meadow and riparian habitat in Segment 1 were limited to localized damage from recreational use (NPS 2005). Although these meadows historically experienced grazing impacts, most of the meadows in this river segment have not been grazed for several decades, and residual effects on meadow composition and productivity from former grazing are minimal (Moore et al. 2000). 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). Meadows

in the vicinity of Merced Lake were grazed by concessioner stock as well as NPS stock at the time of designation and showed typical grazing-related impacts such as trampling, erosion, and a decline in herbaceous production (Sharsmith 1961). Some meadows in this area were closed to stock in the 1990s, but one continues to be grazed to this day. Details regarding grazing effects on this meadow, located just east of the Merced Lake Ranger Station, along with all major meadows in this river segment and their current state will be included in the forthcoming 2010 Assessment of Meadows in the Merced River Corridor report.

Less is known about the impacts from recreational use on the meadows and riparian habitat of this segment at the time of designation. The forthcoming meadows condition assessment will provide additional information. By 1987, visitation in the Yosemite high country was being controlled through quotas due to the increasing popularity of outdoor recreation at Yosemite National Park. Because most recreationists likely chose to stay on trails, their impact on river-dependent meadow and riparian-associated biodiversity was expected to be limited to the trail and its immediate vicinity. At the time of designation, habitat for river-dependent meadow and riparian-associated species along this river segment remained relatively intact and free from disturbance.

Current Condition. The current condition of river-related meadows and riparian habitat in the Merced River high country are likely similar to conditions in 1987, except where specific NPS actions have reduced impacts and restored habitat. The meadow west of the ranger station at Merced Lake shows minor evidence of stock use (such as residual hoof prints)—most likely from day use, as overnight grazing is not allowed in this meadow. The meadow east of the ranger station at Merced Lake has the highest level of stock use of all the meadows in this river corridor; resulting impacts include grazed vegetation, roll pits, manure and trampled soils. Grazing was eliminated from the meadow near the High Sierra Camp in the 1990s. The meadow has recovered from previous stock-use impacts and no obvious grazing impacts remain. Other meadows in the Merced River above Nevada Fall segment show residual evidence of stock use, but impacts are minimal. Some meadows in this corridor also exhibit signs of recreational use such as social trails and bare areas.

The Yosemite parkwide vegetation map (1997) identifies several meadows in the Little Yosemite Valley and Echo Valley areas. Some of these meadows are transitioning into lodgepole pine and Jeffery pine forests.

Forthcoming NPS research includes a Conditions Assessment of the meadows within this river segment, which will provide additional information as to current conditions.

Management Considerations

The list below summarizes the management considerations associated with the Biological ORV in River Segment 1:

- The upper reaches of the Merced River and its associated meadow and riparian habitats are generally in excellent condition. The meadow east of the Merced Lake ranger station has the highest level of stock use of all the meadows in this river corridor; resulting impacts include grazed vegetation, roll pits, manure and trampled soils.

- NPS will continue to monitor and manage visitor use to protect meadows and riparian areas.

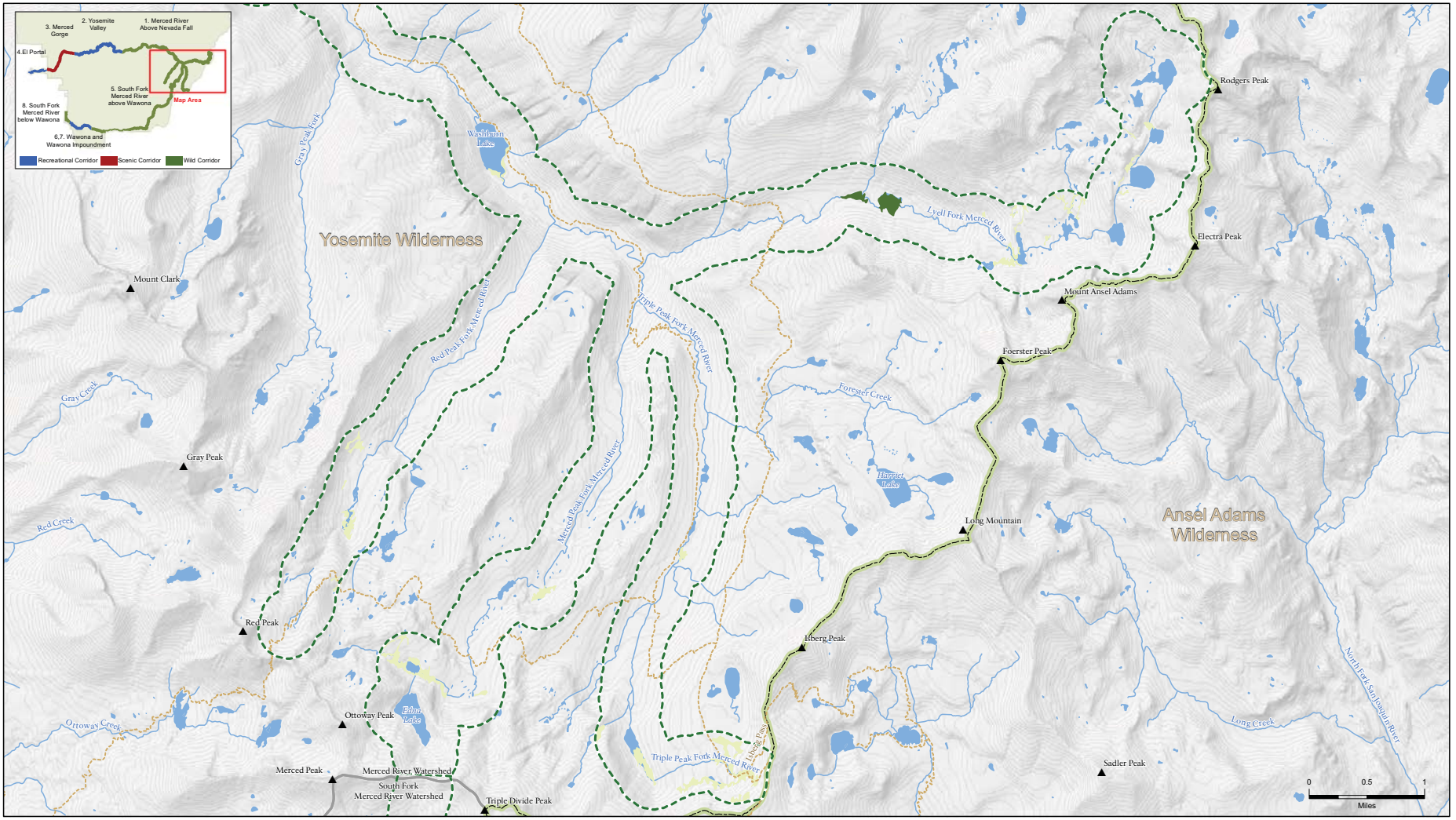

Figure 2.1-1
Biological ORV - River Segment 1. Merced River Above Nevada Fall
Wild WSR Corridor

Wild WSR Corridor Classification
Yosemite National Park Boundary
Lakes
Intermittently to Seasonally Flooded Meadow
Semi-permanently to Permanently Flooded Meadow
Watershed Boundary
Trail
Stream/River
Landmark

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Projection: North American Datum 1983, UTM Zone 10

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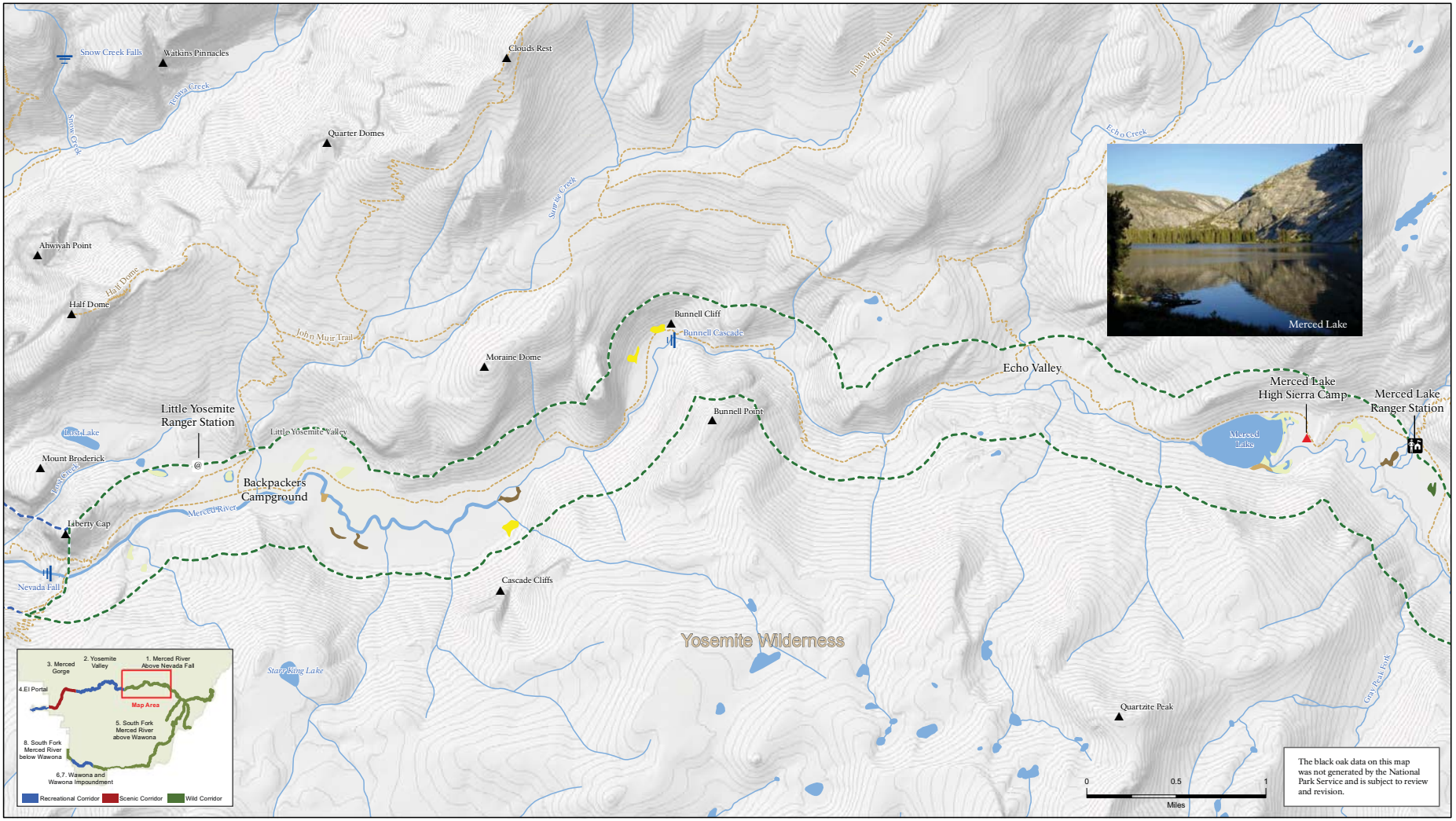

Figure 2.1-2
Biological ORV - River Segment 1. Merced River Above Nevada Fall-Little Yosemite Valley and Merced Lake High Sierra Camp Wild WSR Corridor

Recreational WSR Corridor Classification
Wild WSR Corridor Classification
Lake
Willow Species Riparian Shrubland Mapping Unit
Willow Species Meadow Shrubland Mapping Unit
Intermittently to Seasonally Flooded Meadow
Semi-permanently to Permanently Flooded Meadow
California Black Oak Alliance
Trail
Stream/River
High Sierra Camp
Landmark
Ranger Station
Waterfall

National Park Service U.S. Department of the Interior
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2.1.5 River Segment 2: Yosemite Valley

The meadows in Yosemite Valley were originally one large meadow with a much greater extent, but are now divided by roads and conifer encroachment into eight principal meadows, with additional smaller meadows scattered throughout the Valley. However, the Valley meadows are still much larger in size than most other mid-elevation meadows in the Sierra Nevada and are thus rare and unusual at a regional scale (NPS 1997). About 31 different sedge species have been collected in Yosemite Valley meadows, which is considered by experts in the genus to be an exceptional degree of diversity (Acree 2011a). These meadows also support special-status animal species and a great diversity of bat species (17 different bat species). These attributes combine to make Yosemite Valley's meadows an extraordinary example of a regionally rare ecosystem. The ecological functions of Yosemite Valley meadow and riparian areas are discussed separately below.

Photo 2.1-1: Meadow Oak

Meadow Ecosystems. Although the meadows of Yosemite National Park constitute just 3% of the park's area, they support disproportionate amounts of biological diversity, ecosystem function, and aesthetic interest (Moore et al. 2000) (**Photos 2.1-1 and 2.1-2**). For example, the meadows slow runoff from steep uplands, thereby sustaining longer periods of water availability. They also provide a final opportunity to trap sediments before runoff enters downstream watercourses. Once trapped, the meadows contribute to the breakdown of toxins and cycling of nutrients found within sediments. Sustained and maintained by periodic

Photo 2.1-2: Wet Meadow

flooding and river-associated groundwater, Yosemite's meadows and riparian corridors support a rich diversity of plants and wildlife, including those species recognized as having "special status" due to their rarity, declining populations, and/or susceptibility to disturbance.

Mid-elevation meadows on the Merced River floodplain are hydrologically driven. These meadows are dependent on river processes, including the frequency, duration, and magnitude of flooding; frequent, low-intensity broadcast fires also help to maintain them. The meadows in Yosemite Valley are transition zones from drier upland and black oak communities to wetter riparian communities. The meadows themselves vary from wet to seasonally dry and link the Merced River and its tributaries to upland areas. The aquatic food chain in the Merced River is dependent on a connection with overflow channels in the meadows, which spill over during periods of high water and release concentrated food sources into the river (NPS 2005).

Riparian Ecosystems. Riparian zones extend outward from the banks of the Merced River and its tributaries into adjacent meadow and forest communities (**Photo 2.1-3**). Riparian habitat plays a critical role in a variety of dynamic processes. Situated at the interface between terrestrial and aquatic ecosystems, the riparian zone acts to buffer hydrologic and erosional cycles, control and regulate the biogeochemical cycles of nitrogen and other key nutrients, limit fire movements, and create unique microclimates for animal species (Rundel and Stuner 1998).

Photo 2.1-3: Riparian Habitat

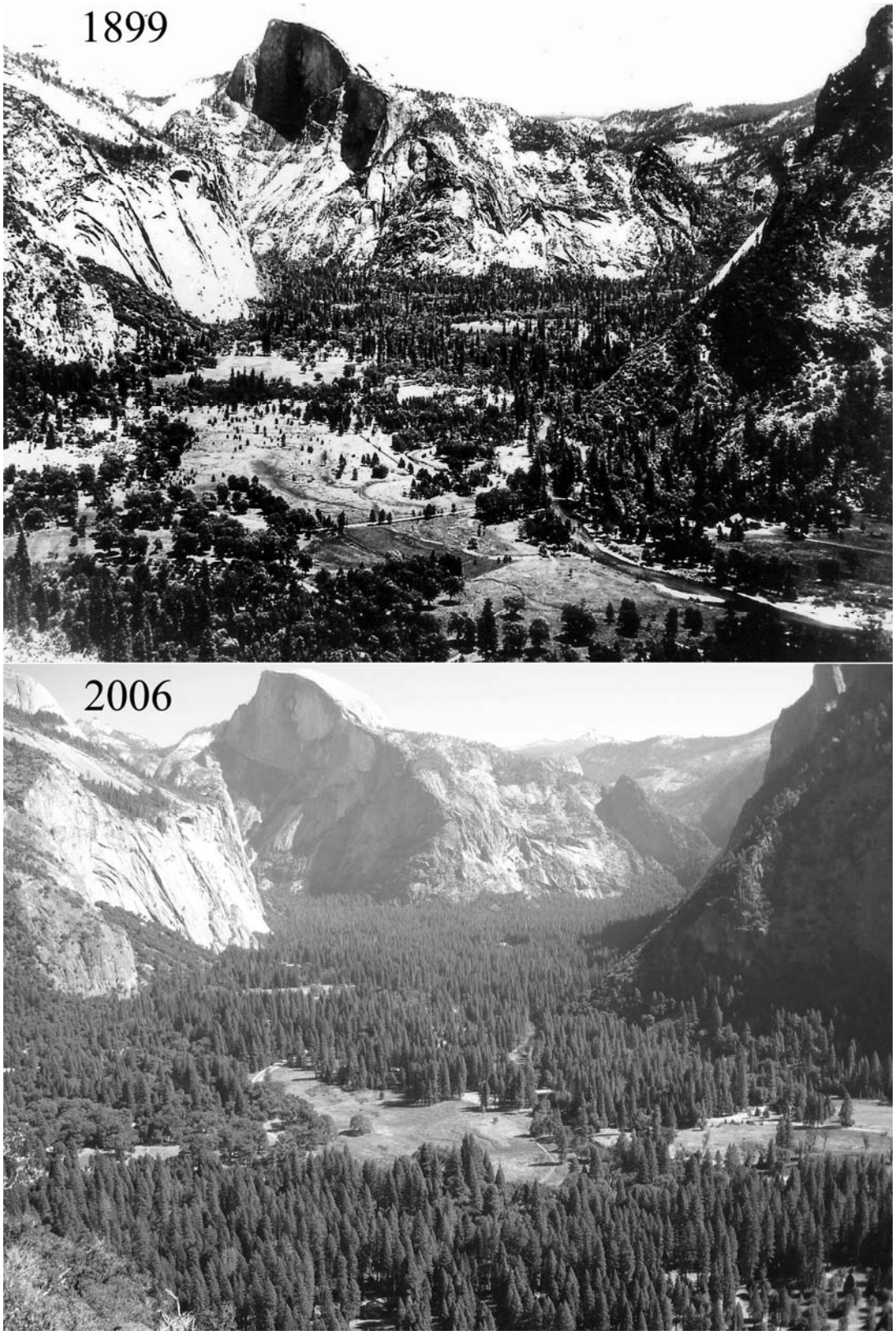
Riparian habitat in Yosemite Valley is characterized by broadleaf deciduous trees such as white alder (*Alnus rhombifolia*), black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), and willow species. Such areas provide a structural complexity that supports rich species diversity. Within riparian zones, vegetation is regularly disturbed through the deposition and removal of sediment and soil and the scouring force of floodwaters. As a result of these natural forces, riparian plants readily colonize newly formed riverine deposits. The distribution of riparian communities varies with soil saturation and frequency of disturbance. For example, big-leaf maple riparian forests grow in protected spots on moist, gravelly, alluvial soils bordering streams, whereas sandbar willow woodlands flourish on point and mid-channel bars that are inundated annually by spring floods (NPS 1994).

Yosemite Valley Background. 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 promote an understanding of trends in the condition of the Biological ORV.

While ethnographic studies have shown Yosemite Valley's original inhabitants – the Ahwahneechee – used fire to manage at least 250 different crops (Levy 1978), and used fire intensively throughout their village area (Gassaway 2005), observable impacts on natural resources resulting from this method of crop management were minimal. By the time Euro-Americans arrived in Yosemite Valley, the river-dependent riparian, meadow, and riverine wildlife habitats in Yosemite Valley would have exhibited high biodiversity and productivity. The stretch of Merced River within Yosemite Valley was free of dams and diversions; meadows and associated riparian habitat were largely free of structures and most other human-related impacts. Shortly following the arrival of visitors and residents in Yosemite Valley in the 1850s, anthropogenic impacts became more pronounced, consisting of (but not limited to) roads and trails, fences, user-made campsites, and permanent structures. For example, in 1868 John Muir noted the presence of several year-round residents and an apple orchard in the Yosemite Valley (Perrottet 2008).

Condition at the Time of 1987 Designation. Over the past century the acreage of meadows in Yosemite Valley has decreased. Reasons for this reduction are myriad, as described below. Many wetlands in the Sierra Nevada were drained when the earliest settlers attempted to "reclaim" meadows and other seasonally wet areas to improve grazing and to permit agriculture. The meadows of Yosemite Valley did not escape these practices (Gibbens and Heady 1964; Heady and Zinke 1978; Cooper and Wolf 2008). In the Valley, drainage ditches were constructed to dewater wet meadows in order to reduce mosquito breeding areas and to provide open land for grazing and agriculture. Many of these drainage ditches have not been filled and still drain wet meadows in Yosemite Valley (NPS 2005).

In addition, Cooper and Wolf (2008) determined that conifers have colonized former meadows for several reasons: (1) the installation of drains, water diversions, and other facilities caused hydrologic changes that lowered the summer water table (the widening of the Merced River may also be a factor in changing hydrology); (2) the cessation of burning by Native Americans allowed fire-sensitive species to persist; (3) disturbance caused by plowing meadows and planting hay crops and apple orchards allowed conifers to invade the bare soils after the rhizomatous meadow species were destroyed; and (4) placement of fill to raise the ground elevation allowed upland species to invade. 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). Although Whitney (1868) recorded 745 acres of meadows in Yosemite Valley in 1866, by 1960 only 340 acres could be mapped on aerial photographs (Heady and Zinke 1978), an estimated 46% reduction in size from the 1866 meadow. Cooper and Wolf (2008) measured a similar decline in meadow acreage and a corresponding increase in conifer tree cover (**Photo 2.1-4)**. The oldest trees in the former meadows began to appear in 1870 Gibbens and Heady 1964; Cooper and Wolf 2008), and by 1937 NPS type mapping projects mapped 327 meadow acres in Yosemite Valley. In 2011, NPS estimated a total of 269 meadow acres in Yosemite Valley. This is just 36% of the meadow acreage that J.D. Whitney mapped in 1866 (NPS 2011b).



Merced River Comprehensive Management Plan

SOURCE: Cooper and Wolf, 2008

Photo 2.1-4

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

Other factors contributing to a reduction in meadow area included the construction of bridges, roads, pipelines, buildings, campgrounds, and trails; the installation of riprap along the riverbank; and recreational use (see Section 2.3, Geologic and Hydrologic Processes, of this report). Roads, bridges, ditches, trails, and utility lines altered surface and subsurface hydrology (Cooper and Wolf 2008), fragmented the meadows and floodplain, and imposed unnatural barriers to plant and wildlife dispersal.

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. Associated effects include increased water temperature due to a lack of riparian cover, increased suspended sediment, and reduced dissolved oxygen levels (Madej et al. 1994).

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 intrusion and further devaluation. Conifer encroachment into meadow habitats had been halted. Trampling in meadow and riparian habitats had been restricted, and some restoration was in progress. By the time of designation in 1987, the meadows of Yosemite Valley provided high-quality habitat for the 31 different sedge species and the 17 different bat species that contribute to the Biological ORVs within the Yosemite Valley segment of the Merced River.

Current Condition. In general, conditions in Yosemite Valley's meadows and riparian habitats are similar to those present in 1987, with some notable improvements due to a number of specific projects (**Figures 2.1-3 and 2.1-4**). Results from the *2008 User Capacity Management Monitoring Program Annual Report* (NPS 2008), summarizing the NPS visitor-use and impact monitoring program, show that riverbanks with high visitor use have a higher percent cover of exposed roots and a lower percent cover of large woody debris, as well as a lower percent cover for woody seedlings. However, it is difficult to draw a definite link between the observed conditions and high visitor use. The report suggests that high visitor use may be associated with soil loss and bank erosion, but further research is necessary before conclusions can be made. Under the same program, monitoring of the extent and condition of informal trails in 2008 showed that restoration as well as boardwalk and fence installation at Stoneman Meadow had improved conditions overall, although these measures were not enough to deter the formation of new social trails around the meadow perimeter.

Non-native plant species are common in Yosemite Valley meadows. So far, most invasive 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). Close attention to early detection and eradication of non-native meadow plants will keep additional species and populations from encroaching into wetlands.

Social trailing is common in Yosemite Valley, with the highest levels found in El Capitan, Sentinel, and Bridalveil Meadows. Stoneman and Cook's Meadows have the lowest cover of social trails, which may be due to the presence of the elevated boardwalks that minimize visitor impacts due to foot traffic.

The overall Biological ORV conditions in Yosemite Valley since 1987 are difficult to assess due to the scarcity and limitations of available data, but the trend appears to be positive. Restoration projects such as the Cook's Meadow Restoration Project and the Eagle Creek Restoration Project (NPS 2011a) have helped restore the ecological integrity of Yosemite Valley's meadows and riparian habitats.

NPS has completed a number of ecological restoration projects and other planning efforts aimed at protecting and enhancing Yosemite Valley's meadows and riparian habitat. For example, riparian vegetation has been restored along a reach of the river adjacent to North Pines Campground. Park staff fenced the riverbank and planted riparian vegetation in an attempt to halt erosion and protect the banks and vegetation. Associated educational efforts direct visitors to areas that can better accommodate heavy use without long-term impacts, such as sandy beaches and gravel bars.

Additional restoration projects in Yosemite Valley, including the Cook's Meadow Restoration Project and the Eagle Creek Restoration Project, 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 with an elevated boardwalk) 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).

As discussed previously, this section will be updated once the forthcoming NPS condition assessment reports become available.

NPS is implementing a number of management programs to restore meadow and riparian communities along the Merced River within Yosemite Valley, including prescribed burning, eradicating non-native plants, and increasing inundation levels by manipulating altered drainages. Although the meadows of Yosemite Valley have experienced a variety of human-related impacts over the past 150 years, they are still largely intact and are some of the most ecologically valuable meadows in the entire Sierra Nevada.

Management Considerations

The list below summarizes the management considerations associated with the Biological ORV in River Segment 2:

- Social trailing is common in Yosemite Valley meadows, with the highest levels found in El Capitan, Sentinel and Bridalveil Meadows.
- Trampling of soils and riparian vegetation in developed, high-use areas in Eastern Yosemite Valley has widened the Merced River, contributed to the loss of riparian vegetation cover and accelerated bank erosion in some reaches.
- Invasive plant species are commonin 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.

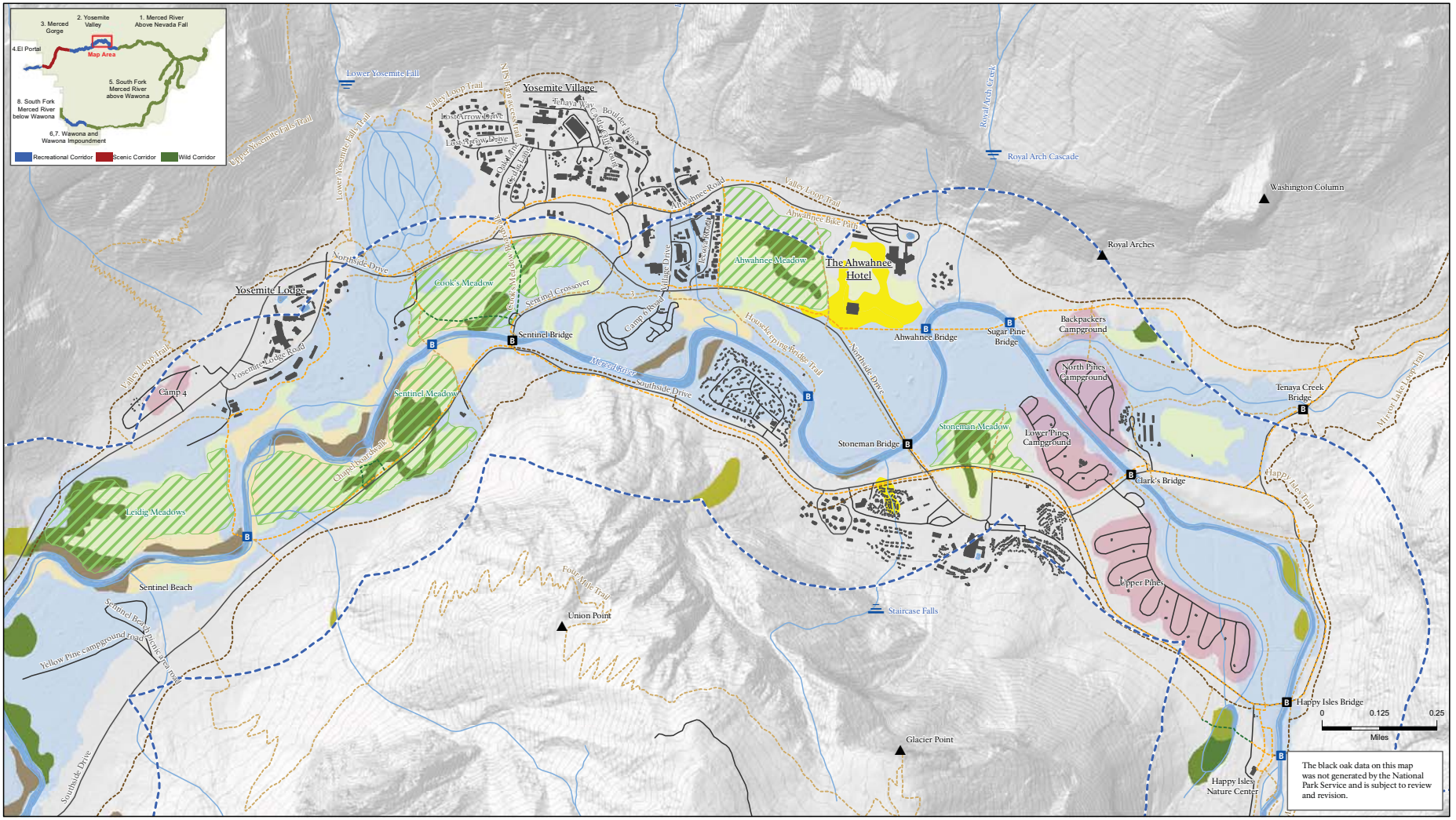


Figure 2.1-3
Biological ORV - River Segment 2. Yosemite Valley
Yosemite Lodge, Yosemite Village, and The Ahwahnee
Recreational WSR Corridor

- Recreational WSR Corridor Classification
- Building
- Campground
- Meadow
- 100 Year Flood Boundary
- Intermittently to Seasonally Flooded Meadow
- Semi-permanently to Permanently Flooded Meadow
- Black Cottonwood Temporarily Flooded Forest Alliance
- White Alder & Bigleaf Maple Forest Superalliance
- Willow Species Riparian Shrubland Mapping Unit
- California Black Oak Alliance
- Road bridge
- Footbridge
- Landmark
- Road
- Valley Loop Trail
- Bike path
- Boardwalk
- Trail
- Stream/River
- Waterfall

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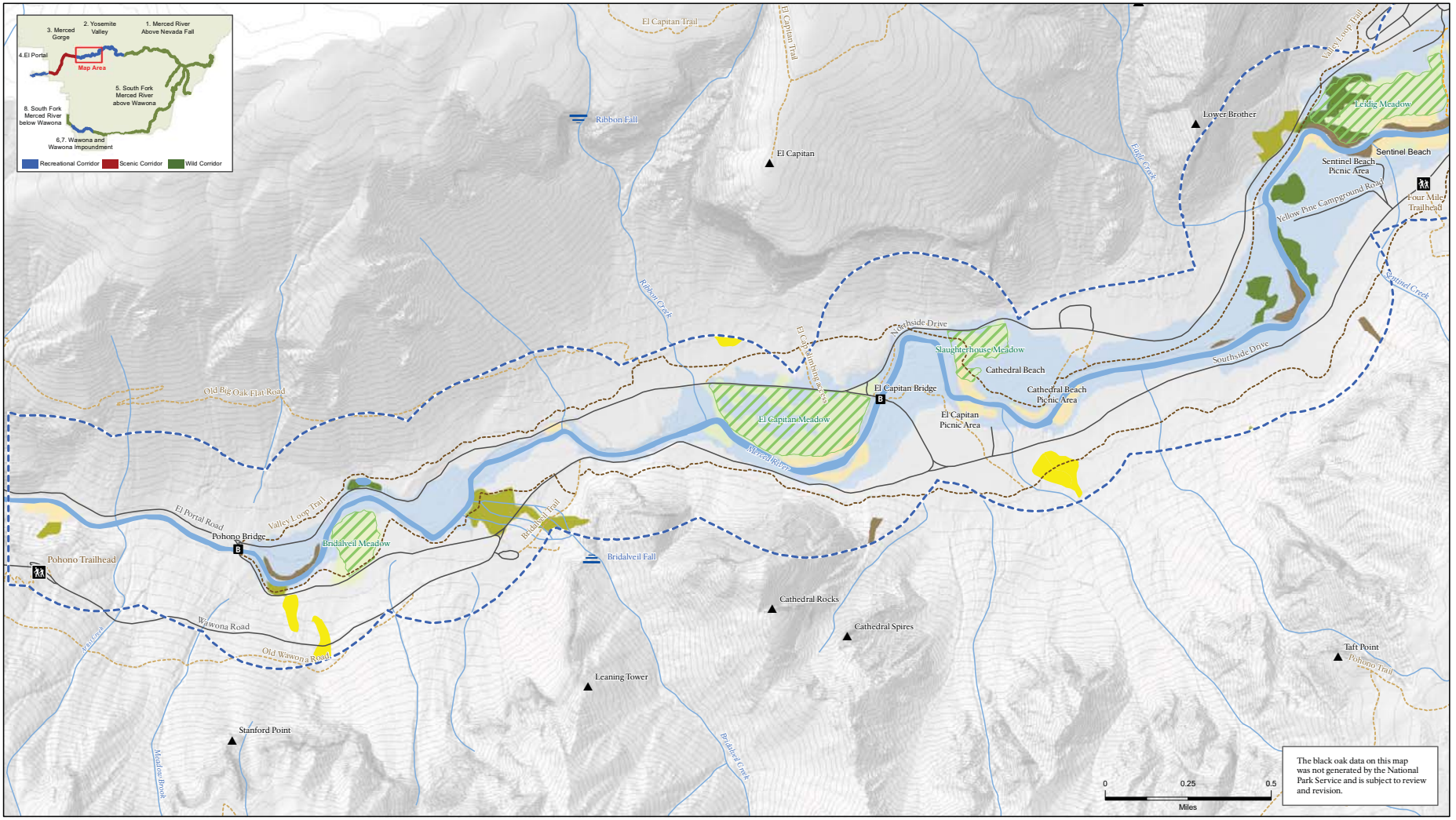

Figure 2.1-4
Biological ORV - River Segment 2. Yosemite Valley
El Capitan Meadow, Cathedral Beach, and Sentinel Beach
Recreational WSR Corridor

Recreational WSR Corridor Classification
Meadow
100 Year Flood Boundary
Waterfall
Landmark
Trailhead
Intermittently to Seasonally Flooded Meadow
Semi-permanently to Permanently Flooded Meadow
Black Cottonwood Temporarily Flooded Forest Alliance
White Alder & Bigleaf Maple Forest Superalliance
Willow Species Riparian Shrubland Mapping Unit
California Black Oak Alliance
Road
Stream/River
Yosemite Valley Loop Trail
Bike path
Boardwalk
Trail

National Park Service U.S. Department of the Interior

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2.1.5 River Segment 4: El Portal

Valley oaks are a keystone species in floodplain riparian habitats throughout California. Endemic to California, valley oak populations have experienced a widespread decline throughout the state. The California Native Plant Society considers the valley oak plant community, or *Quercus lobata* alliance, as rare and threatened throughout its range (Sawyer et al. 2009). Yosemite is home to one valley oak population, at the El Portal Administrative Site. This population is unique, as it is geographically isolated from most remaining populations centered in the Great Central Valley of California and lies at the extreme eastern boundary for the species' range (**Figure 2.1-5**).

Valley oak riparian and woodland areas comprise habitat of high value to wildlife (Howard 1992). In general, riparian environments support more species and greater numbers of wildlife than any other habitat type in the Sierra Nevada (University of California, Davis 1996). Collectively, valley oak riparian forests in California support 67 nesting bird species—more than any other California habitat for which data are available (Gaines 1980). The ecological significance of riparian habitat at lower elevations in Yosemite is accentuated by its Mediterranean climate, where water is extremely limited during hot summer months. Foothill areas below about 3,300 feet have the greatest loss of riparian vegetation of any region in the Sierra Nevada (University of California, Davis 1996).

The nucleus of the El Portal valley oak population is El Portal Road, located next to the existing fuel storage facility and El Portal Post Office. The population expands west in the floodplain to Middle Road, and east in the river cutoff channel toward the gas station. Additional oaks radiate up the hillside, although botanists postulate that many oaks in drier uphill habitats may be hybrids between valley oaks and upland species. These upland oaks exhibit slight differences in morphological characteristics from the core population, such as slightly hairy terminal buds, but genetic studies have not been conducted to determine whether they are hybrids. These drier-habitat oaks are not part of the population that constitutes the ORV, as they are not strongly river-dependent or river-related. The ages of the large valley oaks in El Portal are uncertain, though recent dating of a mid-size tree suggests that the larger specimens may approach 400 or 500 years of age (Acree 2011b)(**Photo 2.1-5**).

Photo 2.1-5: Valley Oaks (Photo: Yochim 2010)

Condition at the Time of 1987 Designation.
Anderson (2005) estimated that urbanization and land conversion destroyed about 90% of the valley oak stands in California that existed prior to European contact. Researchers estimate that about 1.5% of original valley oak acreage in the Sacramento River System remains (Hehnke and Stone 1979). The valley oak population in El Portal was likely an exception to this extensive loss, although the population had

sustained some impacts from rural development at the time of designation. Based on aerial photos and the age of existing structures, roughly 25% of potential valley oak habitat in the core floodplain of El Portal had been converted to structures and roads by the time of Merced Wild and Scenic River designation.

Another impact on the valley oak population at the time of designation was the loss of overbank flooding in the El Portal floodplain (see **Photo 2.1-6**). Construction of the Yosemite Valley Railroad terminus in El Portal and the El Portal Road (Highway 140), and subsequent road repairs after regular flood events, effectively blocked flooding throughout the population, except during very large flood events. Flooding rejuvenates riparian systems, creating a dynamic system and depositing nutrients. Prior to this construction, and long before designation of the river, the valley oak population likely had a robust understory, with flooding typically occurring every one to five years (Howard 1992).

Looking east at the results of the August 13, 1913 cloudburst and flood from the vicinity of the present Standard Oil Co. plant in El Portal.
Jim Law collection

Photo 2.1-6. 1913 El Portal Flood in Core Valley Oak Habitat (Law 1993)

Current Condition. One of the most useful tools for examining the condition and long-term viability of the El Portal valley oak population is the size distribution of existing individual trees (Tyler 2006). While the size of the oaks does not necessarily reflect their age, it is generally true that the largest individuals are old and the youngest individuals are small (although the smallest trees are not always the youngest). Regardless, the size of oaks is a good indicator of reproductive capabilities (Tyler 2006). A healthy population would generally have higher numbers of smaller trees than larger trees.

The core El Portal valley oak population contains 38 individual trees, with sizes ranging from small to very large trees (see **Figure 2.1-6**). Five valley oaks in the smallest size class were removed in the past five years, which is not reflected in the figure (Acree 2011b). The distribution of the El Portal valley oak population in a variety of age classes (i.e., more young trees than old trees) is of particular importance. The greatest challenge facing those who manage valley oak woodlands is the lack of sapling recruitment (Howard 1992). In a review of published studies on the demography and recruitment of California oak trees, nearly all of the valley oak inventories found valley oak seedlings and saplings to be uncommon or absent (Howard 1992). The El Portal population is exemplary in its distribution of age classes.

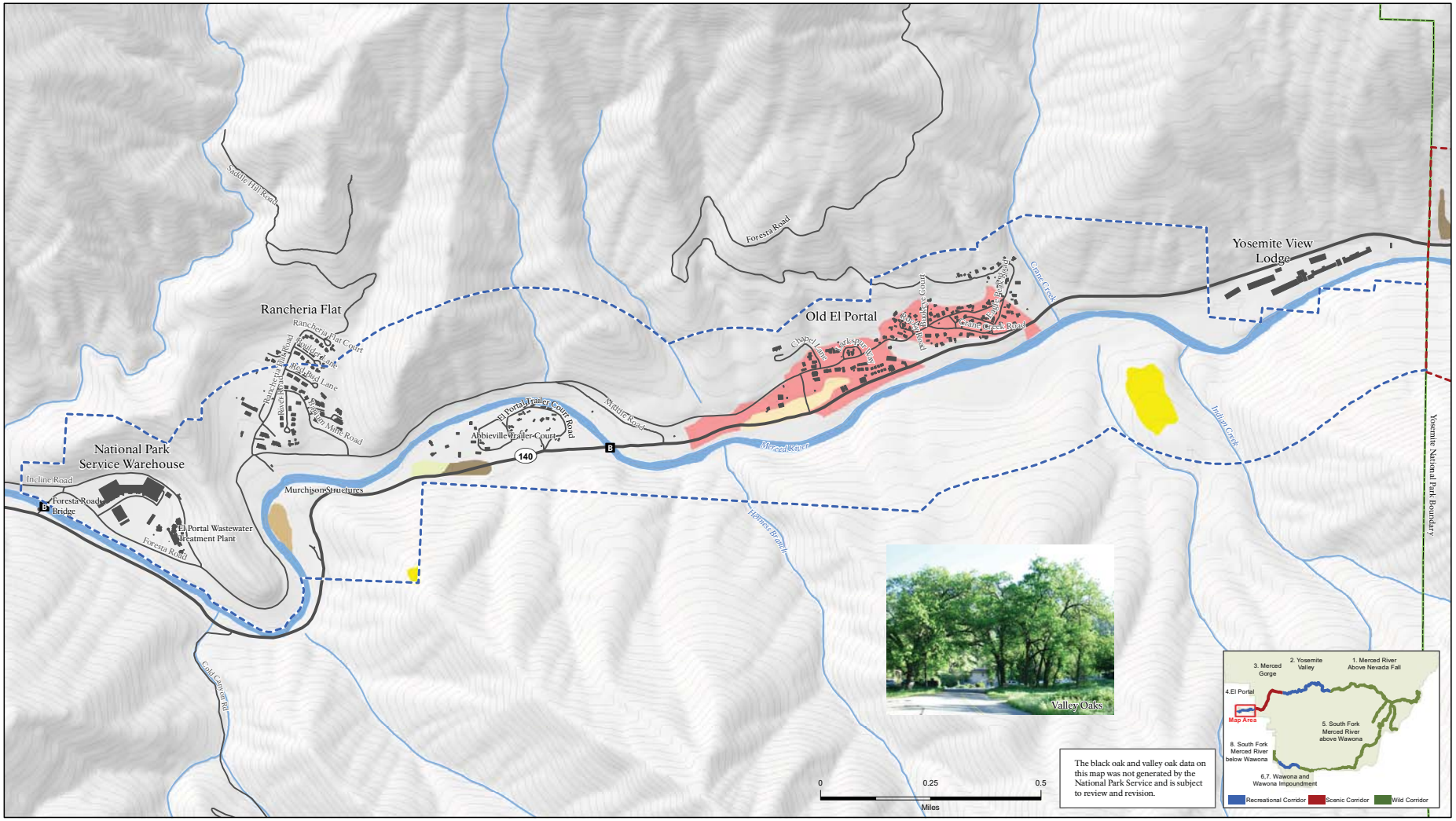

Figure 2.1-5
Biological ORV- River Segment 4. El Portal
Recreational WSR Corridor

- Recreational WSR Corridor Classification
- Scenic WSR Corridor Classification
- Building
- California Black Oak Alliance
- Valley Oak Woodland Alliance
- Intermittently to Seasonally Flooded Meadow
- Black Cottonwood Temporarily Flooded Forest Alliance
- Willow Species Forest Mapping Unit
- Willow Species Riparian Shrubland Mapping Unit
- Highway 140
- Road
- Stream/River
- 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: 1/5/11

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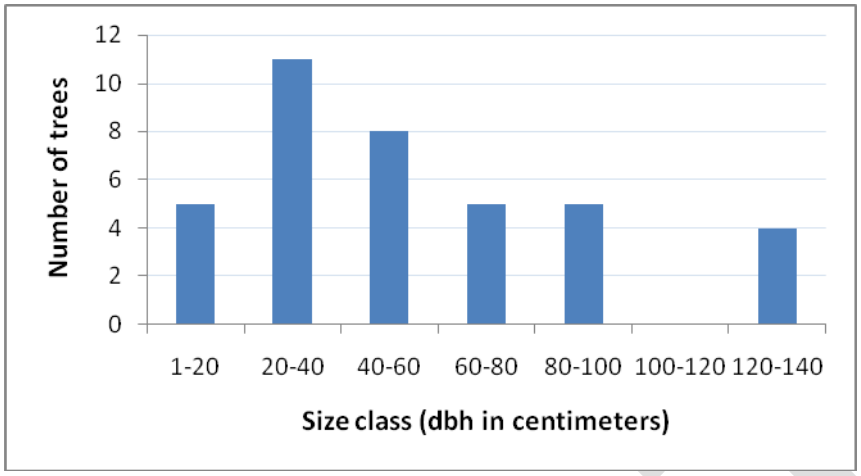

Figure 2.1-6
Size Class Distribution of Core Valley Oak Population
[Note: Five trees in the smallest size class are not reflected in this figure, as they were removed in the last five years.]

Rural development continues to limit the establishment of valley oaks in potential habitat in El Portal at slightly higher levels than at the time of designation. The dirt parking lot across from the Yosemite Conservancy has expanded under the dripline of mature oaks; in addition, some areas within the core population have been graded, and a few small oaks have been removed for different purposes. The valley oak understory is largely degraded, and an invasion of non-native Himalayan blackberry (*Rubus discolor*) exacerbates the issue. The loss of overbank flooding continues, although the root systems of mature oaks are likely connected to the Merced River water table for survival (Acree 2011b). Despite these issues, the core population retains sufficient integrity as a vegetation community and is classified as valley oak woodland in Yosemite's parkwide vegetation map.

As summarized by McClaran (1986), successful oak recruitment requires a combination of events including abundant acorn production, sufficient rainfall, and limited competition for light and water from neighbors. Mature trees are sensitive to overwatering, pruning, grade changes, and asphalt covering the root system (Rossi 1980). In El Portal, long-term stability of the valley oak population would be enhanced by habitat protection of habitat in the vicinity of valley oak trees and under the drip line of existing oak trees, and removal of invasive plants.

Management Considerations

The list below summarizes the management considerations associated with the Biological ORV in River Segment 4:

- Additional development pressure in Old El Portal could lead to negative impacts on the El Portal valley oaks.
- Overall health of El Portal population should be monitored to ensure sapling recruitment and long-term viability.

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

Sierra sweet bay is a small shrub endemic[4] to the Sierra Nevada and occurring at elevations from 1,000 to 5,000 feet. It is found in seven 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 only 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 (NPS 2010a). Calflora, an online database of California flora, documents four observations in the park—two from Wawona Campground and two from Big Creek, a tributary to the South Fork. Unpublished GIS data from NPS documents a larger population along an approximately two-mile reach of the South Fork in the vicinity of Wawona Campground (NPS 2010b) (**Figure 2.1-7**).

Photo 2.1-7: Sierra Sweet Bay Female Plant

Sierra sweet bay is a deciduous shrub with male and female flowers occurring on separate plants (**Photo 2.1-7**). 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 in the database. In 1980, Yosemite National Park staff described the species as fairly abundant at known locations, but designated the species as rare in the park since it was known to be present in only a few locations. At the same time, however, since the species was of sufficiently widespread distribution and occurred in minimally impacted areas, it was believed that it should not be considered threatened or endangered (NPS 1980).

[4] **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.

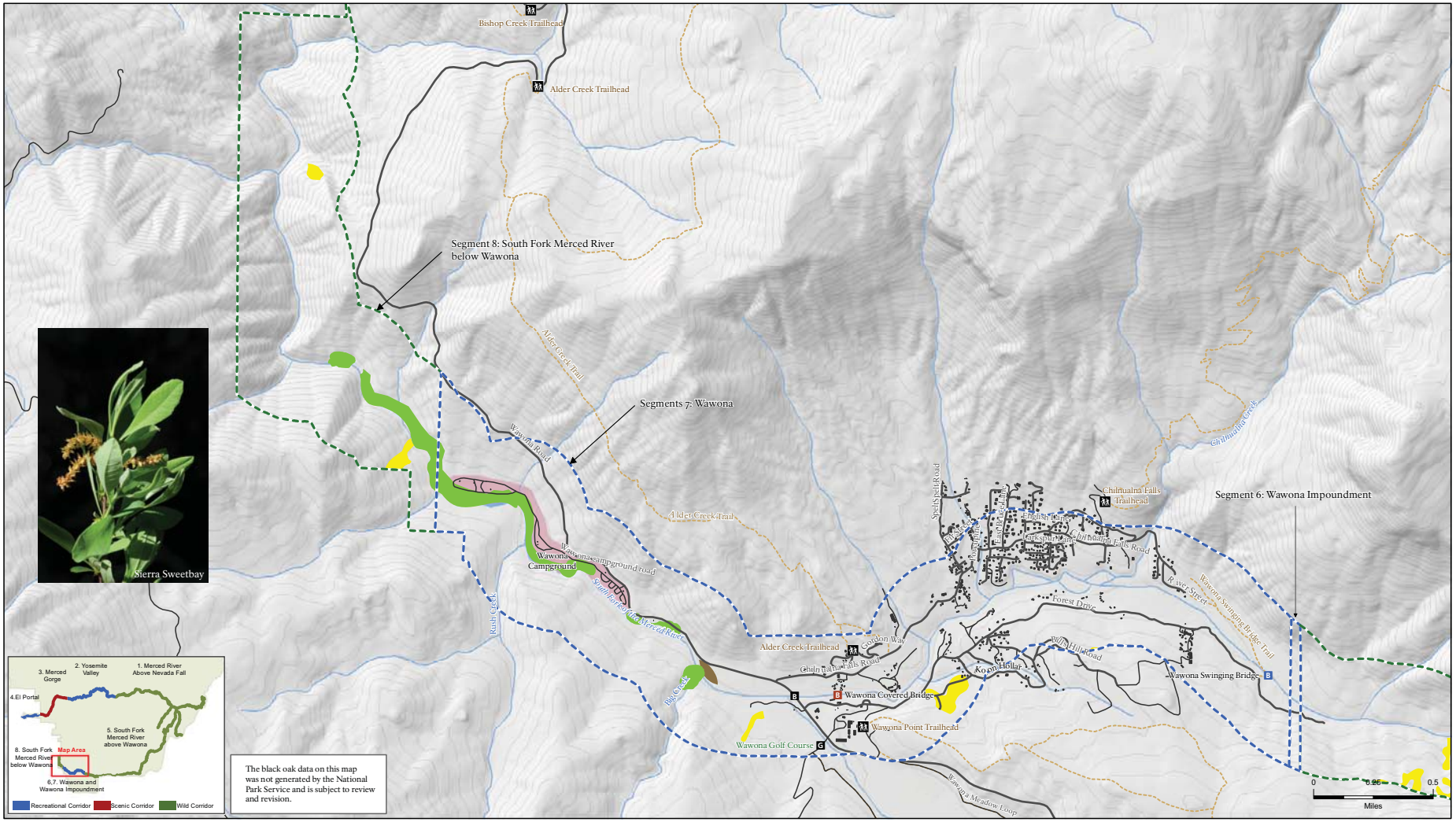

Figure 2.1-7
Biological ORV - River Segments 6,7,8.
Wawona Impoundment, Wawona,
and South Fork Merced River Below Wawona
Recreational WSR Corridor

Recreational WSR Corridor Classification
Wild WSR Corridor Classification
Building
Campground
Myrica hartwegii
Willow spp. Riparian Shrubland Mapping Unit
California Black Oak Alliance
Road
Stream/River
Trail
Road bridge
Footbridge
Historic bridge
Golfcourse
Trailhead

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Projection: North American Datum 1983, UTM Zone 10

Date: 2/25/11

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Current Condition. 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 the park boundary. It occurs at the river's normal high-water mark to the five-year flood line only, very tightly associated with the river channel.

Sierra sweet bay is present along the river in Wawona Campground, which has 99 campsites and is open year-round, as well as downstream in lesser visited areas. Visitor uses in this river segment are restricted to swimming, which can lead to riverbank impacts, including erosion and trampling of vegetation. These impacts are typically most severe in association with campgrounds and other areas that concentrate visitor use, such as trailheads and parking lots (NPS 2005).

Management Considerations

The list below summarizes the management consideration associated with the Biological ORV in River Segments 7 and 8:

- 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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2.2 RECREATION

2.2.1 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 and South Fork Merced Rivers provide for exceptional river-related experiences, and the dramatic and picturesque setting is central to these recreational experiences. Settings range from the undeveloped wilderness of the Upper Merced and South Fork, to Yosemite Valley's views of high granite cliffs and towering waterfalls, to Wawona, the Merced Gorge, and El Portal where the roar and vibration of the river become especially apparent during spring runoff. Many first time-visitors are awe-inspired by the rivers' natural wonders, forming their first connection to wild nature. Others return year after year, building long-lasting relationships and attachments to the rivers and their environs. For all visitors, the Merced and South Fork Merced Rivers are places to experience a wild and scenic river in one of America's most revered national parks.

Seven of the eight designated Merced Wild and Scenic River segments (Segments 1–5, 7, and 8) contain Recreational ORVs. This section describes the condition of each of the ORV components by segment. River segments 1, 5, and 8 are classified as wild segments and thus are described together below.

River Segments 1, 5, and 8: Merced River Above Nevada Fall and South Fork Merced River Above and Below Wawona

The Merced River, spectacular High Sierra landscape, dramatic scenery, natural sounds, and abundant opportunities for solitude combine to produce a variety of exceptional wilderness-oriented recreational activities.

Wild segments of the Merced River and South Fork 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 these river segments. 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. Off-trail hiking and Class V kayaking along the South Fork Merced River below Wawona are other examples of river-related recreational opportunities.

River Segment 2: Yosemite Valley

The Valley's incredible setting – with its striking cliffs and waterfalls towering above a meandering river and extensive moist meadows – provides for a variety of active, creative, educational, social, and reflective experiences.

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; these include active pursuits such as hiking, biking, swimming, climbing, camping, or fishing; creative pursuits such as writing, painting, photography, and other arts; and educational and interpretive activities. Social elements such as group camping and picnicking are integral to many activities, while others offer opportunities for solitude and reflection. 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 river-related activities but do not dominate the landscape or interfere with the natural setting. Visitor use is maintained at appropriate levels so as not to contribute to crowding or congestion.

Overall, the Yosemite Valley 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. These experiences in turn relieve stress and promote connection to the natural world.

River Segment 3: The Merced Gorge

The rushing and cascading river, interspersed with secluded holes, provides the setting for relaxing river-related activities.

As it plunges some 2,000 vertical feet through the Merced Gorge, the Merced River provides a dramatic backdrop for a variety of visitor activities. This segment is undeveloped except for the adjacent road. The road's proximity to the river provides for scenic driving and access to several pools, many of which are tucked away among gigantic granite boulders. These pools, beaches, and other areas are popular for activities such as swimming, fishing, and picnicking. Overall, this segment provides a largely natural setting and opportunities for relative solitude.

River Segments 4 and 7: El Portal and Wawona

The largely natural settings of the rivers in these areas provide for memorable active, contemplative, and creative pursuits.

The Merced River through El Portal and the South Fork Merced River through Wawona (excluding the Wawona Impoundment) provide a primarily natural setting for visitors to easily connect with the river through a variety of active, creative, and contemplative river-related pursuits. Local residents and visitors repeatedly visit road-accessible pools and beaches on these river stretches, contributing to a strong place attachment. Swimming and relaxing along the river are common, providing respite from the summer heat. Similarly, fishing is popular along these segments, with various holes treasured for

their combination of scenery, fishing success, and solitude. Finally, camping along the South Fork Merced River in Wawona allows visitors to be close to the river overnight. Though close to developed communities, the settings along these segments are mainly natural and, for much of the year, interactions with others are infrequent.

2.2.2 Recreational Features that Indicate Outstandingly Remarkable Values

The condition of Recreational ORVs in Yosemite National Park is defined by the experiences of recreationists and the status of the river-related attributes supporting those experiences. The quality of a Recreational ORV is typically determined by how visitors describe their recreational experiences. Four primary components of the Wild and Scenic River setting were considered in this assessment of ORV conditions:

- Recreational experience
- Setting attributes
- Recreational activity participation
- Facilities, services, and amenities

ORV Condition Measures

This evaluation of past and present Recreational ORV conditions along Merced River segments is based on: (1) visitor descriptions of the recreational experience, and (2) identification of quantifiable components that characterize the user experience at a given time. These components establish a baseline for the park to proactively monitor and manage the Recreational ORVs.

Various methods were used to evaluate the recreational experience and identify the components that support the ORVs. Because each river segment has a unique set of Recreational ORVs, the supporting components and how they are measured may differ for each segment. This assessment relied on the following common factors and methods to determine changes in the condition of Recreational ORVs. Several of the condition measures apply to more than one ORV component; for each river segment, an attempt was made to describe assessment measures in the most applicable category and avoid redundancy.

Recreational experience – The quality of the recreational experience is typically measured through visitor-use surveys. Changes in visitor descriptions can serve as early evidence of changes in Recreational ORV conditions. For example, visitors are asked to gauge user density along trails and at attraction sites, and park staff use their responses to estimate the effects of crowding.[1] Visitor perceptions of crowding provide a salient measurement of the recreational experience (Vaske et al. 2008). In wilderness areas, the visitor experience may be influenced by encounter rates.

Setting attributes – The attributes of a given setting are documented through either qualitative or quantitative descriptions. In most cases, park staff have not collected specific data, and the evaluation relies on general setting descriptions to assess the ORV condition.

[1] Crowding is a visitor's negative evaluation of visitor-use levels.

Recreational activity participation – This factor characterizes the recreational activities available in a particular segment and how many users participate in each activity. One frequently used measure of visitor-use levels at recreational sites is Persons At One Time (PAOT). PAOT is an evaluation of site-specific use levels and associated perceptions of crowding. It is not a measure of the total number of people who visit a recreation site but rather a measure of use levels over time; PAOT can help park managers to understand social conditions related to the visitor experience (Manning et al. 1999).

Facilities, services, and amenities – This factor is a description of specific facilities, their capacities, and how they potentially influence the recreational experience. For example, picnic facilities provide visitors with opportunities to gather and picnic within the river corridor. Facilities that do not directly affect the Recreational ORV are not described.

2.2.3 Literature, Data, and Monitoring Information

General visitor surveys have been conducted periodically in Yosemite, particularly in the last decade (ORCA Consulting 1999; Littlejohn et al. 2006; Le et al. 2008; Blotkamp et al. 2010). Visitor transportation and traffic issues have been consistent subjects of study (BRW, Inc. 1994; Binder Research 1997; White et al. 2006, 2008; Lawson et al. 2008, 2009). Several other studies have focused on visitor use and traffic issues at key attraction sites within the park (Manning et al. 1998, 1999; Pettebone et al. 2008, 2010). Manning et al. correlated actual use levels along trail segments to visitor perceptions of crowding (Manning et al. 1999). A 2007 refinement involved developing simulation models that linked vehicle traffic counted at the park's entrances to PAOT, arrival rates, and use levels at attraction sites (Lawson et al. 2008). Many of these studies documented resource concerns and issues associated with increasing park visitation, and efforts have been made to quantify possible visitor displacement effects (Gramann 1992).

Several studies have focused on Yosemite wilderness use, visitors' desired wilderness experiences, and their perceptions of campsite and trail conditions (Boyers et al. 2000; Newman et al. 2001). In recent years, the National Park Service (NPS) has performed annual data collection to monitor both resource and social conditions on the Merced River and at other locations in the park. These studies assessed numerous visitor experiences and recreational activities, including the number and extent of social trails, riverbank conditions, wilderness encounter rates, and the PAOT along the Merced River and at attraction sites in Yosemite Valley. These studies also evaluated picnic table and parking availability at various locations within Yosemite Valley (NPS 2005a, 2006, 2007b, 2008a). PAOT counts were conducted along selected riverbank sites in 2009, and wilderness encounter data and parking availability were measured for 2009 and 2010 (Blotkamp et al. 2010; NPS 2010a).

2.2.4 River Segment 1: Merced River Above Nevada Fall

Segment 1 of the Merced Wild and Scenic River is located in the Yosemite Wilderness. The Recreational ORVs for this segment are described in Section 2.2.1. In summary, the corridor provides wilderness-oriented recreational experiences in a river setting containing dramatic scenery and natural sounds.

Condition at the Time of 1987 Designation

- **Recreational experience.** At the time of Wild and Scenic River designation, 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. Recreationists could expect to encounter other hikers – both day users and overnight backpack campers – as well as stock users, both on the trail and at some campsite areas.

- **Setting attributes**. Scenic qualities influencing the recreational experience are described in Section 2.4, Scenery. At the time of designation, the placement of hiking trails and camping areas brought park users into close contact with the river itself.

- **Recreational activity participation.** The most common visitor activities within the corridor at the time of designation included hiking, backpacking, lodging at the Merced Lake High Sierra Camp, and stock use. 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.[2] (Where available, specific information on use levels and facility conditions is provided in the next subsection.)

- **Facilities, services, and amenities**. The recreational experience was influenced by other attributes such as the park's wilderness permit system, parking capacity, and the availability of other transportation services to and from trailheads.

ORV Condition Measures

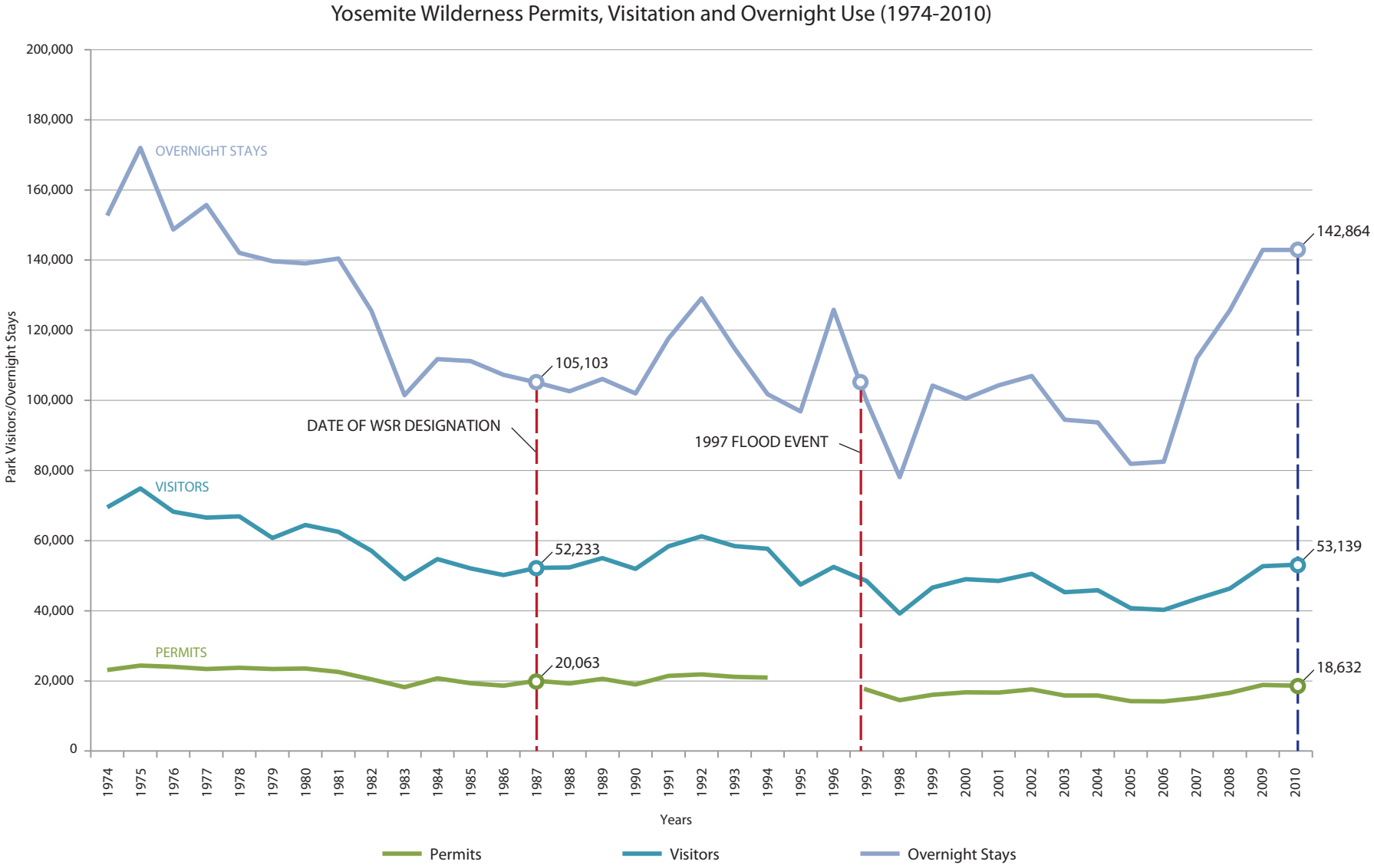
This section presents information available for 1987 regarding recreational activities, facilities, and park visitation as it pertains to the Recreational ORVs in Segment 1. Changes in these metrics could bring about changes to the Recreational ORV.

Recreational experience. At the time of Merced Wild and Scenic River designation, no formal surveys had been conducted to evaluate visitor satisfaction, perceptions of crowding, or encounters with other parties on or off wilderness trails.

Setting attributes. At the time of designation, the recreational experience was primarily influenced by the scenic value of the landscape in this river segment and by the river itself. Section 2.4, Scenery, provides a description of these scenic values. Section 2.2.1, above, describes the character of the river as it affects the recreational experience.

Recreational activity participation. Yosemite's wilderness, including the Merced River corridor, is one of the most highly visited wilderness areas in the National Wilderness Preservation System. Common activities in 1987 included hiking, backpacking, and stock use. Figure 2.2-1 shows wilderness visitation and overnight stays between 1974 and 2010. Recreational use of Yosemite's wilderness

[2] The High Sierra Camps are special administrative areas within the Yosemite wilderness where lodging is operated by the park concessioner.



NOTE: Visitation counts do not include day use visitors to the Yosemite backcountry.
No permit data available for 1995 and 1996.

SOURCE: NPS 2011c

Merced River Comprehensive Management Plan

Figure 2.2-1

Annual Yosemite Wilderness Permits, Visitation and Overnight Use

Backpackers Campgrounds (**Figure 2.2-2**). In addition, overnight lodging was available in the Merced River corridor at the concessioner-operated Merced Lake High Sierra Camp, a potential wilderness addition.[6] Elsewhere in the wilderness areas, backpackers were free to choose their own campsites. **Table 2.2-3** provides a summary of backpack camper facilities.

TABLE 2.2-3: BACKPACKING FACILITIES AND USE IN 1987

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

N/A: not available

SOURCES: NPS 1987; Fincher 2010

As the only designated camping areas in proximity to Valley trailheads, the Little Yosemite Valley and Moraine Dome Campgrounds are 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 is also a popular backpacking location due to its proximity to Merced Lake and nearby access to the facilities provided 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 to Tuolumne Meadows via the John Muir Trail. Most backpackers hiking between the upper Merced River and the Tuolumne River traveled from the Tuolumne down. At the time, the Little Yosemite Valley Campground (Figure 2.2-2) was the largest designated camping area. Although the wilderness campgrounds did not have set capacities, the Little Yosemite 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 campground areas, the individual campsites are dispersed over a relatively wide area within the designated areas that 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 size of groups at these campgrounds was approximately 3.27 people (NPS 1987).

At the time of designation, the ranger station for the campground areas and trailhead was located within 100 feet of the Merced River (NPS 1987). Both campgrounds were undeveloped and offered no

[6] "Potential wilderness additions" are areas that will become full wilderness upon future cessation of its current permitted uses that are inconsistent with a wilderness designation.

peaked in 1975 when an estimated 172,000 overnight stays were recorded (NPS 2011c). The park instituted a trailhead quota system in 1977 to protect resources and provide for an experience of solitude and independence. Daily permit allocations controlled the number of wilderness users at specific trailheads throughout the park.

In 1987, the NPS issued approximately 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 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.

Although data specific to the Merced River corridor is unavailable for this period, approximately 52,200 park visitors spent a total of 105,100 nights in the Yosemite wilderness (NPS 2011b). Based on this overnight visitation and permit data, it is estimated that the 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 2.2-1**). 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 2.2-1: VISITOR USE IN YOSEMITE WILDERNESS IN 1987 AND 2010

Visitor Use Measurement	Quantity	
	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

Hiking

The Merced River trail is the main trail in the river corridor; in Segment 1, the trail extends from Nevada Fall to Junction,[3] from which point visitors can access the upper wilderness areas such as the Lyell Fork and Triple Peak Fork Valleys. The trail passes Washburn and Merced Lakes and then through Little Yosemite Valley.

[3] Junction refers to the confluence of the Merced Peak, Triple Peak, and Lyell Forks.

The Mist Trail 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.[4] The John Muir Trail[5] also originates at Happy Isles and provides an alternate route out of Yosemite Valley and past Vernal Fall. The two trails connect after Nevada Fall and continue along the Merced River for 1.5 miles, at which point the John Muir Trail veers northward and exits the Merced River corridor about a quarter mile east of the Little Yosemite Ranger Station. The downstream end of Segment 1 is located below the intersection of the Mist and John Muir Trails; although the majority of the river segment is beyond these two major trails, their presence influences the recreational experience in Segment 1 due to their popularity.

No data are available on past trail use or trail conditions in this river segment at the time of the 1987 designation.

As shown in **Table 2.2-2**, 125 wilderness permits were available in 1986 from four trailhead locations for overnight wilderness use. 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 wilderness areas in 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 use for Yosemite wilderness areas (Fincher 2010).

TABLE 2.2-2: TRAILHEAD QUOTAS FOR MERCED RIVER WILDERNESS ACCESS

Trailhead	Wilderness Permit Quota	
	1986	2010
Happy Isles	50	30
Glacier Point	25	10
Mono Meadow	25	20
Sunrise	25	20
Total	**125**	**80**

NOTE: The wilderness permit quotas were lowered in the mid- to late 1990s.
SOURCE: Fincher 2010

Backpacking

The Merced River corridor above Nevada Fall provided some of the park's most popular wilderness camping opportunities. Camping in the Little Yosemite Valley and Merced Lake areas was allowed only in official campgrounds. At the time of Wild and Scenic designation, there were three wilderness campgrounds in this river segment: Little Yosemite Valley, Moraine Dome, and Merced Lake

[4] 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.

[5] 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.

amenities except for toilet facilities. The chemical 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.

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 lacked any site amenities, but, at the time of designation, campers could 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. No campground condition or use data are available for this campground (Fincher 2010).

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 park's wilderness area (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 with similar improvements 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 Merced Lake High Sierra Camp, each of which accommodated two to four people. Two of the tents were generally used to house employees, and one was reserved for wranglers traveling with stock. The total capacity of the Merced Lake High Sierra Camp was 60 people/beds.

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). Stock use[7] levels at the time of the 1987 designation are unknown. However, stock use reportedly constituted less than 3% of the total wilderness use in 1978 and, at that time, private individual stock use accounted for the greatest proportion of stock use (42.3% in terms of grazing 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). No data are available on the proportion of stock use required to operate the

[7] Historically, there have been four categories of stock use in the Yosemite wilderness: (1) NPS Administrative Use (wilderness patrols, facility maintenance, and trail crew support), (2) Concessioner Use (High Sierra Camps supply support), (3) Commercial Use Authorization (i.e., commercial guided pack trips), and (4) private individuals.

Merced Lake High Sierra Camp. No facility condition or occupancy data are available for this camp for the period prior to the 1987 designation.

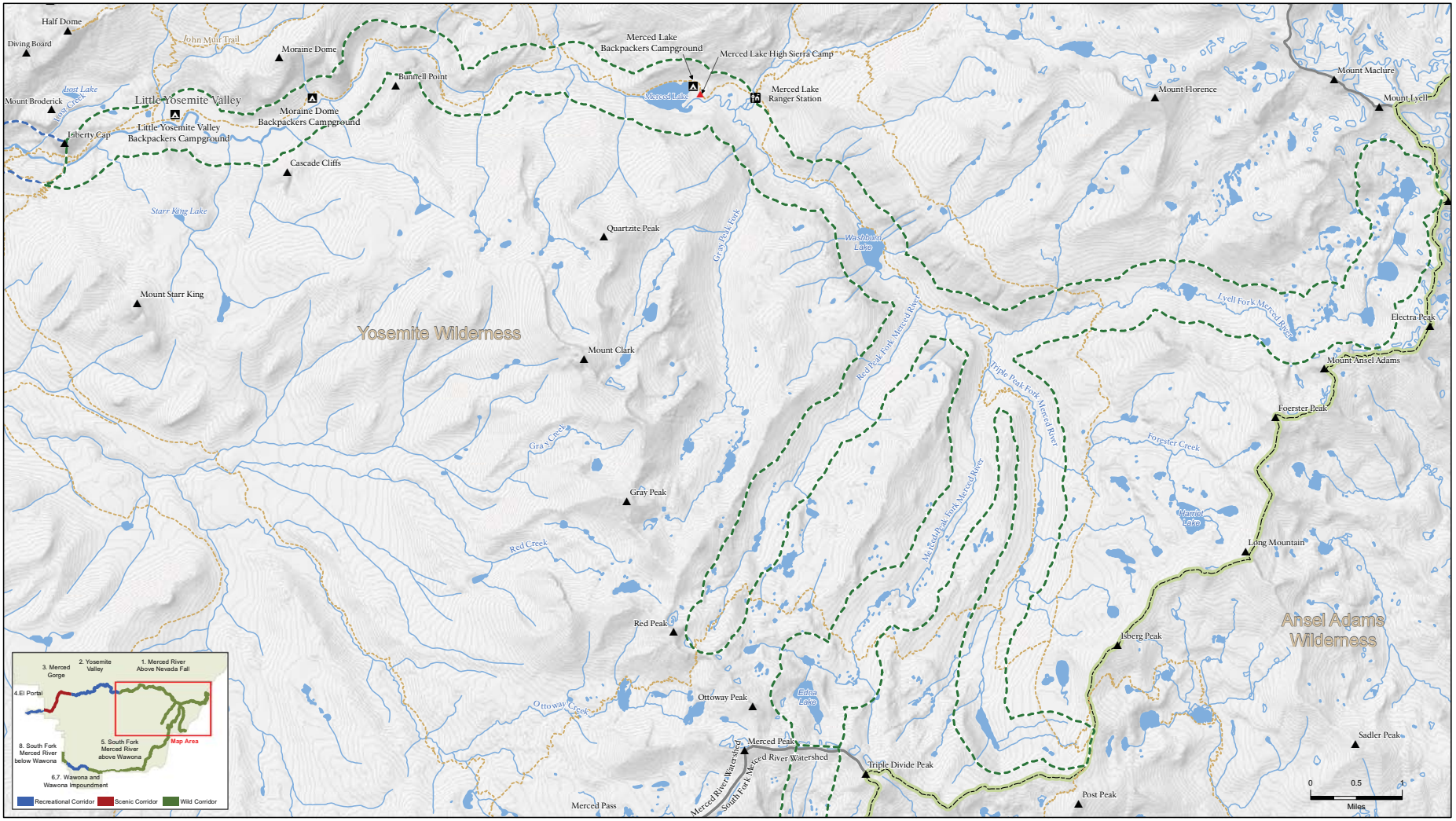


Figure 2.2-2
Recreational ORV - River Segment 1.
Merced River Above Nevada Fall
Wild WSR Corridor

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
Date:	2/25/11
File:	

Recreational opportunities at the High Sierra Camps included commercially guided and private stock pack trips. However, the proportion of stock use by the concessioner-run commercial trips is unknown (Sano 1978). Although no information on wilderness conditions prior to designation is available regarding the extent and effects of wilderness stock use, the potential for adverse physical impacts on trails and meadows (e.g., trampling), grazing effects, and aesthetic factors (hiker encounters and manure on trails) was acknowledged in 1978 (Sano 1978).

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. No specific data are available regarding the amount of time people spent engaged in various activities in 1987.

Facilities, services, and amenities. At the time of designation, non-river-related factors also contributed to the recreational experience, including facilities and features that supported or limited access to the area or provided services to recreationists. For example, the availability of transportation and parking facilities in the wilderness constrained the number of users able to access the area. As discussed above, the wilderness permit quota played a direct role in managing the extent and location of wilderness use in this river segment. In addition, NPS rangers stationed in the wilderness were important in managing wilderness use, while NPS work crews performed essential trail and other facility maintenance and restoration duties in wilderness areas. Administrative stock operations provided support and supplies for these NPS staff working in the wilderness. 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 transportation and parking facilities available to wilderness visitors also affected visitors' ability to access Segment 1. Visitors to the Merced River corridor generally travelled by private vehicle to the park 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.

Current Condition

- **Recreational experience**. The current recreational experience is described in Section 2.2.1 and is similar to conditions present in 1987 at the time of Merced Wild and Scenic River designation. Since 1987, additional data describing the user experience have been collected. Based on trail/campground use and encounter rates, the majority of trail users are concentrated in the river corridor between Nevada Fall and the Merced Lake High Sierra Camp. Encounters with other individuals between Moraine Dome and Merced Lake average one encounter per hour about 65% of the time over the season. Upstream of the High Sierra Camps on the trail to Washburn Lake, encounters with other individuals drop to an average of one encounter per hour more than 76% of the time. Past Washburn Lake, hikers have an encounter with no more than one other party 100% of the time. Encounter rates are described in the section below. Users also report varying levels of campsite quality and observing

evidence of stock use impacts. Since 1987, problems with the campground toilet have been remedied, offering an improved facility. Additionally, in 1991 the Merced Lake Ranger Station and Merced Lake Backpackers Campground were relocated away from the lake. The utility systems at the Merced Lake High Sierra Camp have also been upgraded.

- **Setting attributes**. Section 2.4, Scenery, describes the scenic qualities that influence the recreational experience. In general, the scenic qualities and river character are the same as existed in 1987.

- **Recreational activity participation**. Similar to wilderness activities prior to designation, the most common visitor activities within the corridor are hiking, backpacking, stock use,[8] 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 at the main access trailheads from 125 in 1987 to 80 under current conditions. Additionally, NPS instituted a Half Dome permit system in 2010 to manage the number of Half Dome hikers. This change may influence the length of stay and number of backpackers that use the Little Yosemite Valley Campground in the future.

- **Facilities, services, and amenities**. 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 to provide supplies for the Merced Lake High Sierra Camp (or for NPS administrative purposes) results in encounters on trails within the corridor that are considered unpleasant by some hikers.

ORV Condition Measures

This section presents currently available information on recreational activities, facilities, and visitation that could influence the Recreational ORVs in Segment 1. Changes in these metrics could bring about changes to the Recreational ORV.

Recreational experience. A wilderness survey performed between 2001 and June 2002 provides recent data on the recreational experience and encounter rates in wilderness areas (Newman et al. 2001). The survey investigated visitor tradeoffs among social, ecological, 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. Survey respondents reported that their wilderness experience was most affected by the ability to obtain a wilderness permit and the availability of opportunities for camping away from other users. Other important standards of quality included the variety of campsite choices and the extent of previous human use of the campsites. In addition, respondents indicated that signs of stock and human use as well as encounter rates with other hikers influenced the quality of their wilderness experience. The survey suggested that many wilderness visitors tolerate higher encounter levels on popular trails, but are less tolerant of other users and campsite impacts at more remote wilderness locations. Others reported that their overall recreational and wilderness experience was influenced to a greater extent by the availability of wilderness access and/or the camping conditions within remote wilderness areas than by encounter

[8] As previously discussed, only the private and commercial outfitter 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 sites (e.g., NPS trail maintenance crews or Merced Lake High Sierra Camp).

rates. The Merced River corridor between Nevada Fall and the High Sierra Camps is very popular, and the survey did not define this segment as a more remote wilderness area. Because there are no established campgrounds upstream of the High Sierra Camps, camping is more dispersed 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 several river segments. The NPS collected extensive data between 2004 and 2008 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 Junction. The encounter rate findings are shown in **Table 2.2-4**.

TABLE 2.2-4: 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 – 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 is for the wilderness recreation season between May to mid October.

SOURCE: NPS 2008a

As shown in Table 2.2-4, the survey determined that 70.7% of the time, on average, hikers encountered one other party per hour for the majority of their trip.[9] Encounter rates among Merced River corridor hikers were lowest in 2005, when 85.7% of the time, on average, hikers encountered one other party 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 along the 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

[9] Encounters with other hikers affect the "opportunity for solitude" component of the wilderness experience and thus could affect the area's ORVs. Higher encounter rates would generally diminish the "opportunity for solitude" and related ORVs.

over the survey period. Nearly one-third of hikers met more than one other party for a significant portion (more than 20%) of their trip (NPS 2008a).

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 2.4, Scenery, describes the visual qualities that contribute to the recreational experience in the river corridor. Section 2.2.1, 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.

Recreation Activity Participation

General Wilderness Use. As shown in Figure 2.2-1**,** between 1987 and 2006, annual overnight wilderness use was usually below or comparable to the 1987 visitation of 105,100 overnight stays (NPS 2008b). However, since 2006, Yosemite wilderness overnight visitation has increased substantially, exceeding 1987 levels. In 2010, approximately 53,100 Yosemite visitors spent 142,900 nights in the wilderness (NPS 2011c) (Figure 2.2-1). Although the 2010 overnight visitation is approximately 36% greater than 1987 levels, the number of wilderness visitors in 2009 was approximately the same as the total wilderness visitors 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 wilderness 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 all of the High Sierra Camps. Backpackers often choose to stay near the High Sierra Camps to access facilities and purchase meals (Fincher 2010).

Much of the day use in the Merced River corridor above Nevada Fall may be related to Half Dome visitation. Half Dome visitors that camp in Little Yosemite Valley may extend their overnight stay in order to hike up to Merced Lake. In January 2010, NPS implemented an interim permit system to manage visitor use on the Half Dome cables. On weekends and holidays, a limit of 400 people per day was established to ensure visitor safety and promote a positive experience.

Initial 2010 data on visitor use under the new permit system suggest that weekday use (Monday to Thursday) is higher than weekend use at both Half Dome and on the trail system accessing it. As a result of the new permit system, total Half Dome visitation decreased in 2010. Weekend day use of the trail to Half Dome decreased as a result of the new permit system and there was an increase in weekday use when permits were not required. In addition, there may have been a related decrease in future overnight use of Little Yosemite Valley Campground since wilderness users (without permits) will have reduced opportunities to hike Half Dome and consequently may shorten their stay at Little Yosemite Valley campsites.

Hiking

The designated trail system within Segment 1 has not changed since 1987. Table 2.2-5 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. 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 degradation to these trails' conditions cannot be determined.

TABLE 2.2-5: 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

Many hikers use the 1.5-mile section of the John Muir Trail in the Merced River corridor to hike from Nevada Fall, and exit the corridor at Little Yosemite Valley (approximately 0.25 mile east of the Little Yosemite Ranger Station). Hikers along this trail section include both wilderness users heading up to Tuolumne Meadows as well as others en-route to Half Dome. In contrast, very few day users continue to hike along the Merced River further up the Little Yosemite Valley towards Echo Valley

As shown in Table 2.2-2, in the mid- to late 1990s NPS reduced the number of overnight wilderness permits from 125 to 80 per day from the trailheads that provide access to Segment 1. As a result, fewer overnight wilderness visitors can access the Merced River corridor above Nevada Fall each day from the four trailheads. Day-use hiking access to the area remains unrestricted but is minimal.

Table 2.2-6 shows average 2010 inbound trail use along the Merced (i.e., hikers traveling from Little Yosemite Valley toward Merced Lake and the wilderness). An estimated average of 27 trail users per day hiked from Little Yosemite Valley toward Merced Lake over the course the 2010 wilderness season, for a total of 2,864 hikers. The highest daily use occurred in August, when an average of 34 individual hiked along the route.

Backpacking

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,

TABLE 2.2-6: TRAIL USE ABOVE LITTLE YOSEMITE VALLEY TO MERCED LAKE (2010) (WILDERNESS-BOUND HIKER TRAFFIC)

Month	Average Day Use	Total
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

these campgrounds typically operate at near capacity (Fincher 2010). The Mist and John Muir Trails, originating within Yosemite Valley, are most commonly used to access the Merced River corridor.

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 relocation (Fincher 2010).

In 1991, NPS relocated the Merced Lake Ranger Station and Merced Lake Backpackers Campground away from the lake. The campground capacity has not changed since the relocation. The ranger station facilities were improved with the addition of housing, kitchen, and other support facilities (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 campsites decreased by 17% — predominantly due to the successful full restoration of many campsites to natural conditions. A major improvement in wilderness campsite quality was reported as a 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, NPS has installed solar panels and new septic system and made other minor utility repairs and upgrades at the Merced Lake High Sierra Camp. Residual from the septic system is hauled out by helicopter. The lodging capacity of the Merced Lake High Sierra Camp is 22 tent cabins, each of which accommodates two to four people. Two of the tents are generally used to house employees, and one is reserved for wranglers traveling with stock. The capacity of the Merced Lake High Sierra Camp is

60 people/beds and 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 camp relies on concessioner-run stock to deliver supplies.

The Merced Lake High Sierra Camp operations rely on concessioner operated stock for its operating supplies. Although the NPS does not count this stock use by the concessioner, during its operating season the concessioner typically operates three supply trips per week to the Merced Lake High Sierra Camp.

Other Recreational Activities

Wilderness users in this river segment participate in other recreational activities in addition to those discussed above. Photography, swimming, 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. No data is available specifying the type and amount of time people spend engaged in various other activities.

Throughout the Yosemite wilderness, commercially guided pack trips account for approximately 50% of the total overnight stock use,[10] and private stock use accounts for less than 5% (as informally tracked by the Yosemite Wilderness Office) (Acree et al. 2010). Commercial pack trips are concentrated in several high-use travel corridors; Lyell and Virginia Canyons are the most popular destinations and have the highest levels of overnight stock use (Acree et al. 2010). Since 2003, NPS has limited commercially guided pack trips to 3,973 stock and visitor nights annually; total commercial stock use by Commercial Use Authorization outfitters has been far below the prescribed limits. Between 2003 and 2009, annual stock use by the nine Commercial Use Authorization outfitters in the wilderness averaged 1,629 stock-use nights. 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 approximately 57.3% of the maximum commercial stock-use level currently permitted by the NPS.

Only limited data are available on the extent of stock use in Segment 1 of the Merced River. **Table 2.2-7** shows the total annual number of stock-use nights within this river segment by NPS administrative and commercial operators. Average annual stock use from 2004 through 2010 was 344 nights. Annual commercially guided pack trips in this river segment averaged only 48 stock-use nights, which represents less than 3% of the guided pack trips that occurred in the entire Yosemite wilderness areas.

Facilities, services, and amenities. Non-river-related factors also contribute to the recreational experience, including facilities and features that support or limit access to the area or provide services to recreationists. For example, the availability of transportation and parking facilities allowing access to wilderness areas can constrain the number of users. As discussed above, the wilderness permit quotas play 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 and restoration

[10] This wilderness stock use does not include the concessioner's use of stock to supply the High Sierra Camps.

TABLE 2.2-7: STOCK-USE NIGHTS WITHIN SEGMENT 1 BY LOCATION (2004 TO 2010)[a]

Wilderness Stock Campsite Locations	2004	2005	2006	2007			2008			2009			2010			Total	2004 to 2010	High
	Commercial	Commercial	Commercial	Commercial	Administrative[b]	Total	Commercial	Administrative[b]	Total	Commercial	Administrative[b]	Total	Commercial	Administrative[b]	Total		Average	
Horsethief				12		12	8		8	50		50	21		21	**91**	13	50
Merced Lake Administrative					350	350		96	96		410	410	28	300	328	**1184**	296[c]	410
Washburn	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] Grazing nights only. Data do not represent stock use to supply the Merced Lake High Sierra Camp.
[b] Administrative use was not tracked until 2007 and does not include ranger patrols or sawyers.
[c] Average is for the stock use between 2007 and 2010.

SOURCE: NPS 2011d

duties in the Yosemite wilderness. Administrative stock operations provide support and supplies for these NPS staff working in the wilderness.

Administrative stock use accounts for approximately 45% of the total overnight stock use in the Yosemite wilderness (as informally tracked by the Yosemite Wilderness Office) (Acree et al. 2010). Only limited data are available on the extent of stock use in this river segment. Table 2.2-7 shows the total annual number of stock-use nights by NPS administrative and commercial operators. Average annual stock use in this river segment was 344 stock-use nights, with the majority (86%) of use by NPS administrative stock.

As previously discussed, the transportation and parking facilities available to wilderness visitors will also affect visitors' ability to access Segment 1. 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 in Tuolumne Meadows to hike down to the Merced River from the Sunrise trailhead. Since 1987, the expanded bus transit options to locations outside Yosemite Valley (including both Glacier Point and out of park destinations such as Merced and Mammoth Lakes) offer additional options for visitors to reach the park and organize their visit.

Management Considerations

Management considerations in the Merced River above Nevada Fall segment pertain predominantly to maintaining opportunities for solitary, wilderness-oriented visitor experiences, particularly within Little Yosemite Valley. The list below summarizes the management considerations associated with the recreation ORV in River 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 affect wilderness character and opportunities for solitude throughout most of the wilderness visitation season.
- Current levels of use along the trails in the vicinity of wilderness camping destinations may affect opportunities for solitude and primitive experiences.

2.2.5 River Segment 2: Yosemite Valley

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

Conditions at the Time of 1987 Designation

- **Recreational experience**. Segment 2 has afforded a variety of opportunities to view the Yosemite Valley scenery and to travel along the river and interact directly with it. 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 Valley as a "moderate" problem (Gramann 1992).

- **Setting attributes.** Section 2.4, Scenery, 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.

- **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. Both day-use and overnight camping was popular in this river segment; in 1987, additional riverside campgrounds were available in areas destroyed during the 1997 flood.

- **Facilities, services, and amenities.** The recreational experience and opportunities were influenced by such factors 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 overnight camping opportunities by the river. These campsites, mostly in Lower and Upper River Campgrounds, were eliminated following the 1997 flood. In addition, several housing units in the Curry Village area that were available at the time of designation have been deemed off-limits due to a large rockfall in 2008. More specific details on the extent of these attributes and facilities are provided below.

ORV Condition Measures

Recreational experience. There is little readily available research specific to Yosemite Valley visitors' recreational experience and perception of crowding at the time of the 1987 Merced Wild and Scenic River designation. As a result, the following assessment derives some information from other years in order to ascertain conditions at the time of designation.

Perception of crowding. Visitor concerns regarding crowding were reported and analyzed in 1990 and 1991 (Gramann 1992). Of the survey respondents, 4 out of 10 identified crowding in the Valley as a "moderate" problem. Moreover, the study also reported that traffic and crowding have resulted in visitor displacement (Gramann 1992).

Setting attributes. From the Merced River and its banks, views of Yosemite Falls, Bridalveil Fall, El Capitan, and Half Dome, among other scenic Valley views, 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.

Recreational activity participation. Park entry counts do not distinguish between overnight and day-use visitors, nor do they account for the number of people visiting the Valley versus those using other areas of the park. However, 1992 visitor surveys indicated that 75% of park visitors went to the Valley, and thus provide 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.

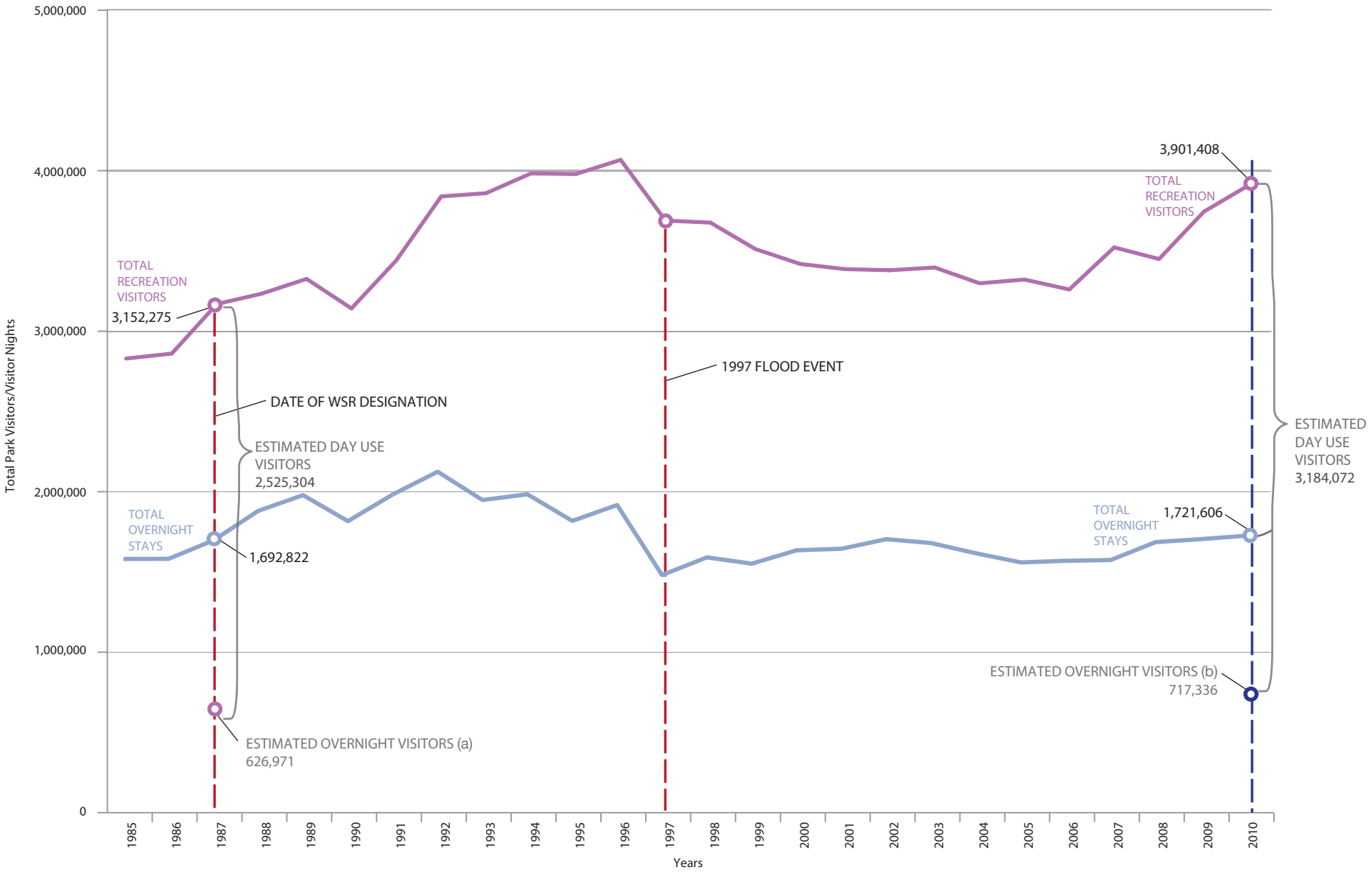
Figure 2.2-3 shows parkwide visitation and overnight use levels between 1985 and 2010. Figure 2.2-4 shows the camping and lodging overnight visitation by major park location (specifically including Yosemite Valley camping use between 1988 and 2010[11]). Yosemite Valley campground use was reported to be 384,000 overnight stays in 1988, and total overnight visitation was estimated to be 1.87 million. In 1990-1991, the average length of stay was 2.7 days (Gramann 1992). Assuming the length of stay in 1988 was similar, there were an estimated 700,000 overnight visitors and approximately 2.5 million day-use visitors to Yosemite in 1988.

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, picnicking, swimming, floating, photography, painting, as well as educational and interpretive pursuits. Specific data on participation in these activities at the time of Merced Wild and Scenic River designation are limited; however, available information is summarized below.

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.

Day hiking. There were about 50 miles of day hiking trails in the Valley (Table 2.2-8) ranging from short, easy hikes to a very strenuous hike to Glacier Point with over 3,000 feet in elevation gain.

[11] Yosemite Valley campground data before 1988 may have been omitted from NPS overnight visitation counts. Total park visitation levels in 1987 and 1988 are comparable. If actual 1987 Yosemite Valley campground use was comparable to use in 1988 of 384,000 overnight stays, then 1987 total overnight stays would be approximately 2.07 million.



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).

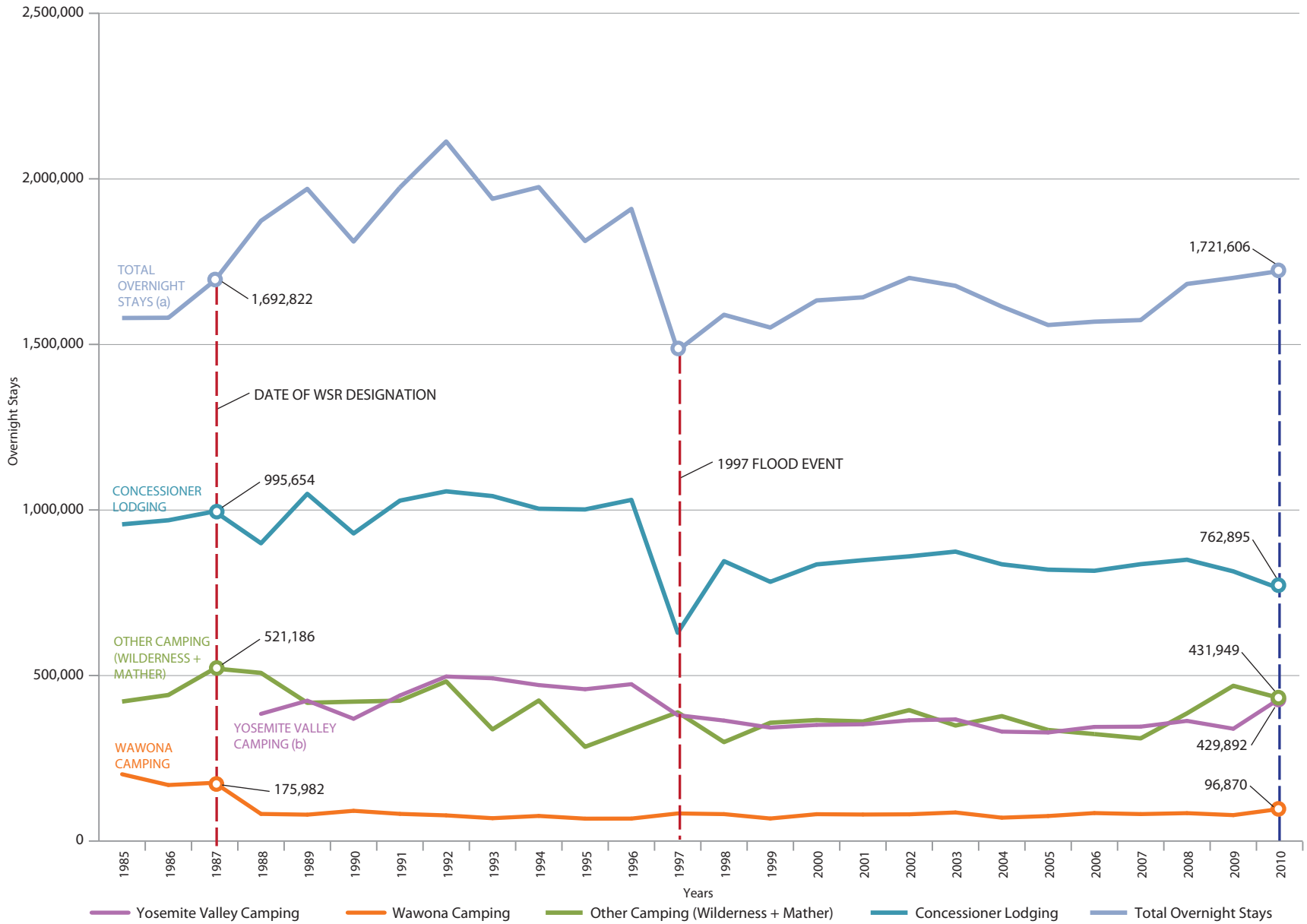
(b) The number of overnight visitors is estimated based on an average 2.4 days length of stay for 2010 park visitors (Blotkamp et al. 2010).

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) Individual visitors typically stay overnight for several days.

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

SOURCE: NPS, 2010a

Figure 2.2-4

Yosemite National Park Overnight Visitor Use (1985-2010)

TABLE 2.2-8: 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, winter route	Happy Isles Shuttle Stop #16	3-mile round-trip, 2 to 4 hours	Strenuous, 1,000-foot gain
Top of Nevada Fall, winter route	Happy Isles Shuttle Stop #16	5-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			

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. These facilities are described below under the subheading Facilities, Services, and Amenities.

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).

Facilities, Services, and Amenities

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.

Overnight accommodations. Camping and lodging facilities in the Valley have provided visitors with opportunities for multi-day experiences within the river corridor or with easy access to river. **Table 2.2-9** shows the camping and lodging facilities operating at the time NPS issued the *General Management Plan* (NPS 1980b) and in 2010. At that time, there were 1,528 overnight lodging units and 872 campsites in Yosemite Valley. No data specific to the 1987 Yosemite Valley camping and lodging

TABLE 2.2-9: YOSEMITE VALLEY VISITOR FACILITIES (1980 AND 2010)

Facility	1980 (GMP) No. of Sites/Units	2010 No. of Sites/Units
Campgrounds		
Sunnyside / Camp 4	38	37
Muir Tree	20	0
Pines Campgrounds[a]	438	438
Upper and Lower River	376	0
Total	872	475
Lodging		
The Ahwahnee	121	123
Housekeeping Camp	300	266
Curry Village	626	443
Yosemite Lodge	481	245
Total	1,528	1,077
Day Use Parking	2,513	1,565[b]

NOTES:

[a] Includes North, Upper, and Lower Pines Campgrounds in Yosemite Valley as well as the Backpackers and Group Campgrounds in the Yosemite wilderness.

[b] An additional 586 parking spots located at the Curry Village/Orchard parking lot were also available for either day or overnight use.

SOURCES: NPS 1980b, 2011b

conditions are available. However, the information in the 1980 *General Management Plan* is 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, and camping areas could accommodate 6 people per campsite (NPS 2009a). Based on these occupancy estimates, the Valley provided overnight accommodations for up to 12,108 people (NPS 2009a). Past occupancy data for the specific lodging and camping facilities in Yosemite Valley are not available. However, aggregate overnight stay information for the concessioner lodging facilities and camping within Yosemite is shown in **Figure 2.2-3**.

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. The 1980 *General Management Plan* identified 2,513 day parking spaces in the Valley (Table 2.2-9). 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 spaces at the time of designation (BRW, Inc. 1994).

The 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 park visitation. 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).

Current Conditions

- **Recreational experience.** 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. In 2010, Yosemite Valley received approximately 3.56 million visitors (89% of total park visitation). A survey conducted in 2005 recorded visitor perceptions of crowding and, in the absence of facility or visitor population changes,[12] 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.

- **Setting attributes.** Section 2.4, Scenery, 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. The natural forces of the river that cause periodic Valley flooding may also influence the Recreational ORVs by affecting visitor access and facilities. Several riverside camping facilities were destroyed and subsequently removed following the 1997 flood.

- **Recreational activity participation.** The most common visitor activities in the Yosemite Valley segment include scenic viewing, scenic driving, day hiking, wildlife viewing, picnicking, creative arts, camping, ranger-led programs, bicycling, floating, nature study, and rock climbing. Both day-use and overnight camping are available in this river segment. Additional details regarding visitor activities and use levels are provided in the following section.

- **Facilities, services, and amenities.** The recreational experience and opportunities are influenced by such factors as parking capacity, transportation services, lodging facilities, roads and trails, raft rental, ranger-led programs, and interpretive displays. 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.

[12] Restoration and improvement of the Yosemite Falls viewing site was completed in April 2005.

Recreational Experience

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 a 1998 a visitor survey, 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 follow-up survey confirmed these findings (Manning et al. 1999).

More recent studies offer a different perspective on visitor perceptions of crowding. White and Aquino conducted a summer-season study that focused on perceptions of crowding (White et al. 2008). 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." In 2007, Lawson and others initiated research that integrated information on traffic levels, visitor-use levels, and visitor preferences for use levels. Lawson conducted visitor surveys and counts at attraction sites in the Valley (Lawson et al. 2009).The study 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 to Bridalveil Fall, the base of and trail to Yosemite Falls, and the trail to Vernal Fall. Multiple simulations predicted visitor-use levels at attraction sites to determine how often visitor preferences for People Per View (PPV) as well as for Persons At One Time (PAOT) within a 50-meter stretch of trail would be exceeded. The PPV and PAOT are both measures of crowding.

Many of the simulations indicated visitor preferences for PPV or PAOT were occasionally exceeded. Simulation results also showed that PPV on trails and PAOT at attraction sites were exceeded more than 10% of the time at all study sites, except for PPV on the trails to Mirror Lake and Yosemite Falls (neither of which are in the Wild and Scenic River corridor). The preference standard for PPV on the trail to Vernal Fall was exceeded in about one-quarter of the simulations. The preference standards for PPV on the trail to Bridalveil Fall and PAOT 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 along 50-meter stretches of the Merced River from Stoneman Bridge to Yellow Pine Picnic Area, the only reach where floating is allowed (**Table 2.2-10**). 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. The most frequently observed activity was floating (**Table 2.2-11**).

TABLE 2.2-10: PAOT LEVELS 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			

TABLE 2.2-11: ACTIVITIES OBSERVED DURING PAOT COUNTS, 2005

Day	Visitors	Float	Fish	Swim	Hike	Other	Total
Weekend	2,219	1,374	-	296	631	965	3266
Weekday	2,041	1,921	468	368	447	842	4066
Holiday	540	52	-	11	67	49	179
Total	**4,800**	**3,347**	**468**	**675**	**1,145**	**1,856**	**7,491**

NOTE: Fishing use was only counted on weekdays.

SOURCES: NPS 2005a, 2006

Summary of Recreation Experiences

Both the river and attraction sites are focal points for visitor use and provide opportunities to experience Valley-related ORVs. Perceptions of crowding have not been measured as part of any river-use studies. However, visitor perceptions of crowding were measured as part of past surveys of Yosemite visitors (Manning 1998, 1999; White et al. 2008). Manning's results indicated that some visitors experienced crowding, although study results from White et al. found that most visitors did not perceive crowding to be a big problem (White et al. 2008). In addition to these studies, Lawson et al. evaluated crowding and its relationship to inbound vehicle traffic and the number of people at attraction sites (Lawson et al. 2009). Under some conditions, visitor preferences for PPV and PAOT were not being met.

It should be noted, however, that White et al. did not survey visitors at the same attraction sites evaluated by the other studies (Manning 1998,1999; Lawson et al. 2009). Also, questions about crowding were phrased differently by White et al. compared to the other studies. Finally, White et al.'s visitor survey questions on crowding focused heavily on traffic conditions and travel - only one question dealt with perceptions of crowding at scenic overlooks.

Consequently, the survey findings of the above-referenced surveys are not directly comparable given that they were conducted at different points in time, focused on different locations, and asked different questions. A reasonable generalization to draw from these studies is that perceptions of crowding vary, depending on where visitors are surveyed and when they visited the Valley. Under certain conditions, some visitors perceive crowding, a premise supported by the simulation research conducted by Lawson et al. (Lawson et al. 2009).

The 1992 Gramann study was used as a proxy to evaluate the visitor experience in 1987. The study is not comparable to the more recent studies referenced above. As a result, it is not known whether visitor opportunities to experience solitude and contemplation have changed since the time of Wild and Scenic River designation.

Setting Attributes

A number of popular activities in the Valley are related to the river, as briefly described below.

Art and photography. About one-fourth (26%) of visitors reported they participated in creative arts. 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 (NPS 2011d). 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. Other facilities in the Valley feature art displays. 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.

Biking. Of the survey respondents, 12% reported engaging in bicycling (NPS 2011d). Over 12 miles of paved bike paths are available in Yosemite Valley. In addition, bicyclists can ride on regular roads. However, the park does not allow off-trail riding, mountain biking, and use of motorized bicycles or scooters on bike paths. Bicycles are available for rent in Yosemite Valley in Curry Village (NPS 2011d).

Day hiking. Slightly more than half of survey respondents (54%) reported participating in day hiking. There are about 50 miles of day hiking trails in the Valley (see **Table 2.2-8**), ranging from short, easy hikes to a very strenuous hike to Glacier Point with an elevation gain of over 3,000 feet.

Picnicking. One-third of survey respondents reported they participated in picnicking. There are picnic areas at El Capitan Bridge, in El Capitan Meadow, at Sentinel Beach, at the trailhead for Four Mile Trail, and in Yosemite Village. Curry Village also has outdoor eating facilities.

Ranger-led programs. Of the survey respondents, 15% indicated they participated in ranger-led programs. Programs are offered daily in the Valley and include activities such as: camera walks and talks on cultural resources, ecology, and geology. Program times and locations can be found on the Events and Programs page of the Yosemite National Park website (NPS 2011d).

Rock climbing. Yosemite Valley features world-renowned climbing. Of survey respondents, 6% indicated they participated in rock climbing, and estimates of annual use range from 25,000 to 50,000 climber days (NPS 2011d). 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. Camping is prohibited at the base of many of the big walls, such as El Capitan and Washington Column. However, camping is allowed at the base of Half Dome with a wilderness permit.

Due in part to the popularity of climbing and the numerous routes, there are environmental impacts associated with climbing. To minimize impacts, climbers are prohibited from using mechanical drills to

establish new bolts, and are discouraged from establishing new routes. Climbers are expected to pack in and pack out their own waste. There are also seasonal climbing restrictions for habitat protection.

Climbing is a high-risk activity. There are more than 100 climbing accidents in Yosemite each year; of these, 15 to 25 parties require rescue. The Yosemite Medical Clinic is equipped to handle climbing injuries.

Wildlife viewing. About 40% of survey respondents indicated they participate in bird watching. 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. The most regularly seen resident birds are Steller's jay, American robin, acorn woodpecker, common raven, and mountain chickadee. Less commonly observed birds include red-winged blackbird (most often seen in wet meadows) and western tanager. American dippers can be observed near rivers and streams. Some of the more sought-after birds to see in Yosemite are the great gray owl, spotted owl, peregrine falcon, pileated woodpecker, and northern goshawk (NPS 2011d).

Summary of Setting Attributes

The most popular river related activities by Yosemite Valley visitors include art and photography, biking, day hiking, picnicking, attending ranger led programs, rock climbing and wildlife viewing.

Recreational Activity Participation

General visitation and use. Figure 2.2-4 shows parkwide visitation and overnight use levels between 1987 and 2010. Figure 2.2-5 shows the camping and lodging overnight visitation by major park location (specifically including Yosemite Valley camping use between 1988 and 2010). In 2010, parkwide visitation at Yosemite was approximately 3.9 million visitors, and parkwide total overnight stays were reported to be nearly 1.72 million.

As discussed previously, Yosemite Valley entrance data is not collected by the NPS and therefore exact counts of Valley visitation are not available and they do not distinguish between day users and overnight visitors. The most recent survey estimated that the average length of stay for Yosemite visitors was 2.4 days (Blotkamp et al. 2010);[13] applied to the 2010 overnight stay levels, this estimate suggests that approximately 717,000 overnight visitors stayed in Yosemite in 2010. This number of overnight park visitors also indicates that there were approximately 3.18 million day-use visitors to Yosemite Park, which is equivalent to approximately 81.6% of total park visitation.

According to the most recent visitor survey, Yosemite Valley was the most common destination for Yosemite visitors, and 70% of the visitors surveyed reported visiting the Valley during their trip

[13] Strictly speaking, the length of stay estimate is for summer visitation. A winter visitor survey in 2008 determined the average length of stay was only 1.3 days (Le et al. 2008). However, given that park winter use is substantially less than summer use, use of the longer length of stay estimate may nonetheless provide a reasonable and more conservative estimate of the number of park overnight visitors in 2010.

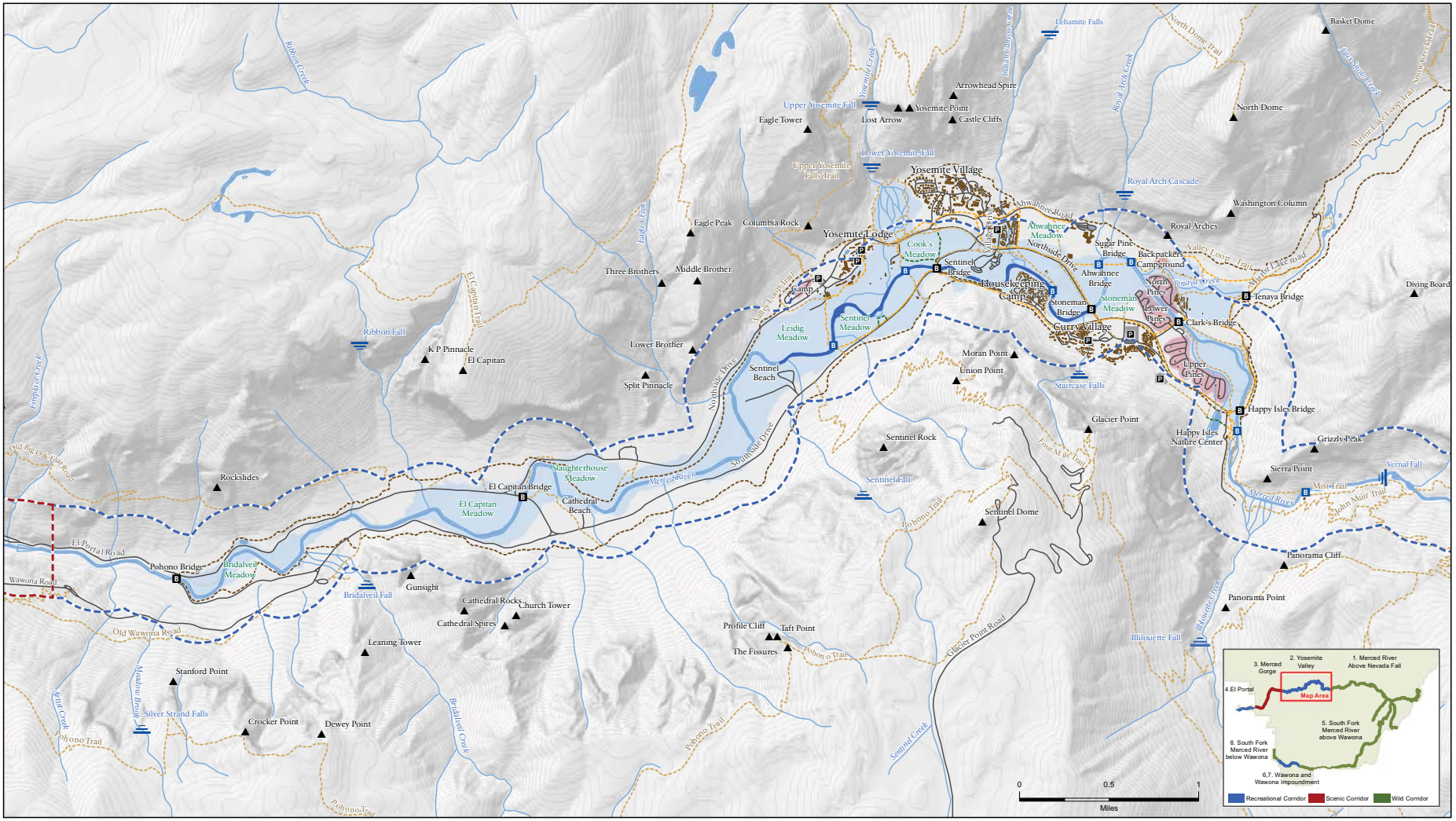


Figure 2.2-5

Recreational ORV - River Segment 2. Yosemite Valley

Recreational WSR Corridor

Recreational WSR Corridor Classification
Scenic WSR Corridor Classification
Building
Campground
100 Year Flood Boundary
Rafting Permitted

Road
Stream/River
Yosemite Valley Loop Trail
Bike path
Boardwalk
Trail

Parking
Landmark
Road bridge
Footbridge
Waterfall

National Park Service U.S. Department of the Interior

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Projection: North American Datum 1983, UTM Zone 10

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(Blotkamp et al. 2010).[14] However, the actual proportion of Yosemite Valley visitors may be higher, since other recent surveys indicate that 85% of visitors likely travel to Yosemite Valley (White et al. 2008).

Partly as a result of the decrease in the overnight accommodations within the Valley, the proportion of day-use visitation within the Valley has increased. Based on a 2007 traffic analysis, the daily number of vehicles entering the Valley for day and overnight use were 3,174 and 2,969 vehicles, respectively (NPS 2007a). In contrast, Van Wagtendonk found that for the park as a whole, only 25% were day users in 1980 (Van Wagtendonk 1980).

Table 2.2-12 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.

TABLE 2.2-12: 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

[14] 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).

Attraction sites. Pettebone et al. (2008) measured visitor use at attraction sites in the Valley. Study results show the magnitude in use at the attraction sites. **Table 2.2-12** shows the average daily visitor arrivals as measured for the peak season months in 2007 at Bridalveil, Vernal, and Yosemite Falls.[15] Both Bridalveil 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.

TABLE 2.2-12: 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 counts 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

These recreational opportunities are available for visitors of all ages and ability levels. The ages of participants ranged from 1 to 98 years, with about one-fifth comprised of children and youth and 7% comprised of visitors 66 years or older. The Mist Trail allows visitors to see, hear, and feel the river and exemplifies a recreation-related ORV for this river segment. This type of recreational opportunity is rare on other rivers in the Sierra Nevada. Another example is floating and swimming along a flat reach of river in a mountainous, meadow setting, which is also unique in the Sierra Nevada. Auto-touring, sightseeing, and floating are discussed below.

Table 2.2-12 shows the average site visitation over the entire 2007 period. Yosemite Falls is the most popular of the key attraction sites, with an annual average of 3,274 visitors per day in 2007. Average annual visitation to Bridalveil and Vernal Falls was 2,415 and 1,911, respectively.

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.

[15] Yosemite Falls is located outside the Merced River corridor. While its location 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.

Floating. Floating on the Merced River is permitted between Stoneman Bridge and Sentinel Beach Picnic Area. The concessioner began renting floatation devices for this three-mile segment of the river in 1982. Initially the concessioner rented up to 50 rafts a day. This number grew to 200 rafts a day in the 1990s, with the requirement that no more than 100 were in use on the river at one time.

Floaters were counted from Stoneman Bridge and from the Yellow Pine Picnic Area in May and June of 2007. An average of 205 floaters per day was counted at Stoneman Bridge and 193 floaters at Yellow Pine Picnic Area (**Table 2.2-13**). At Stoneman Bridge, the number of floaters counted on weekdays was 226, compared to 177 for weekend days. At Yellow Pine Picnic Area, the average number of floaters counted on weekdays was 219 and on weekend days was 158 (Pettebone et al. 2008). Fridays were counted as weekdays, and during the survey one of the Fridays occurred over Memorial Day long weekend.

TABLE 2.2-13: FLOATING COUNTS ON THE MERCED RIVER, 2007

Time Period	Stoneman Bridge	Yellow Pine Picnic Area
Weekdays	226	219
Weekend Days	177	158
SOURCE: NPS 2008a		

Auto-touring and sightseeing. As shown above in Table 2.2-12, auto-touring and sightseeing are the two most common visitor activities in Yosemite Valley. Auto-touring in the Valley provides opportunities to visit several "attraction sites" during in a single trip. Key attraction sites include: Bridalveil, Vernal, and Yosemite Falls (although not in the one-quarter-mile river corridor, these features are river-dependent; discussing it is relevant due to their visibility from the rest of the river corridor. Additionally, the access trail and parking areas are in the river corridor). These attraction sites are particularly popular in spring and early summer when the snowmelt and high flows in the river produce awe-inspiring waterfalls. As flows diminish and summer advances, these sites are less heavily visited. For example, the average daily number of people at the Vernal Fall trailhead (Table 2.2-12) was at its highest level (2,377) people for the Memorial Day weekend, then declined for the remaining summer months.

Summary for Recreational Activity Participation

Viewing scenery is by far the most popular activity for park visitors. Other popular activities include day hiking, 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 river 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. Visitors seeking opportunities for solitude and contemplation can avoid the highest use periods at attraction sites by visiting in early morning or early

evening. Another popular activity is floating the Merced River. Like attraction sites, use tends to be low in the early morning and evening, peaking in the afternoon. However, unlike the attraction sites, floating was higher on weekdays than on weekends, but this observation may be a result of the sampling method employed. Overall, study results show that use is highly variable during the morning, afternoon, and evening periods as well as between weekdays and weekends. Visitors with flexibility in their schedules can avoid the peak-use periods that generally occur at attraction sites in the afternoons, and the higher use levels that occur on weekends.

Since no data are available to characterize use by attraction site at the time of the Merced Wild and Scenic River designation, it is not known whether use levels at these sites have changed since that time.

Facilities, Services, and Amenities

Overnight accommodations. In 2010, 16% of the survey respondents reported camping in a developed campground. There are currently 583 campsites located at four campgrounds (see Figure 2.2-6) 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. The number of overnight accommodations was greatly reduced following the 1997 flood and the 2008 rockfall event. In the 1997 flood, 353 campsites and 262 lodging units were lost. The 2008 rockfall event eliminated 236 of the Curry Village cabins (Bacon 2010) (Figure 2.2-7).

Parking. An estimated 3,650 parking spaces are available for visitors in Yosemite Valley. Approximately 1,000 spaces are in day-use parking lots, another 750 spaces are estimated along roadways, and the remaining 1,900 spaces are associated with overnight accommodations. (NPS 2009a).

Parking availability serves as a measure of overall traffic congestion in the Valley and therefore may indicate the extent that Merced River's Recreational Outstandingly Remarkable Values are affected by vehicular use and visitation.

From 2005 through 2007, NPS rangers recorded the number of vehicles in the Camp 6 day-use lots. In 2005, rangers reported that the Camp 6 lot was filled to capacity and alternate traffic measures were implemented on 90 days, with 51 of the closures occurring between June and August (NPS 2005). Table 2.2-14 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 times (NPS 2006) and to 23 times in 2007 (NPS 2007b). Closures occurred between Memorial Day and Labor Day holidays and typically the lot reached a capacity of approximately 800 vehicles before it was closed. The lot closed twice in a single day on two occasions in 2007. The month of July saw the highest number of lot closures at 10. On average, the lot was closed for 2 hours, 24 minutes on each occasion, and the average number of vehicles on the ground (VOG)[16] at the time of the closure was approximately 777.

[16] "Vehicles on the ground" (VOG) is the number of vehicles located within the parking as counted by park staff at the time of the parking lot closure.

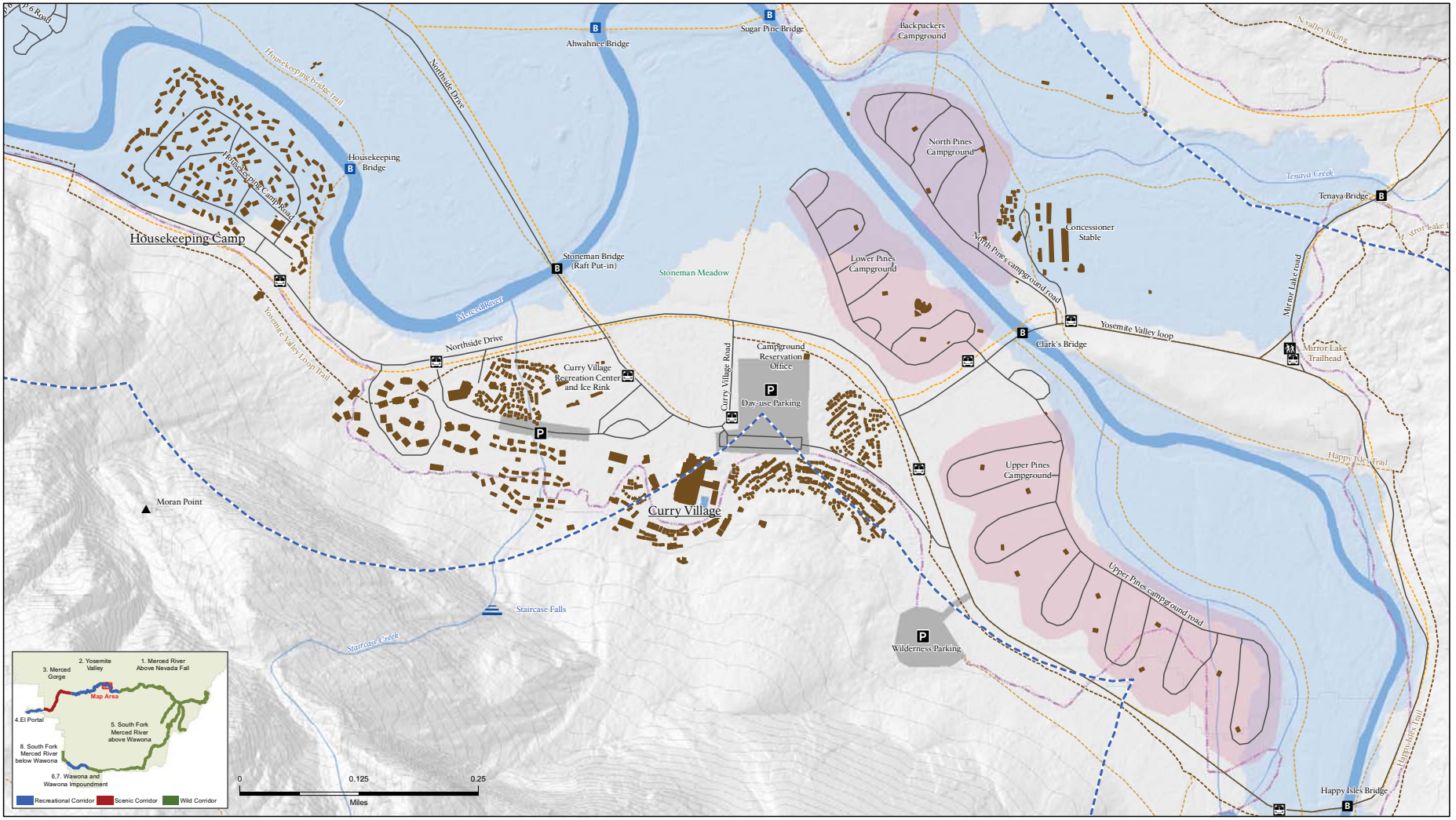

Figure 2.2-6
Recreational ORV - River Segment 2. Yosemite Valley
Curry Village, Pines Campgrounds, and Housekeeping Camp
Recreational WSR Corridor

Recreational WSR Corridor Classification
Building
100 Year Flood Boundary
Base of Talus
Campground
Parking Lot
Landmark
Valley Shuttle Stop
Trailhead
Road bridge
Footbridge
Waterfall
Road
Stream/River
Yosemite Valley Loop Trail
Bike path
Trail

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TABLE 2.2-14: 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			

Parking availability is an indicator of overall traffic congestion in Yosemite Valley and therefore serves as an early warning sign suggesting the extent to which the Merced River's ORVs are affected by vehicle use. **Figure 2.8-8** shows the time and duration of all 23 closures recorded in 2007. Although the day-use parking area closed 23 times during the summer of 2007, this figure represents a decrease from the 28 closures recorded in 2006. 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). The closures occurred between the months of May and October, between the Memorial Day and Labor Day holidays. On most occasions, the lot reached a capacity of approximately 800 vehicles before it was closed.

Summary for Facilities, Services, and Amenities

Since 1987, the number of campsites and lodging units available in the Valley has decreased. More than 350 camping units were lost from the Upper and Lower Pines Campgrounds as a result of the 1997 flood. A total of 498 lodging units have been lost due to the combined effects of the 1997 flood and the 2008 rockfall. The number of day-use parking spots has decreased since 1987.

Between 2005 and 2007, park staff recorded the number day-use parking lot closures. Over that period, the number of closures fell from 51 to 23 in 2007. The closures typically lasted two to three hours and coincided with peak-use periods at attraction sites, generally between 12:00 and 3:30 p.m.

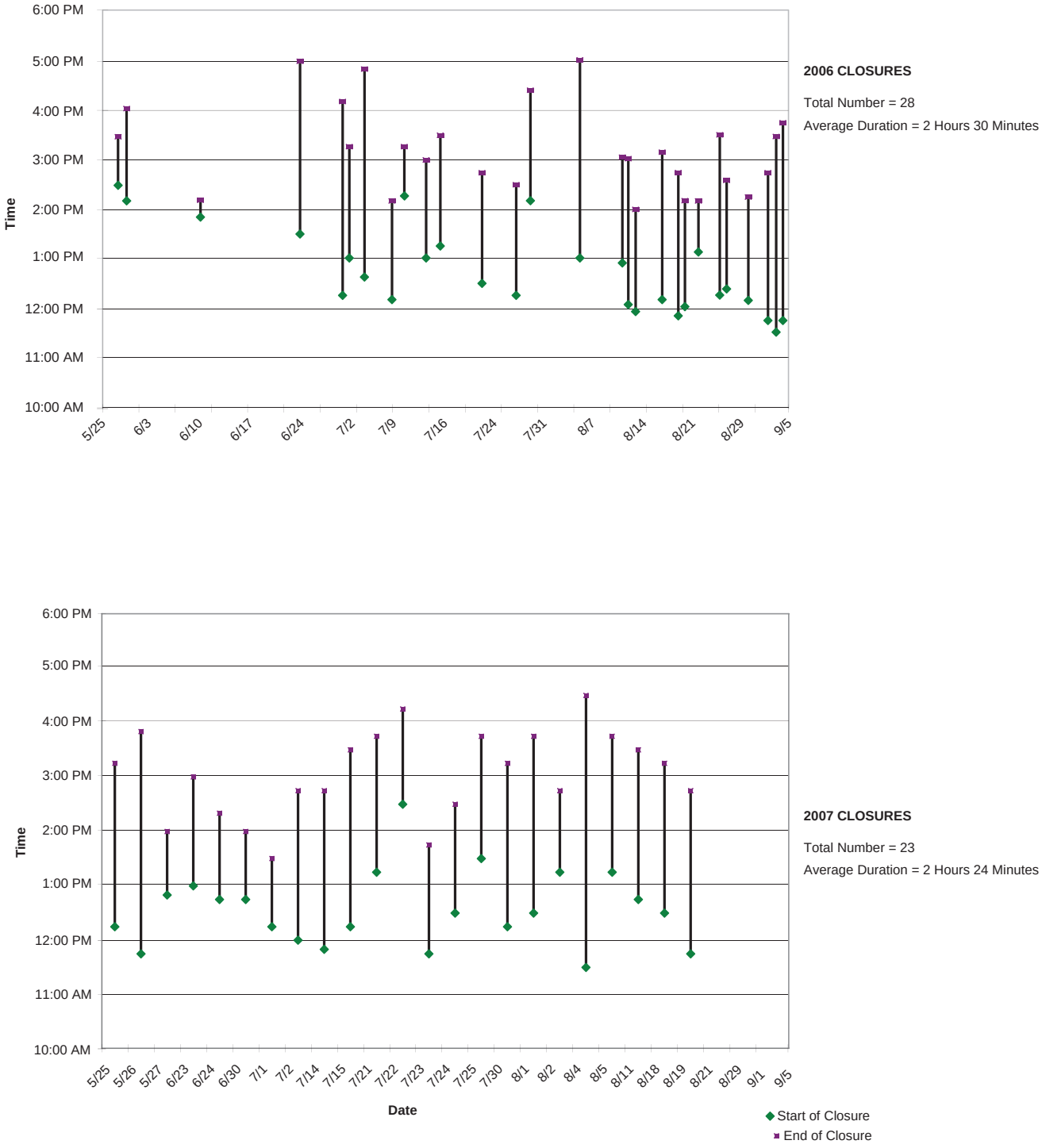
Since the 1987 designation, the number of available day-use and overnight parking spots in the Valley has decreased. However, the most recent transportation surveys conducted by White et al. (2008), found that most visitors did not report problems finding parking. Due to a lack of comparability between White's study and the Gramann study regarding the adequacy of parking in 1992, it is not known whether visitor perceptions of parking issues have changed since the time of designation.

Management Considerations

Management considerations in Segment 2 pertain predominantly to maintaining the recreational opportunities and quality of visitor experiences while also ensuring adequate protection of park resources such as park visitation levels and use patterns change. Management considerations are particularly challenging at the major attraction sites and for certain recreational activities (e.g., floating

the river) and visitor amenities (e.g., overnight accommodations). Management considerations for the Yosemite Valley segment include:

- 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 the park's 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.
- Floating on the river may result in public safety concerns and use conflicts with other visitors' recreational experiences along the Merced River between Stoneman Bridge and Sentinel Beach Picnic Area.



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 2.2-7

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

2.2.6 River Segment 3: Merced Gorge

In the Merced Gorge segment, the Recreational ORV is described in Section 2.2.1. In summary, the segment provides a relaxed, relatively undeveloped setting for river-related activities (**Figure 2.2-8**).

Condition at the Time of 1987 Designation

- **Recreational experience.** The user experience in this river segment, as described in Section 2.2.1, has been characterized by opportunities to enjoy the river and river-related activities in relative solitude. Although the road parallels the river for the entire length of this segment, there were few other human-made and managed features at the time of designation. Visitors had easy access to the river but experienced few encounters with other users compared to the number of encounters in some other river segments.
- **Setting attributes.** Section 2.4, Scenery, describes the visual qualities that influence the Recreational ORVs, which consisted of those features that affect the natural setting. Other river attributes included high-quality aquatic habitat, which provided excellent opportunities for fishing. In addition, this river segment contained a number of pools and beaches that were often frequented for swimming and relaxing.
- **Recreational activity participation.** The most common visitor activities in this segment at the time of designation included swimming, relaxing, picnicking, fishing, photography, and sightseeing. The river was typically accessed by car, and small parking areas were located at the Cascades Picnic Area, Pohono trailhead, and roadside turnouts.
- **Facilities, services, and amenities.** Other features that influenced the user experience included access to roadways and parking turnouts.

ORV Condition Measures

There are no readily available studies on recreational use in the Merced Gorge segment at the time of the 1987 designation. Due to a lack of facilities and development (NPS 2009a), recreational use in this Segment 3 is a small proportion of total recreational use in all river segments. Changes in the level of use in the Merced Gorge are best reflected in the changes in annual visitation for the park as a whole. In 1987, overall annual park visitation was 84% of 2009 annual park visitation (NPS 2011c).

Current Condition

- **Recreational experience.** The user experience, as described in Section 2.2.1, is characterized by opportunities to enjoy the river and river-related activities in relative solitude. A 2006 study of the Cascades Picnic Area showed that visitor use was below the parking and picnic table capacity, even during peak hours. Although the road parallels this river segment for it entire length, there are relatively few other human-made and managed features. Users have easy access to the river but experience few encounters with other individuals compared to the number of encounter in some river segments. No data are available to quantify use of the river segment, other than at the Cascades Picnic Area.

- **Setting attributes.** Section 2.4, Scenery, describes the visual qualities that influence the Recreational ORVs. Other river attributes include high-quality aquatic habitat, which provides

excellent opportunities for fishing. In addition, this river segment contains a number of pools and beaches that are often frequented by visitors for swimming and relaxing.

- **Recreational activity participation.** The most common visitor activities in Segment 3 are swimming, relaxing, picnicking, fishing, photography, and sightseeing. The river is typically accessed by car, and small parking areas are located at the Cascades Picnic Area, Pohono trailhead, and roadside turnouts.

- **Facilities, services, and amenities.** Other features that continue to influence the user experience include access to roadways and parking turnouts. Additional detail regarding parking capacity is provided below.

ORV Condition Measures

One recent NPS study provides information on recreational use in the Merced Gorge segment. The 2006 Visitor Experience and Resource Protection report (NPS 2006) included PAOT counts for the Cascades Picnic Area, which serves as a proxy for visitor use in this river segment as a whole. During the peak time of day (i.e., 12:00 to 1:00 p.m.), the average PAOT was 29, and the peak use during this time was 73. This site has 22 parking spaces and seven picnic tables, which can accommodate more than 73 PAOT; therefore, site use rarely exceeds capacity. As a result, the current condition related to opportunities for solitude and contemplation in the Merced Gorge segment seems to be unaffected since the time of designation.

Management Considerations

There are no recreation-related management considerations for Segment 3.

2.2.7 River Segment 4: El Portal

Section 2.2.1 describes the Recreational ORVs in the El Portal segment. In summary, the segment provides a primarily natural setting for visitors to easily connect with the river through a variety of active, creative, and contemplative river-related recreational pursuits. Local residents and visitors repeatedly visit road-accessible pools and beaches along this river segment, contributing to strong place attachment (Figure 2.2-9).

Condition at the Time of 1987 designation

- **Recreational experience.** The user experience in the El Portal segment, as described in Section 2.2.1, has been characterized by opportunities to enjoy the river and river-related activities in relative solitude. Swimming and relaxing along the river were common, providing respite from the summer heat. Similarly, fishing was popular along this segment, with various holes treasured for their combination of scenery, fishing success, and solitude.

- **Setting attributes.** Section 2.4, Scenery, describes the visual qualities that influence the Recreational ORVs. The El Portal segment has provided the opportunity for visitors to fly-fish for native trout fish. The river habitat along this segment produces fish rarely found elsewhere in the Sierra Nevada; the size and concentration of fish in Segment 4 have been particularly

unique. Other river-related attributes at the time of designation included pools and beaches frequented by recreationists for swimming and relaxing.

- **Recreational activity participation.** The most common visitor activities in this river segment at the time of designation included swimming, relaxing, picnicking, fishing, and sightseeing. The river was typically accessed by car using small parking areas at roadside turnouts.

- **Facilities, services, and amenities.** Other features that influenced the user experience included access to roadways and parking turnouts.

ORV Condition Measures

The 1980 *General Management Plan* indicates that day use in Segment 4 was 765 visitors per day (NPS 1980b). This level of visitation is low compared to that in other river segments. There are no studies or other evidence to indicate this low level of use has negatively affected Recreational ORVs in this segment.

Current Condition

- **Recreational experience.** The user experience in the El Portal segment, as described in Section 2.2.1, is characterized by opportunities to enjoy the river and river-related activities in relative solitude. There are few human-made and managed features, and visitors have easy access to the river. While this segment is in a more populated area, users can still experience relatively few encounters with other individuals compared to encounters in some other segments.

- **Setting attributes.** Section 2.4, Scenery, describes the visual qualities that influence the Recreational ORVs. Other river attributes include high-quality aquatic habitat, which provides excellent opportunities for fishing. In addition, the segment contains a number of pools and beaches that are frequented by visitors for swimming and relaxing.

- **Recreational activity participation.** The most common visitor activities in this segment include swimming, relaxing, picnicking, fishing, and sightseeing. The river is typically accessed by car using small parking areas and roadside turnouts.

- **Facilities, services, and amenities.** Other features that influenced the user experience include access to roadways and parking turnouts. The El Portal Market sells picnic supplies to visitors in this river segment.

ORV Condition Measures

A recent inventory indicated there are 15 day-use parking spots in the El Portal segment (NPS 2009a). Changes in recreational use in this segment are best represented by changes in overall park visitation (NPS 2011c). Based on annual park visitation (NPS 2010a), use at the time of designation was 84% of current levels. This figure is based on visitation figures (NPS 2011c) showing that overall annual park visitation in 1987 was 84% of 2009 annual park visitation. Based on the lack of current or recently completed studies and the relatively low use levels in comparison to other river segments, the recreational ORVs for this segment have not been affected since the time of designation.

Management Considerations

There are no recreation-related management considerations for Segment 4.

2.2.8 River Segment 7: Wawona

Along the Wawona segment of the Merced River's South Fork, visitors are able to easily access the river at several pools and beaches where they can swim, relax, and fish.

Condition at the Time of 1987 Designation

At the time of designation, the day-use level for Wawona was 1,689 visitors and overnight visitation was 1,622 visitors, based on information provided in the *General Management Plan* (NPS 1980b). These visitor-use levels serve as a proxy for use levels at Wawona at the time of designation. Total overnight stays in the Wawona Campground were 175,982 in 1987 (NPS 2011a). No facility or parking information and no crowding-related studies are available for Wawona for the time period coinciding with the 1987 designation.

Current Condition

- **Recreational experience.** The user experience for the Wawona segment, as described in Section 2.2.1, is characterized by opportunities to enjoy the river and river-related activities in relative solitude. There are few human-made and managed features, and users have easy access to the river. While this segment is in a more populated area, visitors to this river segment can still experience relatively few encounters with other individuals compared with some other segments.

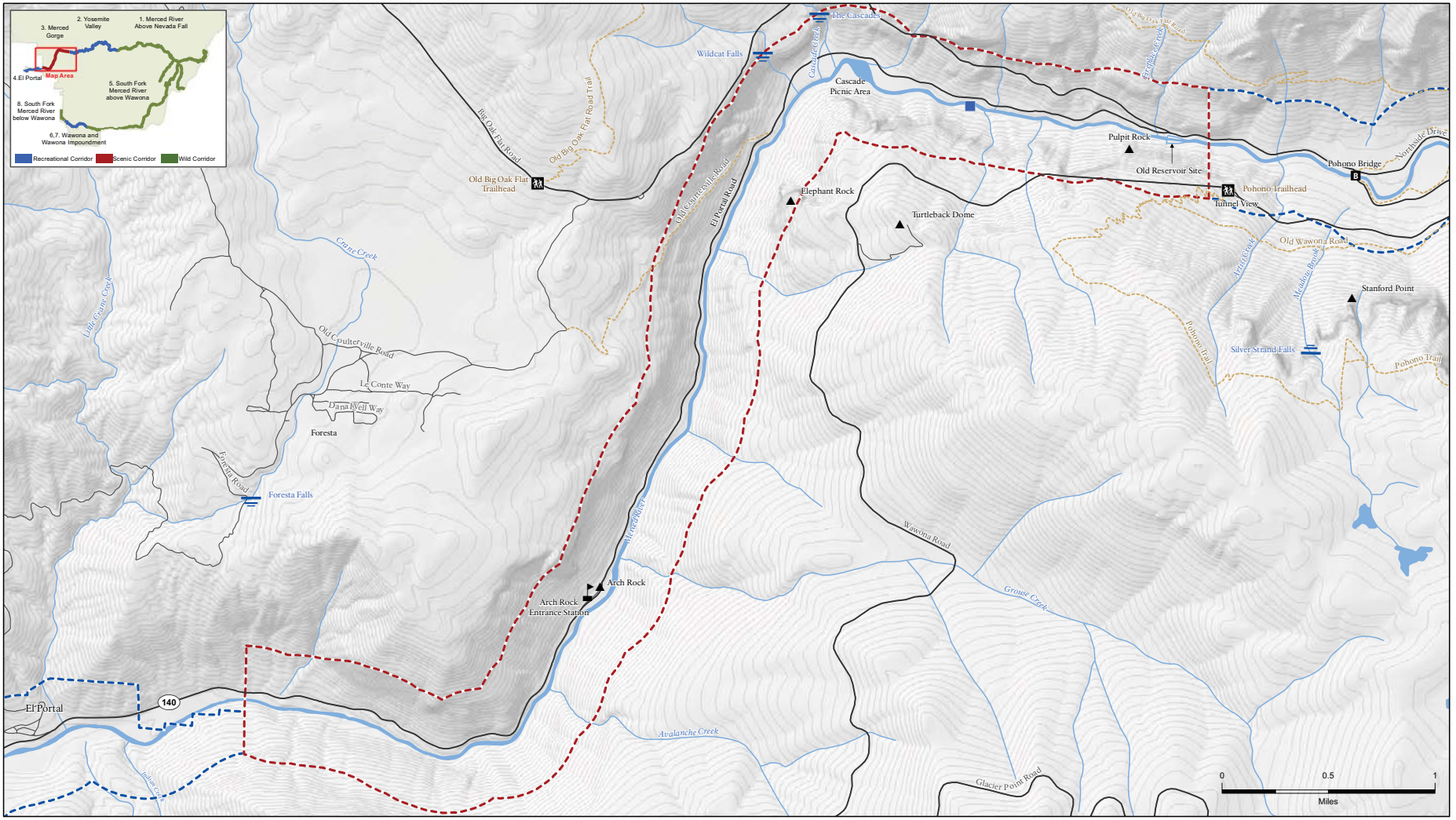


Figure 2.2-8
Recreational ORV - River Segment 3.
Merced Gorge
Scenic WSR Corridor

Scenic WSR Corridor Classification
Recreational WSR Corridor Classification
Trail
Road
Stream/River
Landmark
Trailhead
Cascades Power Plant
Waterfall

National Park Service U.S. Department of the Interior

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Projection:	North American Datum 1983, UTM Zone 10
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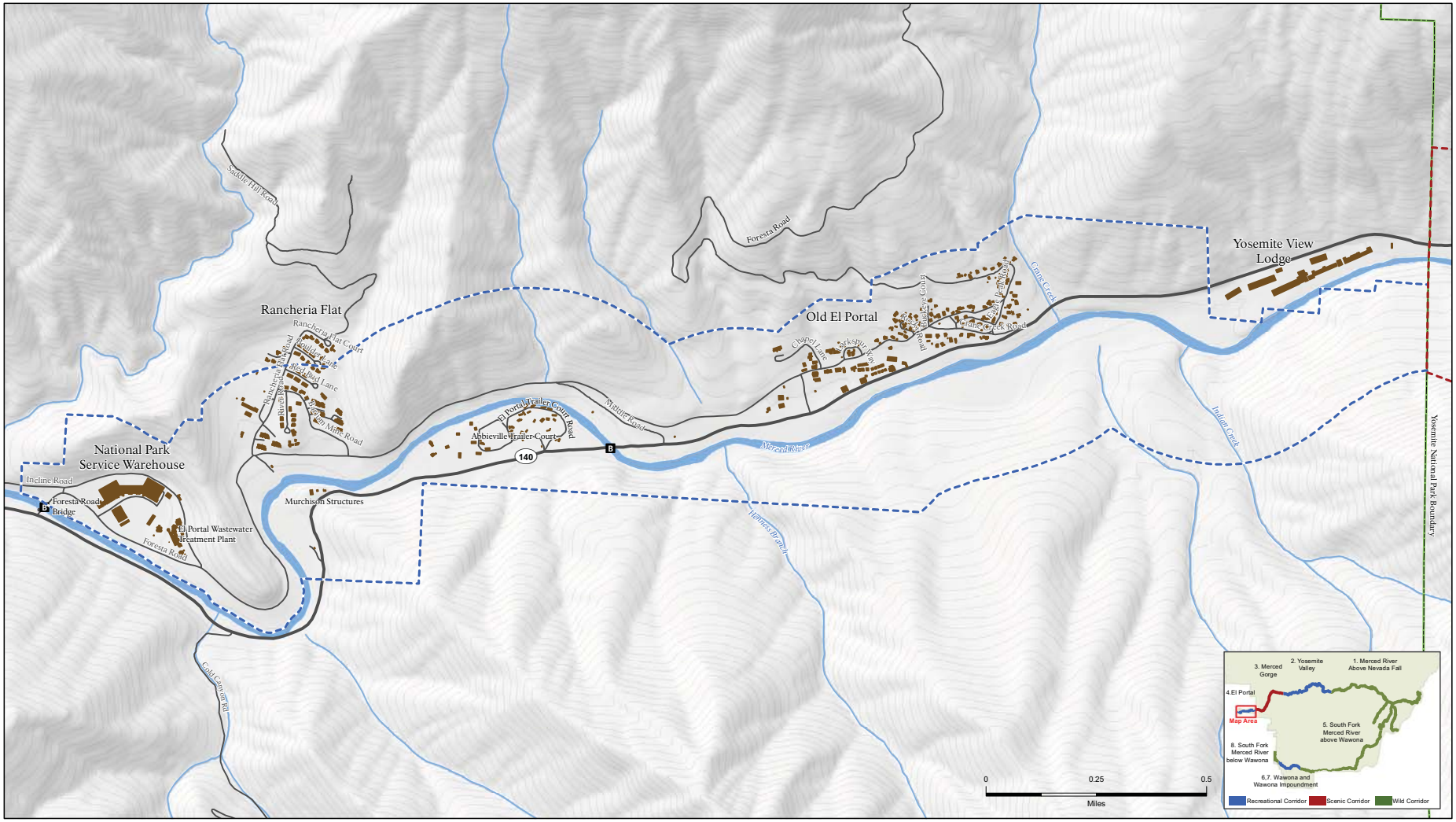

Figure 2.2-9
Recreational ORV- River Segment 4. El Portal
Recreational WSR Corridor

Recreational WSR Corridor Classification
Scenic WSR Corridor Classification
Building
Highway 140
Road
Stream/River
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: 1/5/11

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- **Setting attributes.** River attributes include high-quality aquatic habitat, which provides excellent opportunities for fishing. In addition, the segment contains a number of pools and beaches that are frequented by visitors for swimming and relaxing.

- **Recreational activity participation.** The most common visitor activities in this river segment include swimming, relaxing, picnicking, fishing, and sightseeing. The river is typically accessed by car using small parking areas and roadside turnouts.

- **Facilities, services, and amenities.** Other attributes influencing the user experience in this segment include the Wawona Hotel and access to roadways and parking turnouts.

ORV Condition Measures

Camping in the Wawona Campground (**Figure 2.2-10**) along the South Fork Merced River in Wawona allows visitors to be near the river overnight. The Wawona Campground has 98 campsites, and the Wawona Hotel has 104 hotel rooms, for a capacity of 869 people per night (NPS 2011b). Total capacity is based on the average party sizes for campsites and hotel rooms (six people per campsite, and a visitor capacity of 245 at the hotel). In 2010, the total overnight visitor use was 96,870, down from 175,982 in 1987 (NPS 2011a).

Facility and parking information for Wawona shows 196 parking spaces for overnight use at the Wawona Campground and an additional 514 parking spaces throughout Wawona, including day and overnight use (NPS 2011a). There are picnicking spots at the South Fork Picnic Area and the Wawona Store Picnic Area.

The Wawona segment currently experiences crowding associated with day use. Opportunities to participate in recreational activities that contribute to ORVs are more limited than they were in 1987.

Management Considerations

The list below summarizes the management considerations associated with the recreational ORV in River Segment 7:

- Traffic and congestion can affect the recreational experience in this segment. Finding day-use parking can be difficult during peak periods.

2.2.9 River Segments 5 and 8: South Fork Merced River Above and Below Wawona

Within the South Fork, the ORVs include opportunities for wilderness experiences including solitude, personal reflection, immersion in nature, independence, self-reliance, primitive travel, camping, exploration, and adventure. Activities that allow visitors to realize these opportunities include hiking and backpacking (Figure 2.2-11).

Condition at the Time of 1987 Designation

- **Recreational experience.** The user experience in Segments 5 and 8, as described in Section 2.2.1, has been characterized by opportunities for solitude, personal reflection, immersion in nature, independence, and self-reliance. Although no formal surveys documenting visitor experiences, perceptions of crowding, or encounter rates had been conducted at the time of Merced Wild and Scenic River designation, these segments were less frequently visited than other areas in the Yosemite wilderness. Users could expect few encounters with other hikers, either day users or overnight backpack campers.

- **Setting attributes.** Section 2.4, Scenery, describes the visual qualities that influence the Recreational ORVs. As described in Section 2.2.1, visitors in the springtime experienced the sight, sound, and power of the river's crashing waters.

- **Recreational activity participation.** The most common visitor activities in Segments 5 and 8 at the time of designation included hiking and backpacking. Both day-use and overnight camping were available in these river segments.

- **Facilities, services, and amenities.** The wilderness permit system, as described in Section 2.2.1, influenced user accessibility to these river segments prior to Wild and Scenic River designation.

ORV Condition Measures

There is little visitor information describing the visitor recreation patterns and recreational ORVs for Segments 5 and 8. These segments had few designated trails within the one-quarter-mile corridor on either side of the river. The trail to Moraine Meadow followed the South Fork for approximately two miles, and trails to the Breeze Lake and Chain Lakes areas crossed the South Fork. At the time of designation, access to Segment 5 above Wawona was provided by the Quartz Mountain trailhead as well as several trails south of the river within the Sierra National Forest. The earliest available information on wilderness use for Wawona is from 1998 (NPS 2010a). Wilderness data showed that the number of people obtaining wilderness permits at Wawona in 1998 was 2,171 people, for a total 5,841 nights. These figures represented about 6% of total Yosemite wilderness use in 1998.

Current Condition

- **Recreational experience**. Similar to 1987 conditions, the current recreational experience, as described in Section 2.2.1, has changed little since the river's designation as Wild and Scenic.

- **Setting attributes**. Section 2.4, Scenery, describes the visual qualities that influence the recreational experience. In general, the scenic qualities and river character along these river segments are the same as existed in 1987.

- **Recreational activity participation**. Similar to conditions in 1987, the most common visitor activities in these river segments are hiking and backpacking. The areas continue to see both day and overnight use.

- **Facilities, services, and amenities**. No other significant attributes influencing user experiences were identified for these segments.

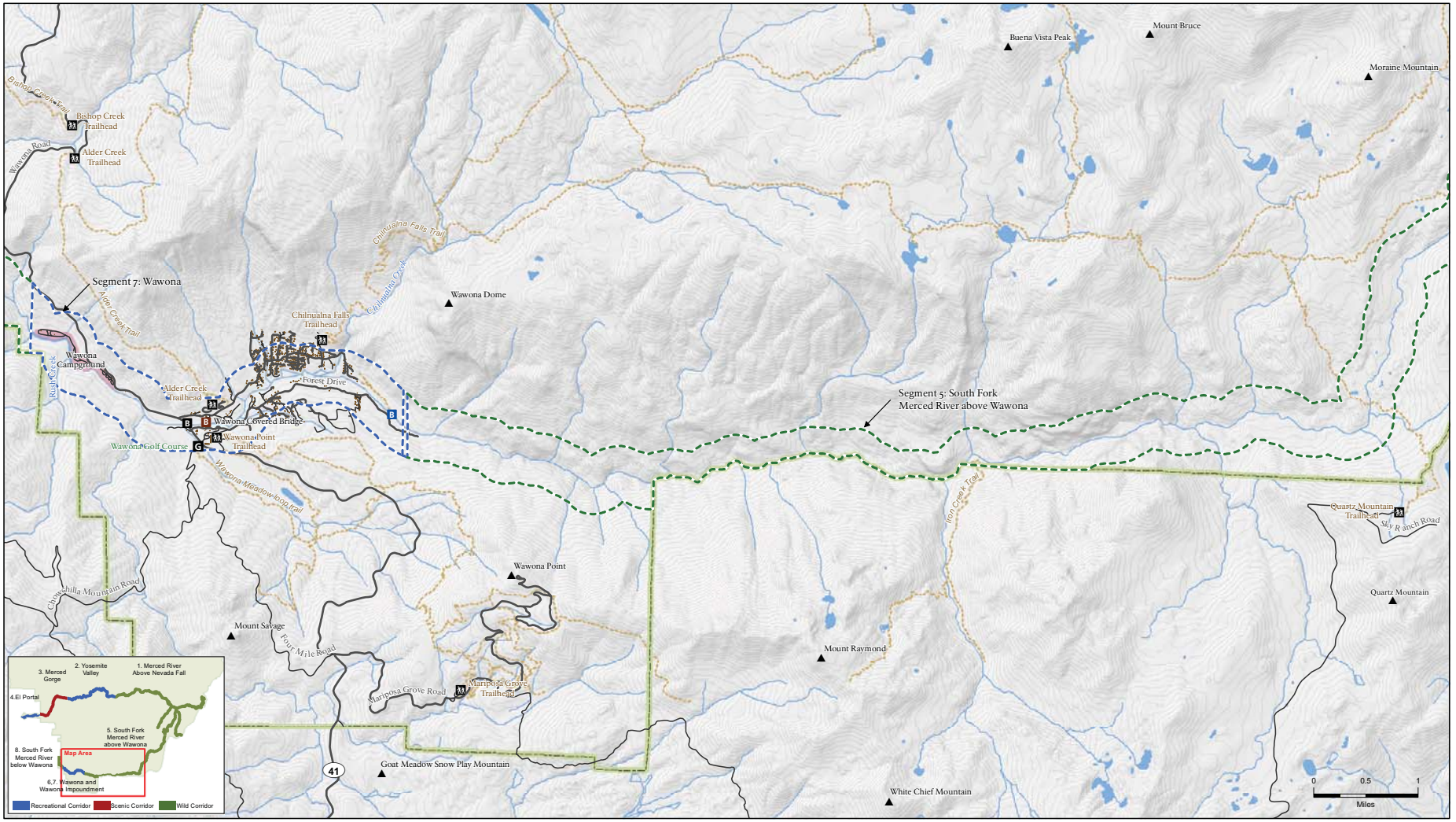

Figure 2.2-10
Recreational ORV - River Segments 5 and 7.
South Fork Merced River Above Wawona and Wawona
Wild and Recreational WSR Corridors

Recreational WSR Corridor Classification
Yosemite National Park Boundary
Building
Campground
Road bridge
Footbridge
Historic bridge
Golfcourse
Trailhead
Road
Stream/River
Trail

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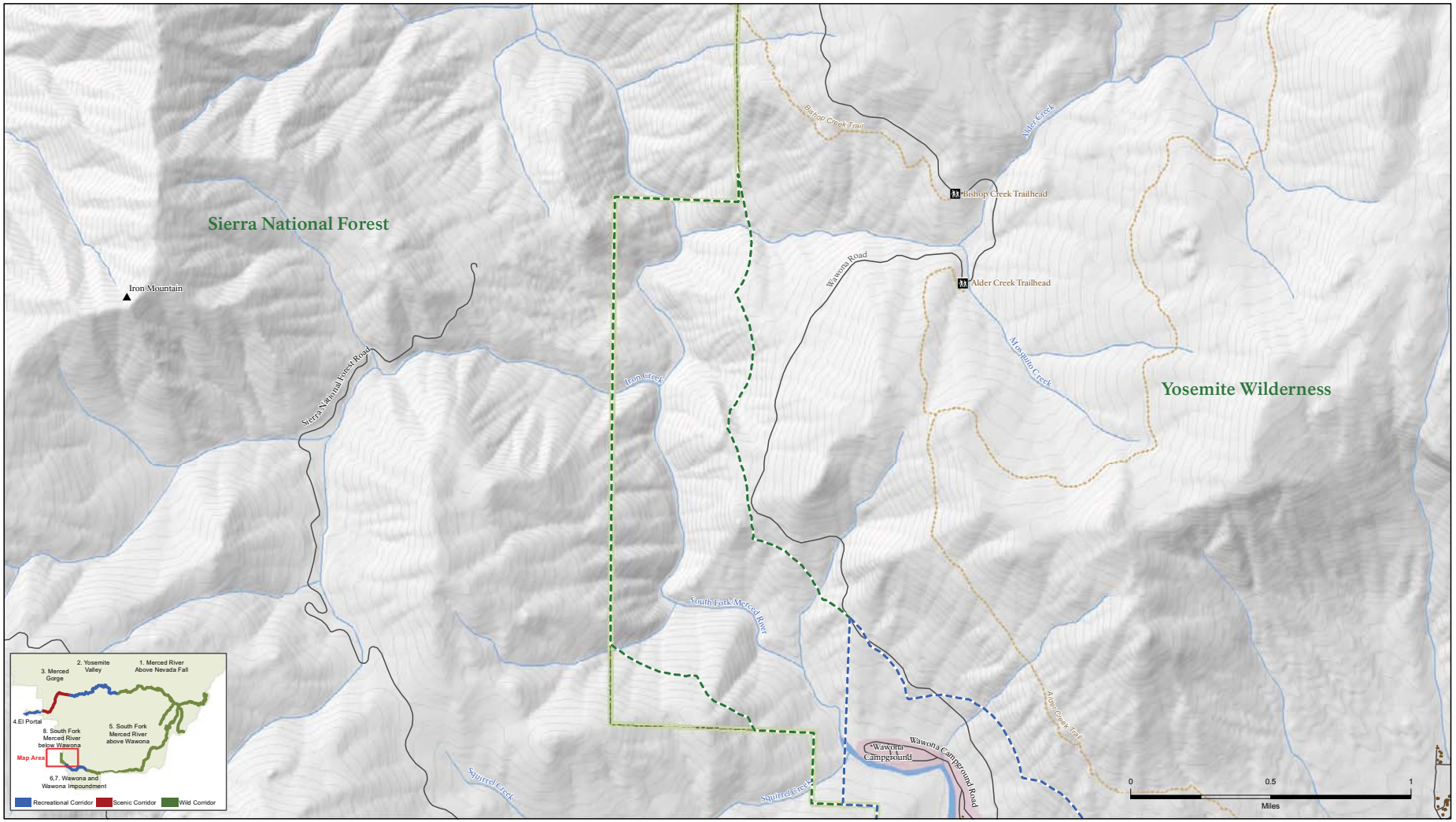

Figure 2.2-11
Recreational ORV - River Segment 8.
South Fork Merced River Below Wawona
Wild WSR Corridor

- Recreational WSR Corridor Classification
- Wild WSR Corridor Classification
- Wilderness Boundary
- Building
- Campground
- Trailhead
- Landmark
- Road
- Stream/River
- Trail

National Park Service U.S. Department of the Interior

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ORV Condition Measures

There are no readily available visitor studies for the South Fork river segments above and below Wawona. Studies carried out in 2004 did not record visitor encounters. In July 2010, wilderness use originating in Wawona was 1,110 people, for a total of 3,325 nights. These figures represent about 9% and 7%, respectively, of total visitation for all of the Yosemite wilderness areas. On the basis on these data, it can be concluded that the Recreational ORVs for these segments have been protected. Trail conditions in the South Fork area above Wawona are primarily poor. Of the four trail segments that pass through the river corridor in Segment 5, the condition of three were assessed as poor and one was rated fair.

Management Considerations

There are no recreation-related management considerations for Segment 5 or Segment 8.

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2.3 GEOLOGIC AND HYDROLOGIC PROCESSES

2.3.1 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, and have resulted in the river's variable gradients and dramatic changes in water speed and volume. The river flows through classic, glacially carved canyons, over sheer cliffs and steep cascades exemplifying stair-step river morphology and hanging valleys, through an alluvial landscape in Yosemite Valley, across a well-preserved recessional moraine, and past an exemplary boulder bar in El Portal.

River Segment 1: Merced River Above Nevada Fall

Following the path of the ancient Merced River, glaciers gouged a textbook U-shaped canyon with sheer granite walls rising steeply above.

This segment of the Merced River is characterized by a large-scale, U-shaped, glacially carved canyon. 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. The condition of this ORV is discussed in *Section 2.3.4,* under the header for *Geologic Condition*.

River Segment 2: Yosemite Valley

The "Giant Staircase," which includes Vernal and Nevada Falls, is one of the finest examples of stair-step river morphology in the country.

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 condition of this ORV is discussed in Section 2.3.5, under the header for Geologic Condition.

Yosemite Valley has exemplary glacial geology on display, from spectacular hanging valleys to textbook recessional moraines.

Yosemite Valley owes much of its form to periodic glaciations, during which rivers of ice followed the track of the pre-glacial Merced River. As the glaciers scoured out Yosemite Valley, they removed the slopes across which tributaries had formed, creating side valleys that end in high cliffs above the deeper Yosemite Valley. Such "hanging valleys" often feature waterfalls, such as Bridalveil and Yosemite Falls, where the higher valley is truncated by the lower one. When the glaciers retreated, they occasionally paused, dropping loads of sediment and forming recessional moraines. The best preserved of these is the exemplary El Capitan Moraine. The condition of this ORV is discussed in Section 2.3.5, under the header for Geologic Condition.

From Happy Isles to the west end of the valley, the Merced River is a rare example of a 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). The condition of this ORV is discussed in Section 2.3.5, under the header for Free Flowing Condition.

River Segment 4: El Portal

Changing river gradients, glacial history, and powerful floods created a boulder bar whose huge boulders are much larger than typically found in such deposits.

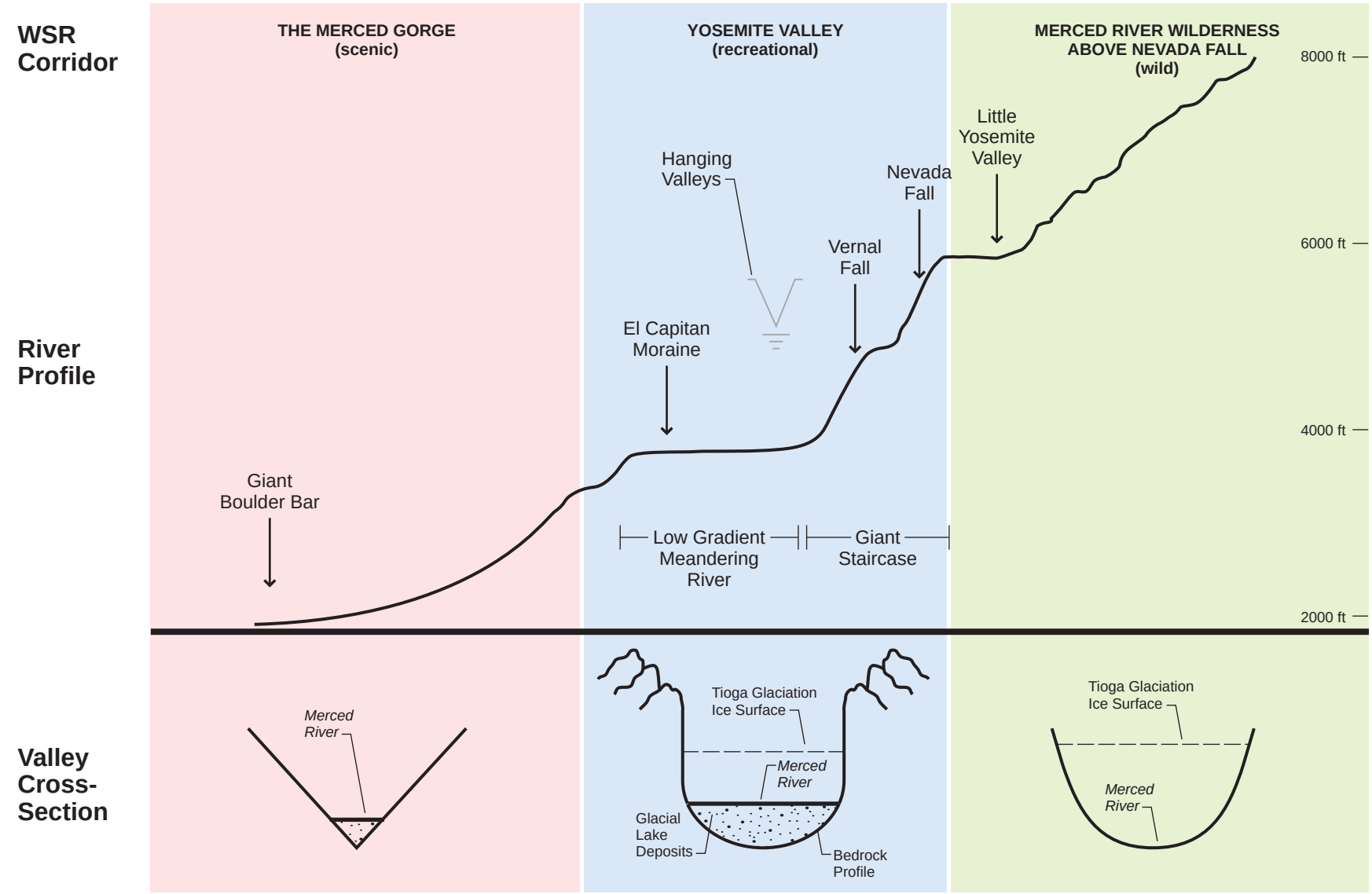
When river gradients decrease, rivers lose the energy needed to transport large sediments and boulders. In such areas, bar-type deposits – such as the large boulder bar at the east end of El Portal – are built up. This rare boulder bar contains massive boulders measuring over a meter in diameter and weighing many tons. It is the combination of boulder availability, the steepness of the river in the gorge, the major change in gradient and valley width at El Portal, and the 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 its power. The condition of this ORV is discussed in Section 2.3.7, under the header for Free Flowing Condition.

2.3.2 Features that Indicate Outstandingly Remarkable Values

Hydrologic Processes 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, 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 2.3-1**, offer dramatic views and experiences that are found in few other places on earth.

The underpinning features of this relatively unspoiled river, and the features 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



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 2.3-1
Schematic Longitudinal Profile and Cross-sections along the Merced River

Yosemite Valley to support facility 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.

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) (see **Table 2.3-1**). 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. 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.

TABLE 2.3-1: GLACIAL CHRONOLOGY OF YOSEMITE VALLEY

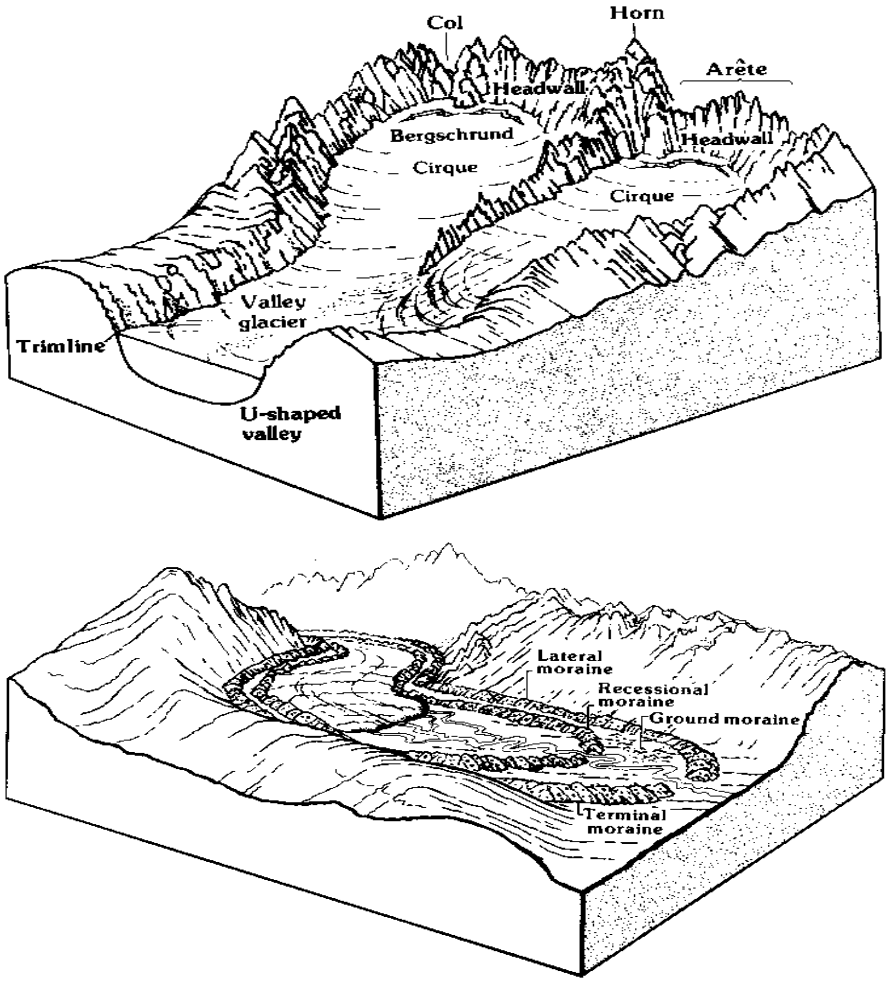
Sierra Glaciation	Age (approximate)	Characteristics/Evidence
Tioga	>9,990 years BP < 25,500 years BP	Minimal gullying of flanks Terminal moraine nearly complete except for narrow breaching by axial streams
Tahoe (or Tahoe II)	> 56,000 years BP <118,000 years BP	Flanks deeply gullied Termini eroded, mostly removed
Sherwin ("pre-Tahoe")	>760,000 years BP	Scattered erratic boulders and formless bodies of till

BP = Before Present
SOURCE: Guyton, 1998

The Tioga, Tahoe, and pre-Tahoe glaciations have affected all of the Sierra Nevada. 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.

From 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 2.3-1. Francois 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, 1987). 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, 2007; Glazner and Stock, 2010). The valley walls below the glacial trimline exhibit textbook evidence of prior glaciers, such as hanging valleys, glacial moraines, and steep, polished surfaces (see **Figure 2.3-2**). The type, quality, and variety of geological and hydrological features evident along the Merced River are unparalleled.



SOURCE: Huber 1987

Figure 2.3-2
Classic Elements of Glacial Landforms

2.3.3 Literature, Data, and Monitoring Information

Hydrologic Processes and Water Quality

The free-flowing condition of the Merced River has been studied since before Yosemite National Park was established. The California Geological Survey conducted the first organized study of the Merced River in Yosemite Valley in 1864, and the river valley has been the focus of many studies since that time. Early park managers sought to control the natural processes of flooding, streambank erosion, and accumulation of large woody debris by implementing management actions to protect park facilities, especially in Yosemite Valley. These actions included armoring streambanks with riprap, removing gravel from the river, and removing accumulated woody debris. Milestone (1978) documented various management actions conducted from 1851 to 1978 that altered the Merced River, including gravel mining, removal of large wood, bank hardening, and other channel control activities, such as blasting the El Capitan recessional moraine in the west Valley. Each of these actions had specific consequences for the river, the result of which has been increased channel erosion and widening. Madej et al. (1991) conducted channel surveys and compared stream geometry to surveys performed in 1919. These surveys found that the Merced River has widened by an average of 27% in the east Valley due to trampling of riparian areas, removal of large wood from the channel, and the influence of bridges. The National Park Service (NPS) is in the process of re-examining the Merced's geometry and morphology to determine the condition of the river, but anecdotal evidence suggests that the river has continued on its trajectory of bank erosion and widening.

The U.S. Geological Survey began monitoring water quality constituents at the Happy Isles gage in 1968, and water quality monitoring in the Merced River is ongoing. NPS published a comprehensive water quality report in 1994, which established baseline water quality data for the Merced River. This report found that the river's water quality was exceptionally high, with relatively few impacts caused by development and visitor use. More recently, studies have revealed that some anthropogenic pollutants (e.g., petroleum hydrocarbons) are present in the Merced River, although concentrations of these pollutants are well below established water quality thresholds (Clow et al. in press; Peavler et al. 2008). Yosemite's Visitor Use and Impact Monitoring Program has collected water quality and streambank stability information since 2004. Through the monitoring program, NPS tests for such water quality constituents as nutrients, *E. coli*, and petroleum hydrocarbons, and characterizes streambank stability by measuring channel dimensions, bank vegetation cover, substrate size, and the amount of large wood in the channel (NPS 2009).

Geologic Processes

The Geologic ORVs are described in this section based on the early work of Francois Matthes and the later work of N. King Huber, whom together describe in great detail the geologic history of the Yosemite region and the glacial history along the Merced River.

2.3.4 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, and 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 2.3-3**). 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 Moraine Dome, 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, creating valuable freshwater wetland habitat and contributing to complex river morphology. The location of this logjam is shown in Figure 2.3-3.

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, with no trail crossings in this reach. Chilnualna, Big, Alder, and Bishop Creeks are major tributaries to the South Fork.

Free-Flowing Condition

Condition at the Time of 1987 Designation. When the Merced River was designated as Wild and Scenic, Segments 1 and 5 had a few small impoundments as well as revetment that somewhat impeded flow. Several small footbridges crossed the river in these areas, and there was a small rock retaining wall adjacent to the river. The Nevada Fall Bridge, a post and rail bridge with mortared stone abutments, extended onto the riverbank, creating a minor constriction. A small diversion dam 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, and there were no footbridges or other 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.

Current Condition. No additional structures have been placed in the bed and banks of the river since the time of designation. Maintenance activities since 1987 include repairing damage to the Nevada Fall Bridge and trails, which suffered damage during the 1997 flood (Gerdes 2004), and removing a small rock wall along the Merced River to enhance its free-flowing condition. All other structures that existed at the time of designation remain; these include the Nevada Fall Bridge, the diversion dam above Nevada Fall, and several small footbridges.

Management Considerations

There are no free flowing condition-related management considerations for River Segments 1 and 5.

Water Quality

Condition at the Time of 1987 Designation. At the time of designation, water quality in the South Fork Merced River above and below 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).

Current Condition. 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). No sampling for bacteria has been conducted in these river segments.

Management Considerations

The list below summarizes the management considerations associated with the geologic and hydrologic processes (water quality) ORV in River Segments 1 and 5:

- 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.

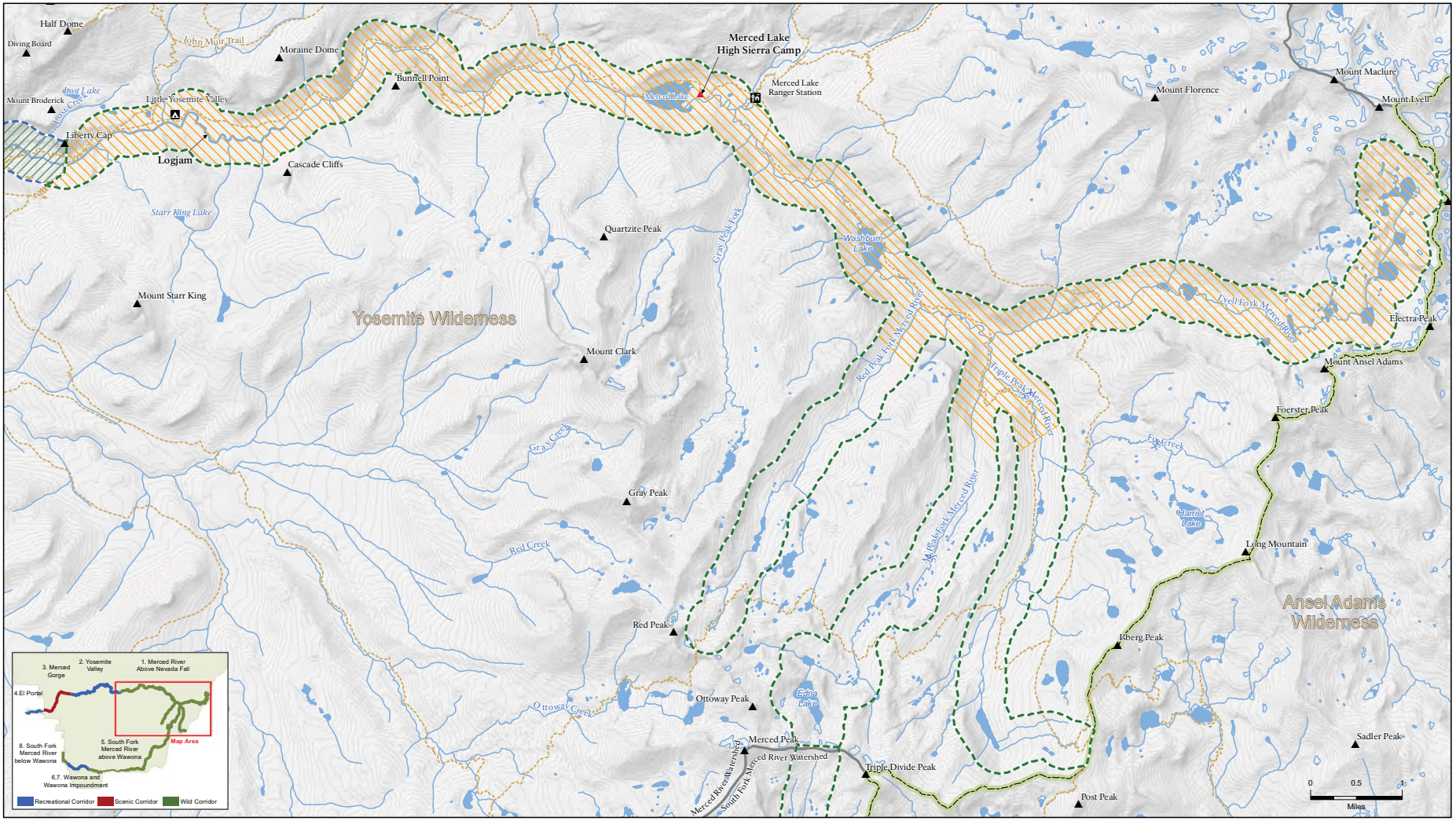


Figure 2.3-3
Geologic/Hydrologic ORV - River Segment 1.
Merced River Above Nevada Fall
Wild WSR Corridor

- Wild WSR Corridor Classification
- Recreational
- Giant Staircase
- U- Shaped Glacially Carved Canyon
- Watershed Boundary
- Yosemite National Park Boundary
- Lakes
- Landmark
- High Sierra Camp
- Campground
- Ranger Station
- Trail
- Stream/River

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection:	North American Datum 1983, UTM Zone 10
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Geologic Condition (U-Shaped Canyon ORV)

Condition at the Time of Designation. The segment of the Merced River above Nevada Fall runs through a large-scale, U-shaped, glacially carved canyon (**Figure 2.3-4**). 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.

Photo Credit: Mike Yochim

Figure 2.3-4
U-Shaped, Glacially Carved Canyon
along the Upper Merced River

Current Condition. 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.

Management Considerations

The list below summarizes the management considerations associated with the geologic and hydrologic processes (geologic condition) ORV in River Segments 1 and 5:

- Natural processes will continue to shape the landscape and the geologic value. NPS has no immediate management considerations with respect to the U-shaped, glacially carved canyon along the Merced River above Nevada Fall.

2.3.5 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 (at 4,000 feet) over a distance of two miles. At 594 feet in height, Nevada Fall is one of the largest 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 as it meanders across the Valley floor. This low gradient is due to the sediment deposited by the river since the last glaciation, but is also influenced by 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 (see **Figure 2.3-5**). 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 outside banks and depositing sediment to form new floodplain[1] 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. Preserving and restoring these processes require a long-term, systems-scale approach.

Bank erosion on outside bends creates important habitat areas such as overhanging banks and undercut tree roots that shelter fish from prey (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

[1] 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.

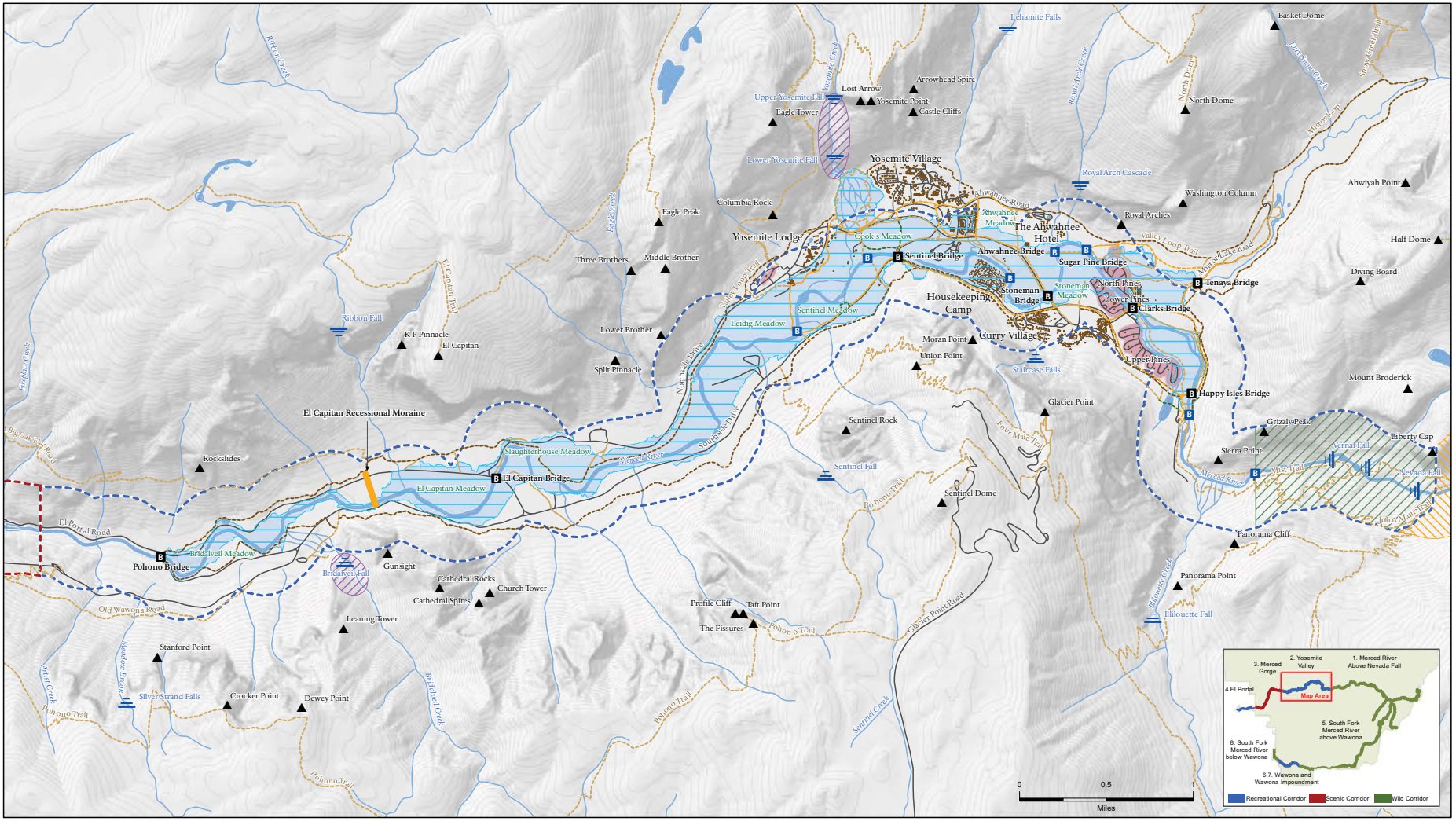

Figure 2.3-5
Geologic/Hydrologic ORV - River Segment 2.
Yosemite Valley
Recreational WSR Corridor

Recreational WSR Corridor Classification
Scenic WSR Corridor Classification
Building
Campground
100 Year Flood Boundary
Low Gradient, Meandering River
Giant Staircase
U- Shaped Glacially Carved Canyon
Hanging Valley
Waterfall
Road bridge
Footbridge
Landmark
Road
Stream/River
Yosemite 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: 2/25/11

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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.

Free-Flowing Condition (mid-elevation alluvial river ORV)

Condition at the Time of 1987 Designation. 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 had remained relatively unchanged since its discovery by Euro-Americans. This reach was heavily controlled by bedrock and massive talus boulders and was both less susceptible and less proximate to human activities. Visitor use of this area was less intense than on the Valley floor, and trails were farther away from the river channel. The free-flowing condition of the river was largely intact, with only minor constrictions at the Happy Isles Bridge, the Happy Isles Gaging Station footbridge, and two footbridges on the Mist Trail. From Happy Isles 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 free-flowing condition of this river 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, which lowered the base level of the Merced River by 4 to 5 feet (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 1880s to reduce flood risk near bridges and to facilitate river recreation, primarily between Stoneman Bridge and Sentinel Bridge. 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 has 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).

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, where it is 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 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 Yosemite Valley segment 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.

Twelve 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). The locations of these bridges are shown in Figure 2.3-5. 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 such as 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, two dams spanning the Merced River created barriers to river flow: the Happy Isles Dam, a 6-foot-high structure near Happy Isles, and the Cascades Diversion Dam, a 17-foot-high structure at the far west end of the Valley. Both of these structures were used to divert water from the Merced River By the time of designation, the dams no longer produced electricity but still impeded the free-flowing condition of the river.

Current Condition. 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, Lower River Campground, and the El Capitan Picnic Area. Restoration techniques have included soil decompaction, revegetation, bioengineering stabilization, riprap removal, and installation of fencing to protect restored areas. In addition, the two river impoundments present at the time of designation (Happy Isles Dam and Cascades Diversion Dam) were removed, restoring the free-flowing condition of the river in those areas. These actions eliminated the largest

impediments to the free-flowing condition of the river; however, the fundamental causes of channel degradation remain, including the removal of large wood from the channel, bank revetment, bridge confinement, and continued bank erosion.

Large wood continues to be managed, although less aggressively than at the time of designation. The current maintenance practice is to remove large wood that threatens boaters from the center of the channel to the edges where possible (Roche 2011), although this practice is not official park policy. While this practice does not completely restore the historical large wood load or the tendency toward channel avulsion, it constitutes an improvement over 1987 conditions by creating cover and organic inputs for aquatic life. Hazard tree removal in campgrounds and near heavy-use areas also continues, further reducing the amount of large wood available. This practice has the potential to destabilize the banks from which wood is removed and to reduce wood loading into the river.

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.

Hydraulic restrictions due to bridges remain at the levels that existed at the time of designation. No bridges have been removed from the channel or have been modified to accommodate additional river flow. Anecdotal evidence suggests that deposition upstream of bridges – notably Sugar Pine Bridge – has largely continued, increasing the probability of a major channel avulsion around a bridge in the event of a flood relative to 1987 conditions. Large scour holes still exist near bridges in the Valley.

Anecdotal evidence also suggests that some areas have undergone further bank erosion and widening since the time of designation. Visitor use, which is correlated with riparian vegetation loss and bank erosion, has increased since 1987. Several current studies to quantify the amount of continued erosion will allow for a more detailed conclusion regarding the trajectory of channel morphology.

Management Considerations

The list below summarizes the management considerations associated with the geologic and hydrologic processes (free-flowing conditions) ORV in River Segment 2:

Impact of bridges

- Several bridges are causing upstream deposition and downstream scour as well as creating the potential for flooding and uncontrolled channel avulsions. **Table 2.3-2** describes the level of concern associated with each bridge as identified in an earlier study of this segment (Madej et al. 1991).

TABLE 2.3-2: BRIDGES CAUSING HYDRAULIC CONSTRICTIONS IN YOSEMITE VALLEY

Bridge	Level of Concern[a]
Sugar Pine Bridge	Extremely serious
Stoneman Bridge	Serious
Housekeeping footbridge	Moderate
Sentinel Bridge[b]	Moderate
Ahwahnee Bridge	Moderately low
Clark's Bridge	Low

[a] The level of concern is based on the expected damage that will occur to park resources if corrective work is not undertaken. Potential damage ranges from Severe, in the case of Sugar Pine Bridge (where major changes in channel patterns could easily be triggered by continued enlargement of the cutoff channel) to Low, in the case of Clarks Bridge (where the channel is steep and bridge effects are confined to local scouring downstream of the right abutment).

[b] Based on 1989 field work. Sentinel Bridge was later reconstructed.

SOURCE: Madej et al. 1991

Management of large wood

- Large wood removal can affect channel migration and avulsion as well as many aquatic biological processes.

Hardened bank protection

Extensive bank hardening restricts the free-flowing condition of the Merced River and artificially maintains the river in its existing shape.

Streambank erosion and damage to the riparian corridor

- 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.

Water Quality

Condition at the Time of 1987 Designation. 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.

Current Condition. 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. in press). Nutrient concentrations are very low (Brown and Short 1999) and have been near background levels for similar undeveloped areas (Clow et al. 2009 in press). 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. 2009 in press). Dissolved oxygen levels are very high, with most samples near 100% saturation (Brown and Short 1999). Nine to 14% 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. Since the time of designation, NPS has removed over 100 underground tanks, eliminating a potential source of contamination.

Management Considerations

The list below summarizes the management considerations associated with the geologic and hydrologic processes (water quality) ORV in River Segment 2:

- Water quality in this river segment is high. The National Park Service will continue to protect water quality by monitoring and identifying potential pollution sources.
- Contaminants associated with parking lots, roads, and campgrounds in the Valley include petroleum hydrocarbons.
- Trampling of vegetation in the east Valley has led to excessive streambank erosion (Madej et al. 1994). Excessive erosion can result in increased suspended sediments, higher temperatures due to a lack of riparian cover, and lower dissolved oxygen levels due to elevated temperatures and shallower river depths.

Geologic Condition

Condition at the Time of 1987 Designation. Yosemite Valley contains several Geologic ORVs, as described below. The locations of these ORV elements are shown in Figure 2.3-5.

The Giant Staircase. The Giant Staircase, which includes Vernal and Nevada Falls, is one of the finest examples of stair-step river morphology in the country (**Figure 2.3-6**). 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.

Photo Credit: Mike Yochim

Figure 2.3-6
The Giant Staircase along the Merced River

El Capitan Recessional Moraine. The El Capitan moraine, located in the west Valley, is a textbook example of a recessional moraine (**Figure 2.3-7**). At the time of designation, this ORV element had been slightly modified. In 1879, a guardian of the valley (Galen Clark) blasted large boulders where the Merced River crosses the moraine, thereby lowering its original elevation by 4 to 5 feet along the river corridor (Milestone 1978). In addition, a barrow pit was dug near the northwest side of the moraine, but not into the moraine itself (Yochim 2010). As discussed above, the blasting had notable

Photo Credit: Mike Yochim

Figure 2.3-7
The El Capitan Recessional Moraine

ramifications on the behavior and morphology of the Merced River upstream of the moraine (see Free-Flowing Condition under Section 2.3.5), but did little to perceptibly modify the moraine as a whole. At the time of designation, the moraine was largely intact and unaltered when viewed as a large, cross-valley geological/topographical feature. It is the most conspicuous example of a glacial moraine in the valley.

Hanging Valleys. Glacial action removed the slopes across which tributaries had formed, creating hanging valleys with world-renowned waterfalls (**Figure 2.3-8**). These include Bridalveil Fall as well as Yosemite Falls—the tallest waterfall in North America.

Current Condition. The river- and glacier-dependent landscapes along the Merced River –including the Giant Staircase, the El Capitan recessional moraine, and the hanging valleys – 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.

Management Considerations

NPS has no immediate management considerations with respect to the Geologic ORV elements in Yosemite Valley.

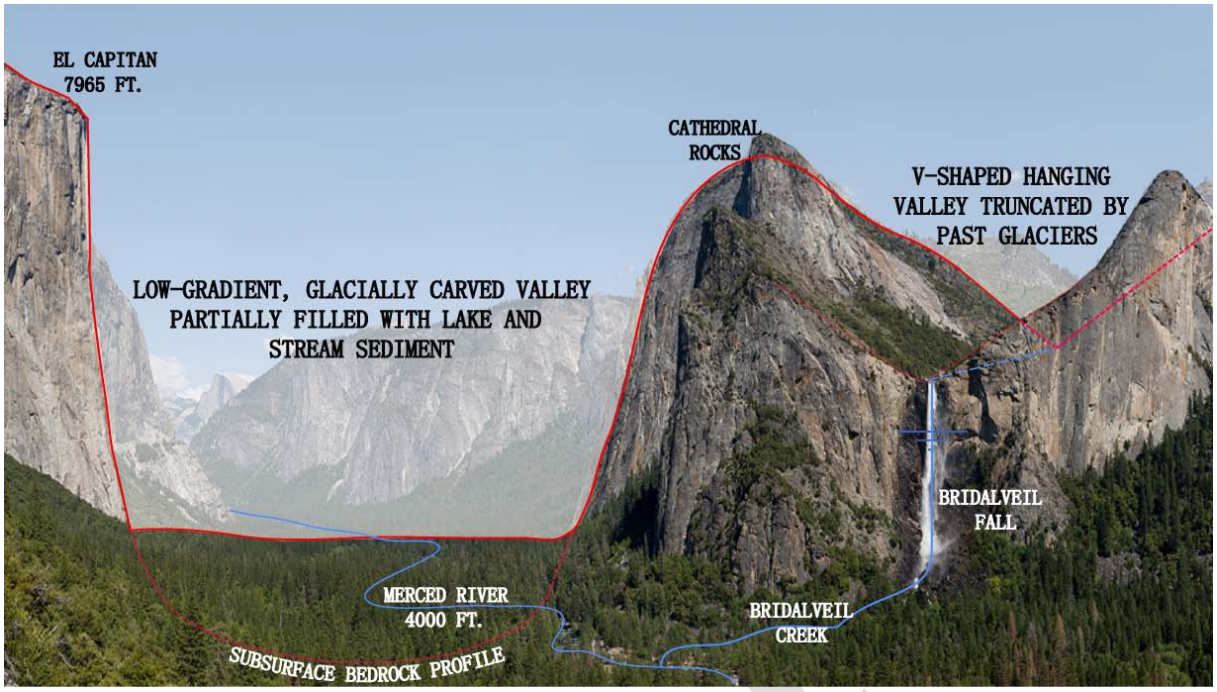

Photo Credit: NPS Panoramic Imaging Project

Figure 2.3-8
Yosemite Valley and Hanging Valley of Bridalveil Creek

2.3.6 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.

Free-Flowing Condition

Condition at the Time of 1987 Designation. At the time of designation, the Merced River Gorge was free of impoundments that would impede flow or otherwise alter the free-flowing condition of the river.

Current Condition. During the 1997 flood, El Portal Road suffered significant damage when the Merced River eroded the road's embankments. About 7.5 miles of the roadway were rebuilt after the flood with extensive riprap. There are no structures or other impediments in the Gorge segment that affect the free-flowing condition of the river.

Management Considerations

The list below summarizes the management considerations associated with the geologic and hydrologic processes (free-flowing conditions) ORV in River Segment 3:

- Management considerations focus on maintaining the free-flowing condition of the river in this segment. This includes designing future embankment protection with the natural processes of the river in mind.

Water Quality

Condition at the Time of 1987 Designation. 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.

Current Condition. 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. in press). Dissolved oxygen levels are very high, with most samples near 100% saturation (Brown and Short 1999).

Management Considerations

There are no management considerations associated with geological and hydrologic processes in River Segment 3.

Geologic Condition

There are no identified Geologic ORVs in this river segment.

2.3.7 River Segments 4, 6, 7, 8: El Portal, 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.

Free-Flowing Condition

Condition at the Time of 1987 Designation. 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 reaches flows of less than 6 cfs. At flows of less than 6 cfs, diversions are limited to 10% of the river flow. No other diversions take 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.

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.

In El Portal, a small levee is located on the left bank of the Merced River, just downstream from the Highway 140 Bridge (**Figure 2.3-9**). This levee is approximately 300 feet long and was built to protect the Trailer Village area from flooding. The Merced River near El Portal is also confined by Highway 140 and associated abutments and revetment, which in places encroach into the historical channel bed. The road berm has also cut off the floodplain and a historical meander, creating Odgers' Pond near El Portal. These constrictions somewhat increase flow velocities and reduce channel complexity, active floodplain inundation, and backwater habitat. The California Department of Transportation manages Highway 140 in the vicinity of El Portal. NPS does not have management authority over the highway in this segment. Other modifications to the river in this segment include several remnant rock diversions and a sand pit.

Current 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 and adverse 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.

An impressive mid-channel bar of boulders and cobbles is located on the Merced River across from and just upstream of the El Portal General Store (see Figure 2.3-9). The Boulder Bar is an exposed mid-channel bar composed of boulders and cobbles, that became prominent following the 1997 flood. Bars

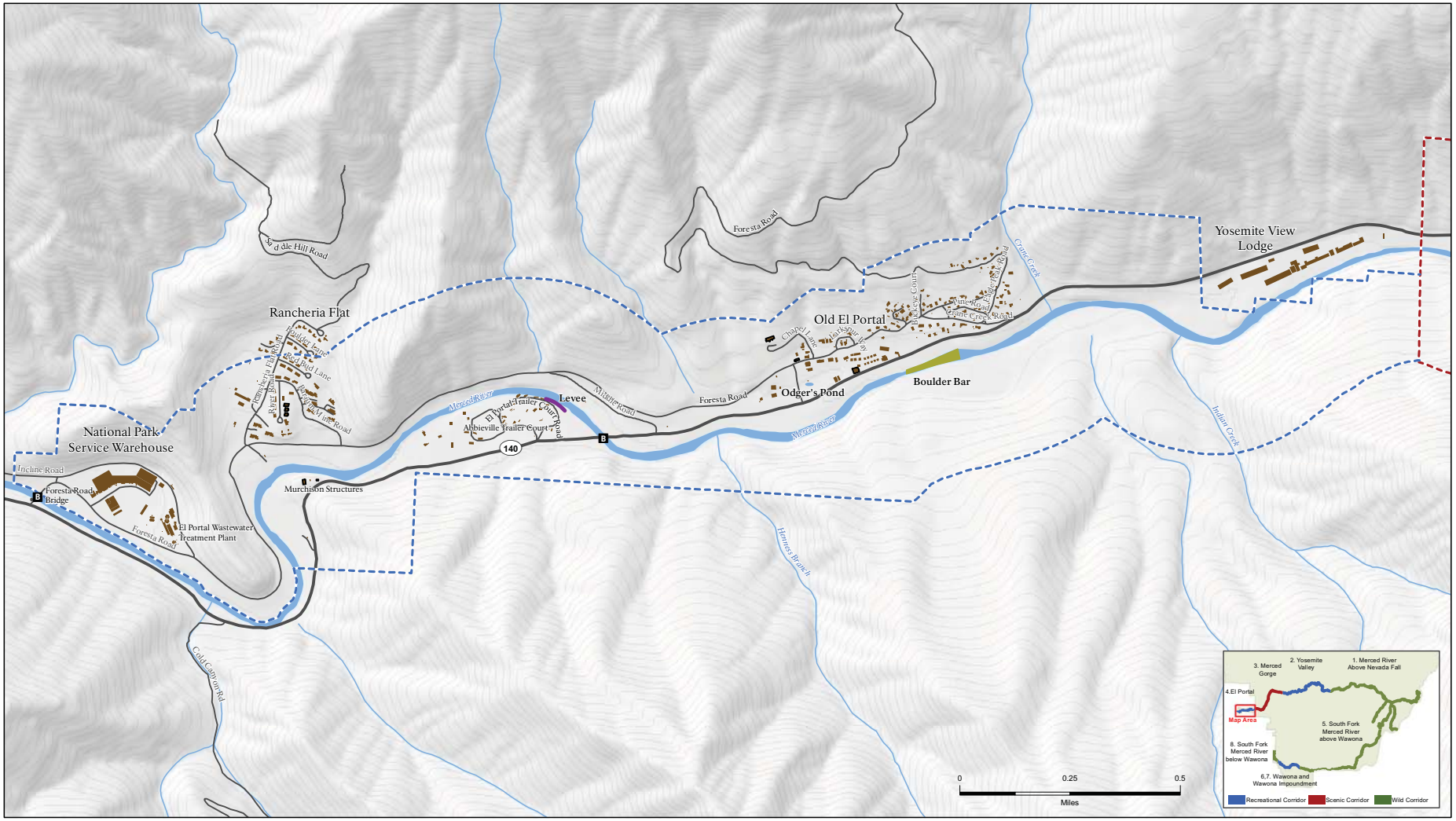

Figure 2.3-9
Geologic/Hydrologic ORV - River Segment 4. El Portal Recreational WSR Corridor

Recreational WSR Corridor Classification
Scenic WSR Corridor Classification
Building
Highway 140
Road
Stream/River
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: 1/5/11

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form when more sediment flows into a reach than can be transported out, a situation that often occurs immediately downstream of steep tributaries such as Crane Creek. 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. Based on historical maps and aerial photos it appears that prior to the 1997 flood there was a vegetated bar where the Boulder Bar is currently located. The flood 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 Highway 140) where the channel returns to its former north side course.

Management Considerations

The list below summarizes the management considerations associated with the geologic and hydrologic processes (free-flowing conditions) ORV in River Segments 4, 6, 7 and 8:

- Extensive riprap on both sides of the river limits river functions.
- In El Portal, the Merced River is confined by Highway 140 and associated riprap as well as by the small levee near the Trailer Village.

Water Quality

Condition at the Time of 1987 Designation. At the time of designation, water quality in the Merced River near these four 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). Elevated levels of nutrients and metals were measured below the El Portal Wastewater Treatment Plant, but water quality was still within established limits.

Current Condition. Water quality in these segments is considered to be high. Bacteria levels are generally low (Peavler et al. 2008), 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. in press).

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).

Management Considerations

The list below summarizes the management considerations associated with the geologic and hydrologic processes (water quality) ORV in River Segments 4, 6, 7 and 8:

- Although pollutant concentrations are below levels of concern, nutrient levels downstream of the El Portal Wastewater Treatment Plant are elevated during periods of low streamflow (July – September) (Peavler et al. 2008).

- Nonpoint-source pollutants associated with parking lots, roads, and campgrounds in Wawona and El Portal include hydrocarbons and phosphorus. These pollutants have the potential to impact water quality on the Merced River and the South Fork Merced River.

- The impacts to water quality from fertilizers and herbicides used to maintain the Wawona Golf Course are unknown.

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

Geologic Condition

There are no identified Geologic ORVs in these river segments. The condition of the giant boulder bar near El Portal is discussed above under free flowing conditions.

2.3.8 References

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2.4 SCENERY

2.4.1 Scenery 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 (see Photo 2.4-1), Half Dome (see Photo 2.4-2), 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

Passing through serene montane lakes and slickrock cascades and by classic Sierran peaks, the Merced forms the foreground to scenes of great visual delight and variety. Starting at the headwaters, the Merced River passes through chains of "paternoster" lakes[1], enters the upper Montane forest, and becomes walled in by a classic U-shaped glacial valley. Scenic landmarks visible from the river and 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.

River Segment 2: Yosemite Valley

Crashing over Nevada and Vernal Falls and then meandering quietly under 2,000-foot cliffs, the Merced forms a placid foreground to some of the world's most iconic scenery.

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 and its banks, views consist of Yosemite Falls, Bridalveil Fall, El Capitan, Half Dome, and other named and unnamed parts of the cliffs 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 and 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

Descending 2,000 feet in 14 miles, the river is 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 and its banks. Dropping 2,000 feet in 14 miles, canyon walls rise steeply from the river and have

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

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

Passing through an untrammeled forested wilderness, the South Fork Merced River forms the centerpiece of some of the Sierra's wildest scenery.

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 and its banks is that of an unspoiled 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.

2.4.2 Features that Indicate Outstandingly Remarkable Values

Scenic views from nearly all land areas within the Merced River corridor are distinctive. Steep valley and canyon walls, spectacular rock formations, and panoramic views combine to offer a wealth of visual resources unsurpassed in the United States. As people move along the valleys and canyons of the Merced River, they experience a sequence or pattern of topography and vegetation that affords a cumulative visual experience; this in itself is a unique experience that rises above that of enjoying any one viewpoint. This cumulative experience involves the interaction of multiple elements in relation to each other: 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 the visual landscape.

Photo 2.4-1. El Capitan – 2009 (Yochim 2009)

Photo 2.4-2. Half Dome – 2010 (Yochim 2010)

The following common conditions can serve as indicators to assess changes in the Scenery ORV:

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

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 scenic character of the Merced River corridor may be impacted.

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, as further described below (NPS 2010a).

Air Quality and Climate Change: Nitrogen oxide and hydrocarbon concentrations 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 degrade visibility in Yosemite, particularly in the summer months. Visibility can also be reduced periodically by smoke from natural and 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 scenic resources of the Merced River corridor.

2.4.3 Literature, Data, and Monitoring Information

Scenic resources have been studied and analyzed in Yosemite since at least 1865, when a board of commissioners appointed by the governor of the State of California commissioned three artists to study and document the scenery of Yosemite. The Merced River is featured prominently in the work produced by that commission (NPS 2000). As part of developing its *General Management Plan*, NPS conducted a study in the late 1970s to determine existing viewing conditions within Yosemite Valley and to identify the landscape features most visitors look for and are able to distinguish (NPS 1980; NPS 2000). The results of this study are further described below in Section 2.4.5, River Segment 2 – Yosemite Valley.

More recently, NPS (2010a) prepared the *Draft Scenic Vista Management Plan for Yosemite National Park* (Scenic Vista Management Plan) to provide a systematic program for documenting, protecting, and reestablishing Yosemite's important viewpoints and vistas. As part of developing that plan, park staff inventoried 181 scenic vistas outside of wilderness areas in Yosemite (NPS 2010a; NPS 2009a; NPS 2009b). Most of the scenic vistas were located within Segment 2 – Yosemite Valley, or featured views of the river segment within the Valley, as described below.

The visual resources of the Merced River wilderness and Merced River Gorge are less studied than those in Yosemite Valley and other developed areas.

Visitor surveys that documented traffic conditions and the perception of crowding directly relate to recreation resources (see Section 2.2, Recreation), but also provide an understanding of the effect of crowding and traffic on the scenic quality of Yosemite. For instance, permit data show that wilderness use is most heavily concentrated in the Merced River corridor between Nevada Fall and Washburn Lake, and along trails in the vicinity of the High Sierra Camps. Research on visitor preferences for wilderness experiences also indicates that visitors are willing to accept some restrictions on where they camp in wilderness areas, and prefer to camp in areas that show no to moderate levels of human use. The perceived naturalness of campsites is the most important attribute contributing to visitors' desired wilderness experiences (Newman and Manning 2001).

Since 2004, the park's visitor use monitoring program has guided annual data collection for monitoring resource and social conditions on the Merced River and in other park locations. This effort involves annual monitoring of conditions related to such scenery resources as the number and extent of social trails (i.e., informal trails), riverbank conditions, and encounters with other visitors (see Section 2.2, Recreation).

2.4.4 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 (see Photo 2.4-3), Echo Valley, Bunnell Point, and Little Yosemite Valley (see Figures 2.4-1a and 2.4-1b[2]), and many other named and unnamed scenic landmarks. The long river segment of great visual variety and its uncompromised natural setting provide diverse, exceptional scenery, all with the river in the foreground.

Photo 2.4-3. Merced Lake – 2010 (Yochim 2010)

[2] Scenery resources figures include identification of scenic landmarks and other viewpoints within the river corridor or that provide views of the river corridor; human-made structures and other visual intrusions within the river corridor; and Scenic Vista Points within the river corridor or that provide views of the river corridor, as identified in the Draft Scenic Vista Management Plan for Yosemite National Park (see Section 2.4.5, River Segment 2: Yosemite Valley, for a description of this plan).

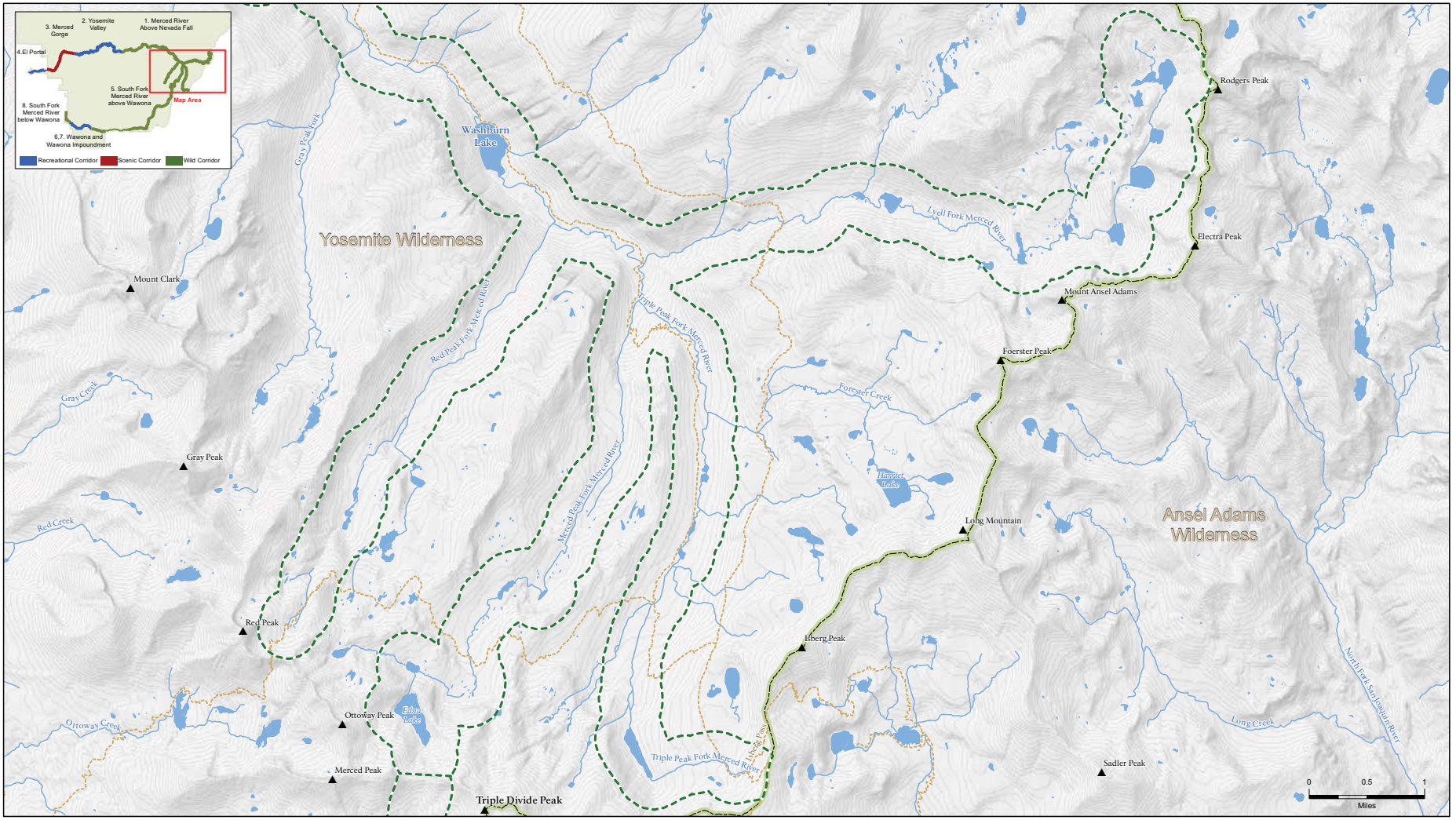

Figure 2.4-1a
Scenic ORV - River Segment 1. Merced River Above Nevada Fall
Wild WSR Corridor

Wild WSR Corridor Classification
Yosemite National Park Boundary
Lakes
Trail
Stream/River
Landmark

Note: See Table 2.4-1: Vista Point Summaries for detailed information on scenic vista points.

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection: North American Datum 1983, UTM Zone 10

Date: 2/25/11

File:

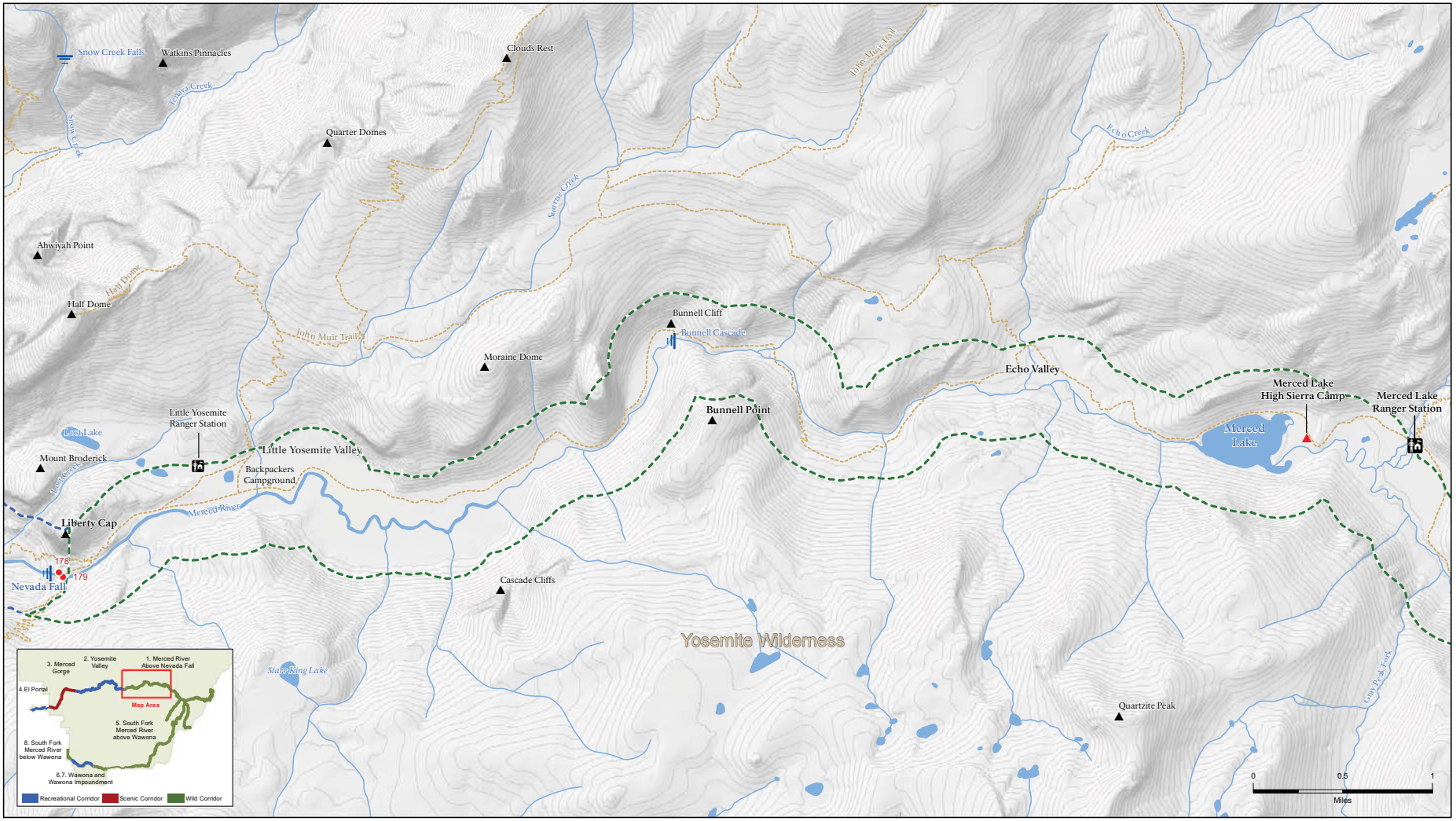

Figure 2.4-1b
Scenic ORV - Segment 1. Merced River Above Nevada Fall-Little Yosemite Valley and Merced Lake High Sierra Camp Wild WSR Corridor

Recreational WSR Corridor Classification
Wild WSR Corridor Classification
Lake
Trail
Stream/River
Waterfall
High Sierra Camp
Landmark
Scenic Vista Points
Ranger Station

Note: See Table 2.4-1: Vista Point Summaries for detailed information on scenic vista points.

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection: North American Datum 1983, UTM Zone 10

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Condition at the Time of 1987 Designation. No formal visual resource studies have been performed for this segment of the Merced River since designation as Wild and Scenic. At the time of designation, this river segment flowed through a natural setting with few human-made features. Low overall visitor levels in this area enhance the scenic quality (NPS 2000), although overnight use of the limited areas of wilderness campgrounds at the time of designation was generally high. During the summer months, the campsites were typically fully occupied, with vacancies occurring only during the shoulder seasons (i.e., spring and fall, before and after the period of peak visitation).

Only four visual intrusions were identified along this river segment at the time of designation—the Merced Lake High Sierra Camp and associated stock corral (established in 1916), the Merced Lake Ranger Station and associated corral, the Little Yosemite Valley Backpackers Campground and associated composting toilet, and the Little Yosemite ranger camp.

Current Condition. Views from the river and trails along this segment continue to have high aesthetic value. Both the Merced Lake High Sierra Camp (see Photos 2.4-4 and 2.4-5) 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 of the camp, although some social trails nearby are still present. Since the river's designation, both temporary and more permanent structures at the Merced Lake Ranger Station complex have increased. In approximately 1992, the Little Yosemite Valley Backpackers Campground and associated ranger camp were moved farther from the river and to the east. The updated backpackers campground and ranger camp is larger and includes semi-permanent tents at the ranger camp. In addition, the number of human-made structures associated with the composting toilet area has increased within the river corridor viewshed.

Between 2006 and 1987, annual overnight wilderness use was typically below or comparable to the 1987 visitation (NPS 2011). As shown in Figure 2.2-1, Yosemite wilderness overnight visitation has increased substantially in the last few years, exceeding the 1987 level of overnight use (NPS 2011).

Management Considerations

The list below summarizes the management considerations associated with the scenic ORV in River Segment 1:

- Regional air pollution results in occasional haze during the summer months
- There are few visual intrusions in this area, however human structures, both temporary and permanent, have increased at Merced Lake Ranger Station and Little Yosemite Valley
- Crowding in and near the backcountry campgrounds, which operate near capacity all summer, may affect river-related scenic resources

Photo 2.4-4. Merced Lake High Sierra Camp – 2010 (Yochim 2010)

Photo 2.4-5. Merced Lake High Sierra Camp – 2010 (Yochim 2010)

2.4.5 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 and its banks, views consist of Yosemite Falls, Bridalveil Fall, El Capitan, Half Dome, and other named and unnamed parts of the cliffs rimming the valley (see Figures 2.4-2a through 2.4-2c and Photos 2.4-6 through 2.4-8).

Condition at the Time of 1987 Designation. NPS conducted a study in the late 1970s during development of the *General Management Plan* to determine existing 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 are 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 rated for the quality of views and proximity to roads and trails. All of these features were visible from various sections of the Merced River through the Yosemite Valley. Other important scenic resources that could be seen from within the Merced River corridor in Yosemite Valley 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.

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 the foreground, intermediate ground, or background of many representations of the Valley, both inside and outside of the Merced River corridor. Once the existing and historical viewpoints were established for the *General Management Plan* viewpoint analysis, specific locations in the Valley were 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 (includes 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 (see Figure 2.4-3). 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.

Photo 2.4-6. Merced River in Yosemite Valley from Valley View – 2010 (Yochim 2010)

Photo 2.4-7. Yosemite Falls – 2010 (Yochim 2010)

Photo 2.4-8. Half Dome from Sentinel Meadow – 2010 (Yochim 2010)

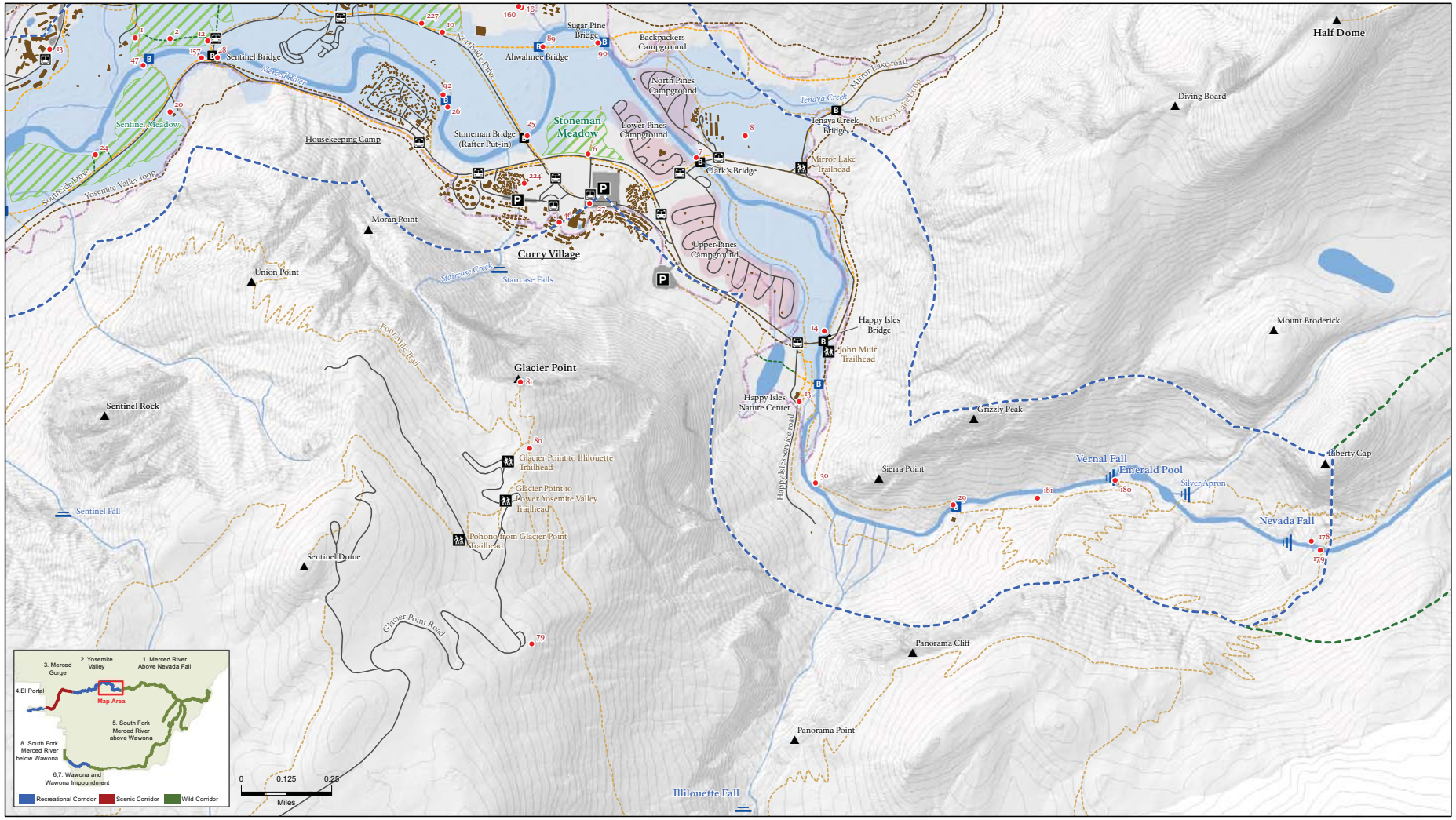

Figure 2.4-2a
Scenic ORV - River Segment 2. Yosemite Valley - Curry Village, Pines Campgrounds, and Housekeeping Camp Recreational WSR Corridor

Recreational WSR Corridor Classification
Wild WSR Corridor Classification
Base of Talus
Campground
Meadow
Building
100 Year Flood Boundary
Scenic Vista Points
Landmark
Valley Shuttle Stop
Trailhead
Waterfall
Parking Lot
Road bridge
Footbridge
Road
Stream/River
Yosemite Valley Loop Trail
Bike path
Boardwalk
Trail

Note: See Table 2.4-1: Vista Point Summaries for detailed information on scenic vista points.

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection: North American Datum 1983, UTM Zone 10

Date: 2/25/11

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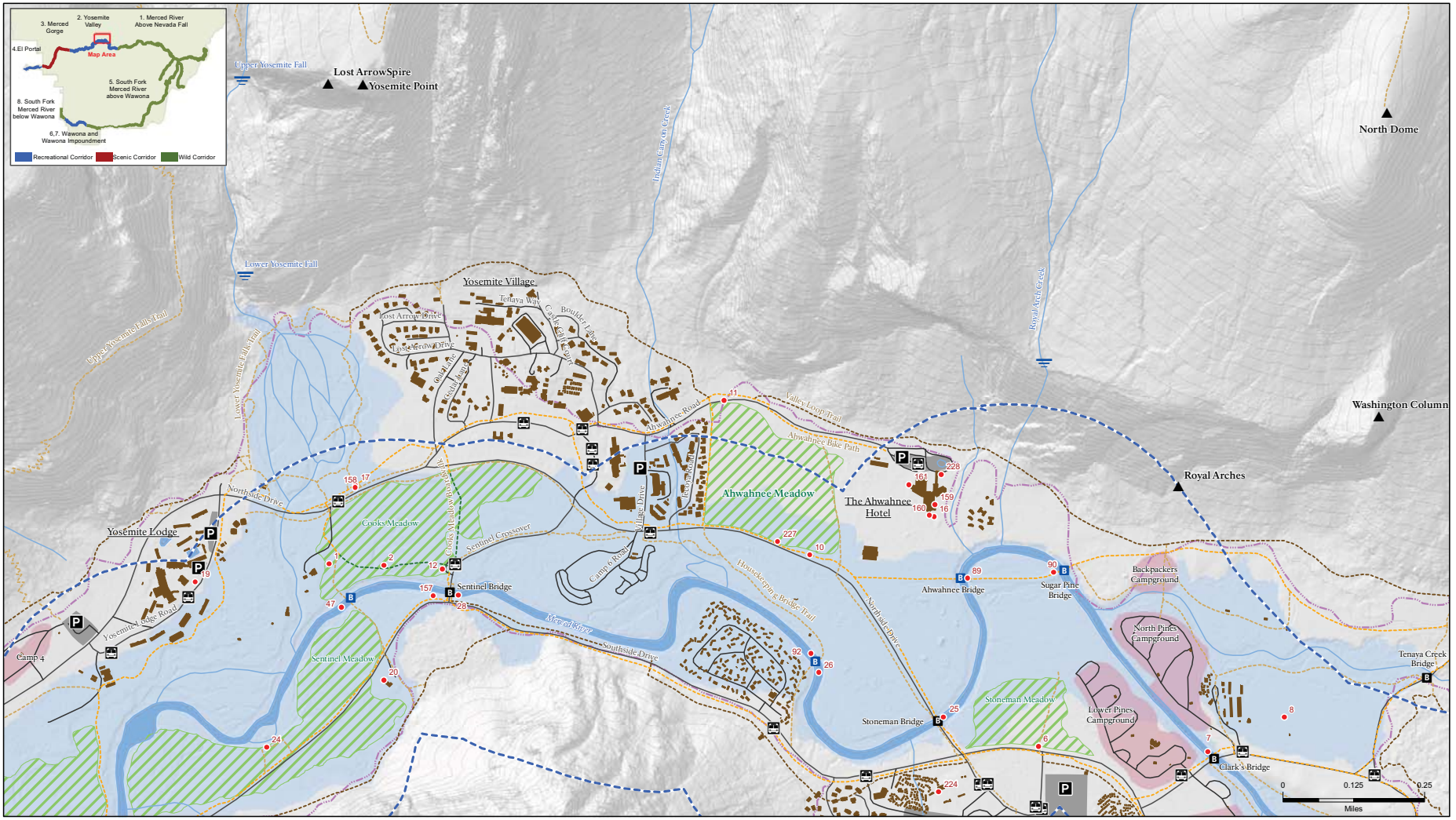

Figure 2.4-2b
Scenic ORV - River Segment 2. Yosemite Valley
Yosemite Lodge, Yosemite Village, and The Ahwahnee
Recreational WSR Corridor

Recreational WSR Corridor Classification
Building
Campground
Meadow
Base of Talus
100 Year Flood Boundary
Scenic Vista Points
Parking Lot
Road bridge
Footbridge
Valley Shuttle Stops
Landmark
Waterfall
Road
Stream/River
Yosemite Valley Loop Trail
Bike Path
Boardwalk
Trail

Note: See Table 2.4-1: Vista Point Summaries for detailed information on scenic vista points.

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
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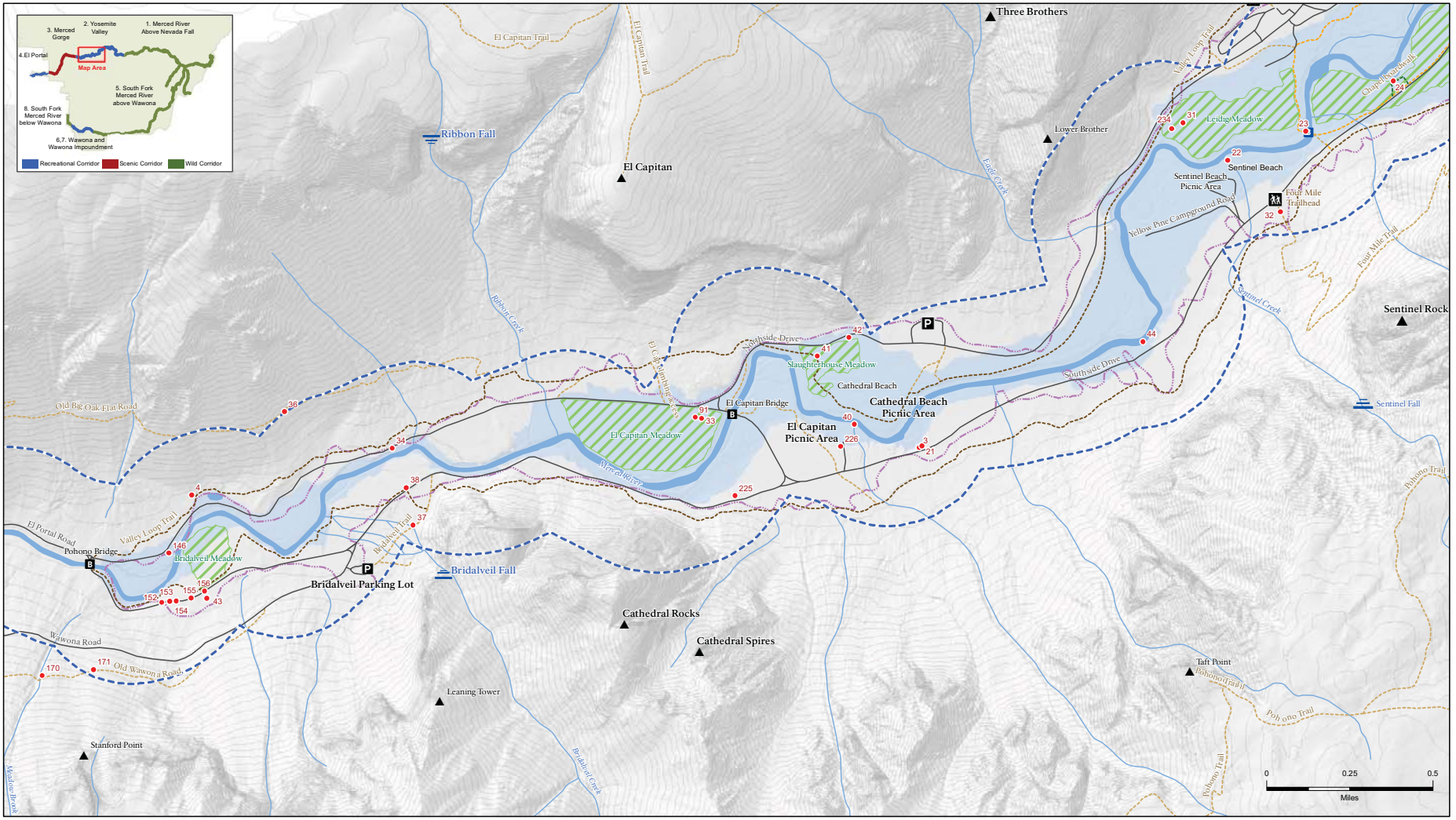

Figure 2.4-2c
Scenic ORV - River Segment 2. Yosemite Valley
El Capitan Meadow, Cathedral Beach, and Sentinel Beach
Recreational WSR Corridor

Recreational WSR Corridor Classification
Meadow
100 Year Flood Boundary
Base of Talus
Scenic Vista Points
Road bridge
Footbridge
Waterfall
Landmark
Parking Lot
Trailhead
Road
Stream/River
Yosemite Valley Loop Trail
Bike path
Boardwalk
Trail

Note: See Table 2.4-1: Vista Point Summaries for detailed information on scenic vista points.

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection: North American Datum 1983, UTM Zone 10

Date: 2/25/11

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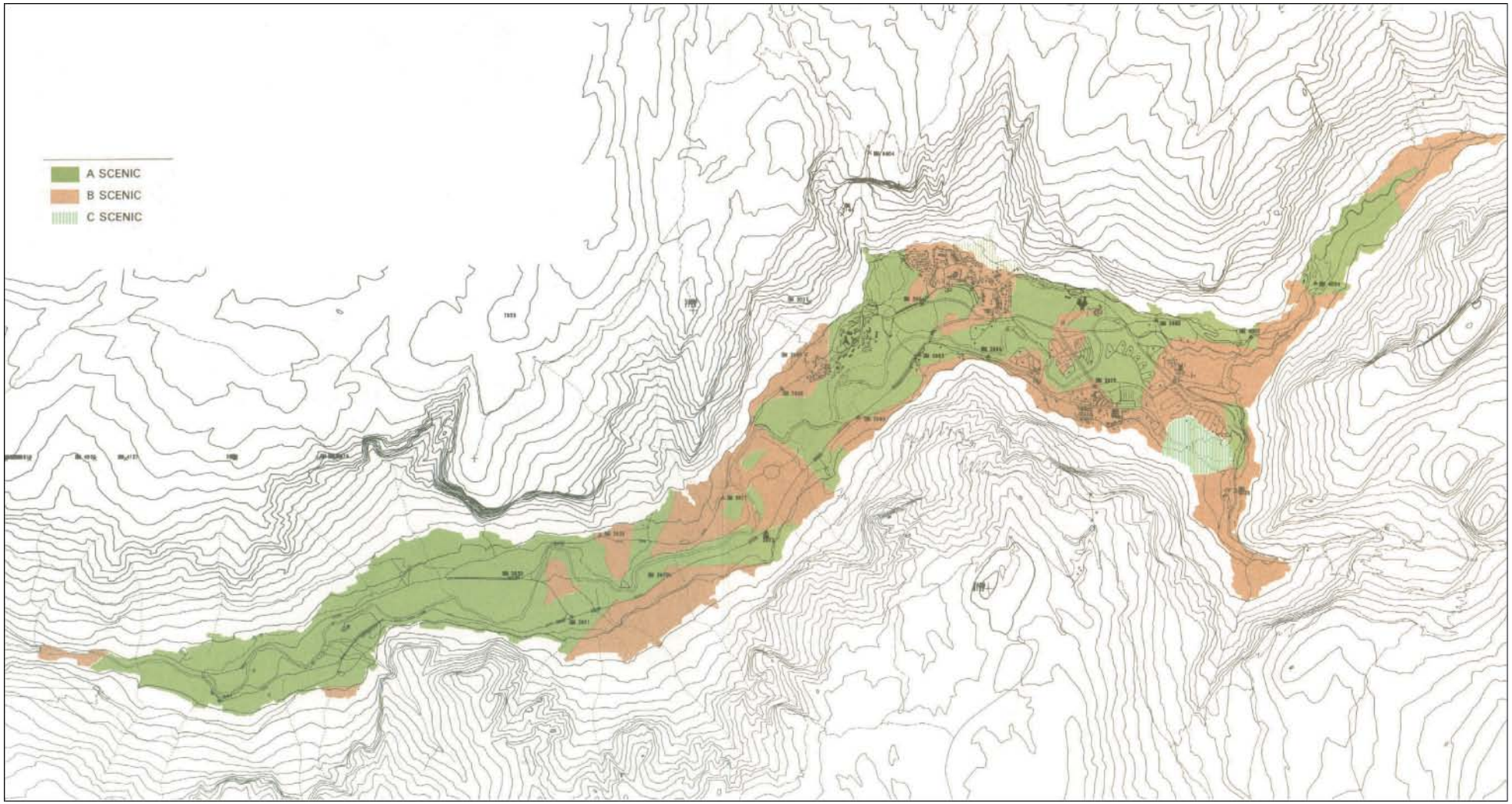

Data Source: National Park Service, 1978

0 1000 2000 3000 Feet

Prepared for:
National Park Service
Department of the Interior

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

Figure 2.4-3
Yosemite Valley Scenic Analysis

Draft Merced Wild and Scenic River
Comprehensive Management Plan/EIS

The viewpoint analysis identified visual intrusions in the Valley caused by human-made features and vegetation that blocked views, and 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. Other major intrusions into the scenic beauty of the Valley included NPS and concessioner maintenance and warehouse facilities, Camp 6, 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 trails and vista points throughout 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 campsites within the Merced River floodplain, and damaged meadow and riparian vegetation. Other changes to the human-made environment since 1987 include installation of curbing along Northside and Southside Drives, completion of the Yosemite Falls project (which removed idling buses from distant views of the falls), 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 (see Section 2.1, Biological Values). While meadow conditions continue to experience damage associated with ongoing casual trail use, 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 have improved as well. Constrictions to the free-flowing condition of the Merced River as well as trampling associated with visitor access to river points continue to cause bank erosion, which affects direct views of the river and long-range iconic views where the river is visible in the foreground (see Photo 2.4-9).

Photo 2.4-9. Social Trails along Merced River Bank – 2010 (ESA 2010)

The Tunnel View Rehabilitation Project, completed in 2008, restored views of Yosemite Valley, including El Capitan, Bridalveil Fall, and Half Dome, which were obscured by over time by trees and brush (see Photos 2.4-10 and 2.4-11).

Photo 2.4-10. Wawona Road Tunnel View (Prior to the Tunnel View Rehabilitation Project) – undated (NPS 2009c)

Photo 2.4-11. Wawona Road Tunnel View (Following the Tunnel View Rehabilitation Project) – undated (NPS 2009)

The *Draft Scenic Vista Management Plan for Yosemite National Park* (Scenic Vista Management Plan) further defined vegetation changes that have resulted in intrusions on scenic viewpoints, and rated and ranked the quality of viewpoints. Appendix E of the *Scenic Vista Management Plan Environmental Assessment* (NPS 2010a) provided visual resource assessment scores (compiled points assigned to scenic values associated with vividness of views, special uses, access, intervening vegetation, etc.) for vista points within or that provide views of the Valley segment as of 2009 (NPS 2009a, 2009b). Scores of 10.0 to 18 are considered "high," scores of 7.25 to 9.99 are considered "medium," and scores of 7 and below are considered "low." The visual resource assessment considered: vividness, framing, uniqueness, special uses, access/duration, infrastructure present, and intactness. The assessment results for sites within the Valley segment and for sites that focus on views of the river and river-dependent resources are provided in Table 2.4-1. The assessment describes the iconic features visible from each vista point and includes recommendations for vegetation management actions that would improve scenic views. As shown in Table 2.4-1, vegetation currently obstructs scenic views at many of the Valley segment vista points. Regional air pollution results in occasional haze during the summer months (NPS and Colorado State University 2002).

Park visitation has increased since the time of designation, from approximately 3.1 million visitors per year in 1987 to approximately 4.0 million visitors per year in 2010. As described in Section 2.2, Recreation, it is estimated that approximately 75% of park visitation is within Yosemite Valley. The proportion of day-use visitation (e.g., vehicle-based sightseeing, day hikes, etc.) has increased substantially, while overnight use has decreased (see Section 2.2, Recreation). As a result, crowding at popular attraction sites, traffic, and parking at or near viewpoints in the Yosemite Valley may continue to reduce the scenic value of these areas.

While a substantial number of structures were removed from the Valley segment following the 1997 flood, visual intrusions remain, including roads and traffic through Ahwahnee Meadow, Stoneman Meadow, and other meadows; NPS and concessioner maintenance and warehouse facilities; and Cathedral Beach and El Capitan Picnic Areas (described above under Condition at the Time of 1987 Designation).

Management Considerations

The list below summarizes the management considerations associated with the scenic ORV in River Segment 2:

- Visual intrusions associated with human made structures include roads and traffic through meadows and some visitor and administrative facilities.
- Vegetation changes continue to result in intrusions on scenic viewpoints, in some cases decreasing the scenic value of these areas.
- The presence of social trails and riparian vegetation loss affects the visual landscape.
- Bank erosion continues to affect direct views of the river as well as long-range iconic views in which the river is visible in the foreground.
- Regional air pollution results in occasional haze during the summer months.

TABLE 2.4-1: SCENIC VISTA MANAGEMENT PLAN – VISTA POINT SUMMARIES

Site Number	Site Name	Visual Resource Assessment Score	Scenic Class	Merced Wild and Scenic River Segment	View Type	Vista Blocked?	Proximal Roads / Trails	Iconic Features Visible from Site	Immediate Vegetation Management Needs	Long-Term Vegetation Management Needs
1	Residence 1	12.05	A	Within Valley Segment	Frontcountry Trail Vista Point	Partial	Cook's Meadow Bike Path	Half Dome, Yosemite Falls, Sentinel Rock, North Dome, Glacier Point, Royal Arches, Washington Column	View of Yosemite Falls partially blocked by oaks	Selective thinning, removal of conifers
2	Cook's Meadow, South Boardwalk	8	A	Within Valley Segment	Scenic Area	Partial	Bike Path	Yosemite Falls, Sentinel Rock, North Dome, Glacier Point	Selectively remove encroaching conifers	Drop large conifers to open up vista
3	El Capitan Postage	9.5	A	Within Valley Segment	Roadside Turnout	Partial	Southside Drive	El Capitan	Conifer and alder removal and thinning	Conifer and alder removal and thinning
4	Black Spring	6.5	Other	Within Valley Segment	Other	Yes	Valley Loop Trail	None	Possible clearing of conifers	Site to remain uncleared due to cultural resources
6	Stoneman Meadow Boardwalk	13.5	A	Within Valley Segment	Scenic Area	Partial	Southside Drive, Valley Loop Trail, Bike Path	Half Dome, North Dome, Glacier Point, Eagle Peak, Staircase Falls	Conifers encroaching on meadow	Selective thinning of conifers to open up views
7	Clark's Bridge	8	B	Within Valley Segment	Frontc Trail Vista Point	Partial	Southside Drive	Merced River	Some riverbank erosion near Pines Campgrounds	Selective thinning of conifers to open up views
8	Orchard Behind Delaware North Companies Stables	7	B	Within Valley Segment	Other	Partial	Not Applicable	Half Dome, North Dome, Washington Column	Selectively clear encroaching conifers	Open view of Glacier Point
10	Northside Drive / Ahwahnee Meadow	10.5	A	Within Valley Segment	Roadside Turnout	Partial	Northside Drive	Yosemite Falls, North Dome, Royal Arches, Castle Cliffs	Encroaching conifers in oak woodland and meadow	Thin encroaching conifers in oak woodland, meadow

11	Church Bowl Picnic Area	12	A	Within Valley Segment	Roadside Turnout	Partial	Ahwahnee Road	Glacier Point	Management of encroaching conifers	Selectively thin conifers to promote oak habitat

TABLE 2.4-1: SCENIC VISTA MANAGEMENT PLAN – VISTA POINT SUMMARIES (CONTINUED)

Site Number	Site Name	Visual Resource Assessment Score	Scenic Class	Merced Wild and Scenic River Segment	View Type	Vista Blocked?	Proximal Roads / Trails	Iconic Features Visible from Site	Immediate Vegetation Management Needs	Long-Term Vegetation Management Needs
12	Sentinel Bridge Parking	11.5	A	Within Valley Segment	Roadside Turnout	Partial	Southside Drive	Yosemite Falls	Manage encroaching conifers to open up view	Manage encroaching conifers, open up view
13	Happy Isles Interpretative Sign	5.5	B	Within Valley Segment	Frontcountry Trail Vista Point	Partial	Happy Isles Trail	Glacier Point, Glacier Point Apron	None	Possible selective thinning of encroaching conifers
14	Happy Isles Bridge	8.5	B	Within Valley Segment	Other	Partial	Not Applicable	Glacier Point Apron	None	Selective thinning of conifers to preserve view
16	Ahwahnee Hotel Front Lawn	10.25	A	Within Valley Segment	Other	Partial	Not Applicable	Royal Arches, Half Dome	None	Selective thinning of conifers to open up view
17	Hutchings View A	12	A	Within Valley Segment	Roadside Turnout	No	Northside Drive	Half Dome, Yosemite Falls, Sentinel Rock, North Dome, Glacier Point, Royal Arches, Washington Column	None	Selective thinning of conifers to maintain view
19	Yosemite Lodge Portico	9.5	A	Within Valley Segment	Other	Partial	Northside Drive	Sentinel Rock, Yosemite Falls	None	Continue thinning to provide for view
20	Chapel	10.5	A	Within Valley Segment	Roadside Turnout	Partial	Southside Drive	None	None	Selective thinning to open up view of Lower Yosemite Fall

TABLE 2.4-1: SCENIC VISTA MANAGEMENT PLAN – VISTA POINT SUMMARIES (CONTINUED)

Site Number	Site Name	Visual Resource Assessment Score	Scenic Class	Merced Wild and Scenic River Segment	View Type	Vista Blocked?	Proximal Roads / Trails	Iconic Features Visible from Site	Immediate Vegetation Management Needs	Long-Term Vegetation Management Needs
21	El Capitan Postage Beach 1	8.5	A	Within Valley Segment	Roadside Turnout	Partial	Southside Drive	El Capitan, Cathedral Rocks, Three Brothers	Blackberry removal	None
22	Sentinel Beach	11.25	A	Within Valley Segment	Other	Partial	Not Applicable	Yosemite Falls, North Dome, Clouds Rest	None	Thinning to north to open views
23	Swinging Bridge	11.5	A	Within Valley Segment	Other	No	Not Applicable	Yosemite Falls, Sentinel Rock, North Dome	None	Selective thinning
24	Sentinel Meadow Boardwalk	11.5	A	Within Valley Segment	Other	No	Not Applicable	Half Dome, Yosemite Falls, Sentinel Rock, North Dome, Royal Arches, Cathedral Rocks, Washington Column	None	None
25	Stoneman Bridge	12	A	Within Valley Segment	Other	Partial	Northside Drive	North Dome, Glacier Point	None	Thin conifers
26	Housekeeping Beach	9.75	A	Within Valley Segment	Other	Partial	Not Applicable	Yosemite Falls, Glacier Point	None	Thin encroaching conifers
27	Curry Village Parking	9.75	A	Within Valley Segment	Other	Partial	Not Applicable	Half Dome	None	Thinning
28	Sentinel Bridge	13.5	A	Within Valley Segment	Roadside Turnout	Partial	Valley Loop Road	Half Dome	None	Selective thinning, prescribed burn
29	Vernal Fall Footbridge	7.25	Other	Within Valley Segment	Other	Partial	John Muir Trail	Vernal Fall	None	Selective thinning to maintain axial view
30	Illilouette Falls View	8.25	Other	Within Valley Segment	Wilderness Trail Vista Point	Partial	John Muir Trail	Yosemite Falls, Glacier Point, Glacier Point Apron, Illilouette Fall	None	Selective thinning

TABLE 2.4-1: SCENIC VISTA MANAGEMENT PLAN – VISTA POINT SUMMARIES (CONTINUED)

Site Number	Site Name	Visual Resource Assessment Score	Scenic Class	Merced Wild and Scenic River Segment	View Type	Vista Blocked?	Proximal Roads / Trails	Iconic Features Visible from Site	Immediate Vegetation Management Needs	Long-Term Vegetation Management Needs
31	West End of Leidig Meadow	11.75	A	Within Valley Segment	Other	No	Not Applicable	Half Dome, Yosemite Falls, Sentinel Rock, Three Brothers, North Dome, Cathedral Rocks, Washington Column, Clouds Rest	Blackberry removal	Manage encroaching conifers in meadow
32	Four Mile Trailhead	10.5	A	Within Valley Segment	Roadside Turnout	Partial	Southside Drive	Yosemite Falls, Sentinel Rock	None	Selective thinning
33	East End of El Capitan Meadow	14.5	A	Within Valley Segment	Roadside Turnout	Partial	Northside Drive	El Capitan, Cathedral Rocks	Address social trails and trampling	Tall trees at base of El Capitan
34	Hanging Valley, Bridalveil Fall	14	Other	Within Valley Segment	Roadside Turnout	No	Northside Drive	Bridalveil Fall, El Capitan, Cathedral Rocks	None	Thin conifers
35	Cascade Fall View	8	A	Within Gorge Segment	Roadside Turnout	No	Highway 140	The Cascades	None	Selective thinning
36	Big Oak Flat Valley View	10.25	A	Within Valley Segment	Wilderness Trail Vista Point	No	Old Big Oak Flat Road	Half Dome, Bridalveil Fall, North Dome, El Capitan, Cathedral Rocks, Sentinel Dome, Ribbon Fall	None	Prescribed burning to open up meadows in Valley
37	Bridalveil Fall Footbridge	7.25	A	Within Valley Segment	Frontcountry Trail Vista Point	Partial	Bridalveil Fall Trail	Bridalveil Fall	Selective thinning to open up view	Selective thinning to open up view
38	Bridalveil Straight Interpretive Sign	13	A	Within Valley Segment	Roadside Turnout	Partial	Southside Drive	Half Dome, Cathedral Rocks, El Capitan, Ribbon Fall	None	Restoration work on impacted area, view of El Capitan
40	Cathedral Beach	10.25	A	Within Valley Segment	Other	Partial	Southside Drive	El Capitan	None	Selective thinning of conifers

TABLE 2.4-1: SCENIC VISTA MANAGEMENT PLAN – VISTA POINT SUMMARIES (CONTINUED)

Site Number	Site Name	Visual Resource Assessment Score	Scenic Class	Merced Wild and Scenic River Segment	View Type	Vista Blocked?	Proximal Roads / Trails	Iconic Features Visible from Site	Immediate Vegetation Management Needs	Long-Term Vegetation Management Needs
41	Devils Elbow	9	A	Within Valley Segment	Roadside Turnout	Partial	Northside Drive	Sentinel Rock, Three Brothers, El Capitan, Cathedral Rocks	None	Selective thinning
42	Wosky Pond	12.25	A	Within Valley Segment	Roadside Turnout	Partial	Northside Drive	El Capitan, Cathedral Rocks	None	Management of encroaching conifers
43	Bridalveil Meadow	9.5	A	Within Valley Segment	Roadside Turnout	Partial	Southside Drive	Ribbon Fall	None	Selective thinning to open up view
44	Ferry Bend	12	A	Within Valley Segment	Frontcountry Trail Vista Point	Partial	Valley Loop Trail	Yosemite Falls	None	Selective thinning to maintain views
46	Curry Amphitheater	9.5	B	Within Valley Segment	View from Building	Partial	Not Applicable	Half Dome, Royal Arches, Washington Column, Glacier Point	None	Thinning to open up view of Glacier Point
47	Superintendent's Bridge, Flood Sign	10.75	A	Within Valley Segment	From Bridge	Partial	Not Applicable	Sentinel Rock, North Dome	None	None
49	Tunnel View	15.2	A	Within Valley Segment	Roadside Turnout	No	Wawona Road	Half Dome, Bridalveil Fall, Sentinel Rock, El Capitan, Cathedral Rocks	None	None
61	Mosquito Helispot Turnout	4.25	Other	Within South Fork Below Wawona Segment	Roadside Turnout	Partial	Wawona Road	None	None	Thinning, prescribed burning to open up vista
70	Bug Turnout South of Wawona	11	Other	View of Gorge, Valley Segments	Roadside Turnout	No	Wawona Road	Half Dome, Sentinel Rock, El Capitan, Cathedral Rocks	None	Thinning to keep view of Valley open
71	Wawona Road, 2 Miles South of Tunnel	6.25	Other	View of Gorge Segment	Roadside Turnout	Yes	Wawona Road	None	None	Selective thinning to open up views

TABLE 2.4-1: SCENIC VISTA MANAGEMENT PLAN – VISTA POINT SUMMARIES (CONTINUED)

Site Number	Site Name	Visual Resource Assessment Score	Scenic Class	Merced Wild and Scenic River Segment	View Type	Vista Blocked?	Proximal Roads / Trails	Iconic Features Visible from Site	Immediate Vegetation Management Needs	Long-Term Vegetation Management Needs
72	Wawona Road, 2.25 Miles South of Tunnel	6.25	Other	View of Gorge Segment	Roadside Turnout	Partial	Wawona Road	None	None	Thinning to open view of Merced Canyon
79	Washburn Point	17.25	Other	View of Valley Segment	Roadside Turnout	Partial	Glacier Point Road	Half Dome	None	None
80	Glacier Point Amphitheater	11.5	Other	View of Valley Segment	Scenic Area	No	Glacier Point Road	Half Dome, North Dome, Nevada Fall, Clark Range	None	Selective thinning
81	Glacier Point	13.25	Other	View of Valley Segment	Frontcountry Trail Vista Point	No	Glacier Point Road	Half Dome, Yosemite Falls, North Dome, Washington Column, Mt. Hoffman, Clark Range	None	None
83	Bridalveil Fall View, Big Oak Flat	13.5	Other	View of Gorge, Valley Segments	Roadside Turnout	No	Highway 120	Bridalveil Fall, Sentinel Dome	None	Selective thinning
84	Half Dome Overlook (B4)	11	Other	View of Gorge, Valley Segments	Roadside Turnout	Partial	Highway 120	Half Dome, Sentinel Rock, El Capitan	None	Selective thinning
89	Ahwahnee Bridge	6.75	A	Within Valley Segment	Frontcountry Trail Vista Point	Partial	Bike Path	Half Dome, Glacier Point	None	Thinning to open views of Half Dome, Glacier Point
90	Sugar Pine Bridge	7	A	Within Valley Segment	Frontcountry Trail Vista Point	Partial	Bike Path	Half Dome, Yosemite Falls	None	Thinning to open views of Half Dome, Yosemite Falls
91	El Capitan Meadow, East End	Not Scored	A	Within Valley Segment	Roadside Turnout	Partial	Northside Drive	El Capitan, Cathedral Rocks	None	None
92	Housekeeping Bridge	8	A	Within Valley Segment	Frontcountry Trail Vista Point	Partial	Footpath	Yosemite Falls, Glacier Point	None	Selective thinning

TABLE 2.4-1: SCENIC VISTA MANAGEMENT PLAN – VISTA POINT SUMMARIES (CONTINUED)

Site Number	Site Name	Visual Resource Assessment Score	Scenic Class	Merced Wild and Scenic River Segment	View Type	Vista Blocked?	Proximal Roads / Trails	Iconic Features Visible from Site	Immediate Vegetation Management Needs	Long-Term Vegetation Management Needs
146	Valley View	16	A	Within Valley Segment	Roadside Turnout	No	Northside Drive	El Capitan, Bridalveil Fall, Cathedral Rocks, Leaning Tower	None	Selective thinning of encroaching conifers
149	Wawona Point	10	Other	Within Valley Segment	Other	No	Mariposa Grove Road	None	None	None
152	Bridalveil Fall, Point 1	10.25	AA	Within Valley Segment	Other	Partial	Southside Drive	None	None	None
153	Bridalveil Fall, Point 2	Not Scored	A	Within Valley Segment	Other	Partial	Southside Drive	None	None	None
154	Bridalveil Fall, Point 3	Not Scored	A	Within Valley Segment	Other	Partial	Southside Drive	None	None	None
155	Bridalveil Fall, Point 4	Not Scored	A	Within Valley Segment	Other	Partial	Southside Drive	El Capitan, Cathedral Rocks, Ribbon Fall	None	None
156	Roosevelt Turnout	10.5	A	Within Valley Segment	Other	Yes	Southside Drive	El Capitan, Ribbon Fall	None	None
157	Old Hutchings View (Cedar Cottage)	8.75	A	Within Valley Segment	Other	Yes	Southside Drive	Yosemite Falls	None	None
158	Hutchings View B	12	A	Within Valley Segment	Frontcountry Trail Vista Point	No	Northside Drive	Half Dome	None	None
159	Ahwahnee Lounge	11.25	A	Within Valley Segment	View from Building	Yes	Ahwahnee Road	None	Selective thinning	Selective thinning
160	Ahwahnee Solarium	8.75	A	Within Valley Segment	View from Building	No	Ahwahnee Road	Glacier Point	Selective thinning	Selective thinning, trimming of black oak
161	Ahwahnee Dining Room	10.25	A	Within Valley Segment	View from Building	Partial	Ahwahnee Road	None	Selective thinning	None
162	Old Wawona Road Point 1	9.25	Other	Within Gorge Segment	Other	Yes	Wawona Road	None	None	None

TABLE 2.4-1: SCENIC VISTA MANAGEMENT PLAN – VISTA POINT SUMMARIES (CONTINUED)

Site Number	Site Name	Visual Resource Assessment Score	Scenic Class	Merced Wild and Scenic River Segment	View Type	Vista Blocked?	Proximal Roads / Trails	Iconic Features Visible from Site	Immediate Vegetation Management Needs	Long-Term Vegetation Management Needs
163	Old Wawona Road Point 2	7.75	Other	View of Gorge Segment	Other	Yes	Wawona Road	The Cascades	None	None
164	Old Wawona Road Point 3	9.75	Other	Within Gorge Segment	Other	Yes	Wawona Road	None	Selective thinning	Selective thinning
165	Old Wawona Road Point 4	9	Other	Within Gorge Segment	Other	Yes	Wawona Road	None	Selective thinning, prescribed burning	Selective thinning, prescribed burning
169	Old Wawona Road Point 5	9.75	Other	View of Valley Segment	Other	Yes	Wawona Road	None	Selective thinning	Selective thinning
170	Old Wawona Road Point 6	8.75	Other	View of Valley Segment	Other	Yes	Wawona Road	None	Selective thinning	Selective thinning
171	Old Wawona Road Point 7	8.75	Other	Within Valley Segment	Other	Yes	Wawona Road	El Capitan	Selective thinning	Selective thinning
178	Nevada Fall Bridge	7	Other	Within Valley Segment, View of Merced River above Nevada Fall	Other	No	John Muir Trail	Glacier Point, Nevada Fall, Liberty Cap	None	None
179	Top of Nevada Fall	6.5	Other	Within Valley Segment, View of Merced River above Nevada Fall	Other	No	Mist Trail	Nevada Fall, Glacier Point, Liberty Cap	None	None
180	Top of Vernal Fall	7	Other	View of Valley Segment	Other	No	Mist Trail	Vernal Fall, Glacier Point	None	None
181	Lady Franklin Rock	6.25	Other	View of Valley Segment	Frontcountry Vista Trail Point	No	Mist Trail	Vernal Fall	None	None
224	Curry Ice Skating Rink	9.75	B	Within Valley Segment	View from Building	No	Southside Drive	None	None	None

TABLE 2.4-1: SCENIC VISTA MANAGEMENT PLAN – VISTA POINT SUMMARIES (CONTINUED)

Site Number	Site Name	Visual Resource Assessment Score	Scenic Class	Merced Wild and Scenic River Segment	View Type	Vista Blocked?	Proximal Roads / Trails	Iconic Features Visible from Site	Immediate Vegetation Management Needs	Long-Term Vegetation Management Needs
225	Cathedral Spires Turnout	7.5	A	Within Valley Segment	Roadside Turnout	Partial	Southside Drive	None	None	None
226	Cathedral Beach Parking near Restroom	9.75	A	Within Valley Segment	Roadside Turnout	Partial	Southside Drive	None	None	None
227	Ahwahnee Meadow, Peeling Dome Interpretive Sign	11.5	A	Within Valley Segment	Frontcountry Trail Vista Point	Partial	Northside Drive	Half Dome, Royal Arches, Glacier Point	None	None
228	Ahwahnee Winter Club Room	9.5	A	Within Valley Segment	View from Building	Partial	Not Applicable	None	None	None
234	Leidig Meadow, West End	Not Scored	A	Within Valley Segment	Frontcountry Trail Vista Point	Partial	Northside Drive, Footpath	Half Dome, Royal Arches, Sentinel Rock	None	None

SOURCE: NPS 2009a

2.4.6 River Segment 3: Merced Gorge

As described above, 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 and its banks.

Photo 2.4-12. Merced River Gorge – 2010 (Yochim 2010)

Condition at the Time of 1987 Designation. Roadway pullouts along the Gorge segment allowed for short- and long-range views of the river (see Photo 2.4-12). The river and Cascades Fall were intermittently visible from vehicles traveling along El Portal Road and Big Oak Flat Road (see Figure 2.4-4). At the time of the 1987 designation, some structures intruded into views from within the Merced River corridor in the gorge, such as the Cascades Powerhouse and Cascades Diversion Dam, but these structures did not dominate the natural landscape from any viewpoint.

Current Condition. Visual resources within the Merced River Gorge are largely similar to those present at the time of Wild and Scenic River designation. However, the scenic quality in the area of the river at the Big Oak Flat Road/El Portal Road junction has improved since NPS removed the Cascades Diversion Dam and associated features (completed in 2004) and implemented subsequent river restoration activities. Photos 2.4-13 through 2.4-15, below, show the Merced River area prior to dam construction, prior to dam removal, and after dam removal. As shown, within six years of dam removal, the scenic quality along this river segment returned to a condition similar to that in existence before the dam was constructed.

The *Scenic Vista Management Plan Environmental Assessment* (described above for the Valley segment) evaluated scenic viewpoints within the Merced River Gorge as well as viewpoints that afford views of the Gorge segment; the visual resources assessment findings for the Gorge are presented above in Table 2.4-1.

Views from the river and trails in the Merced River Gorge continue to have high aesthetic value.

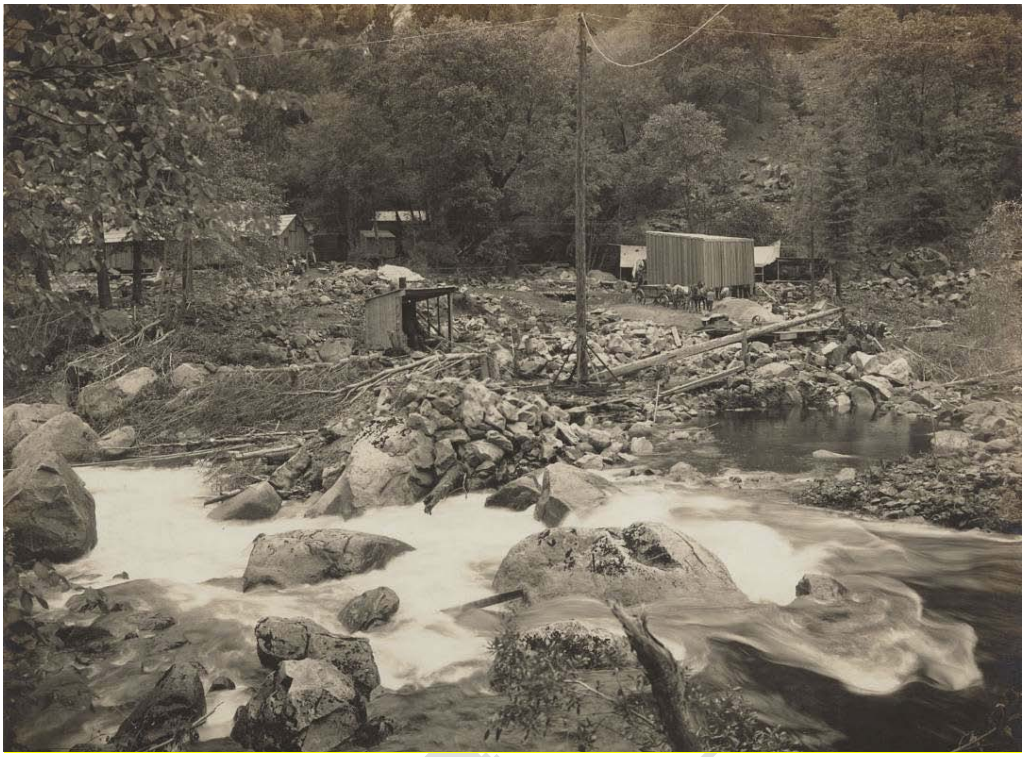

Photo 2.4-13. Before Cascades Diversion Dam Construction (from South Bank) – Undated (taken in approximately 1916 or 1917, immediately prior to dam construction) (NPS undated)

Photo 2.4-14. Before Dam Removal (from North Bank) – 2001 (NPS 2001)

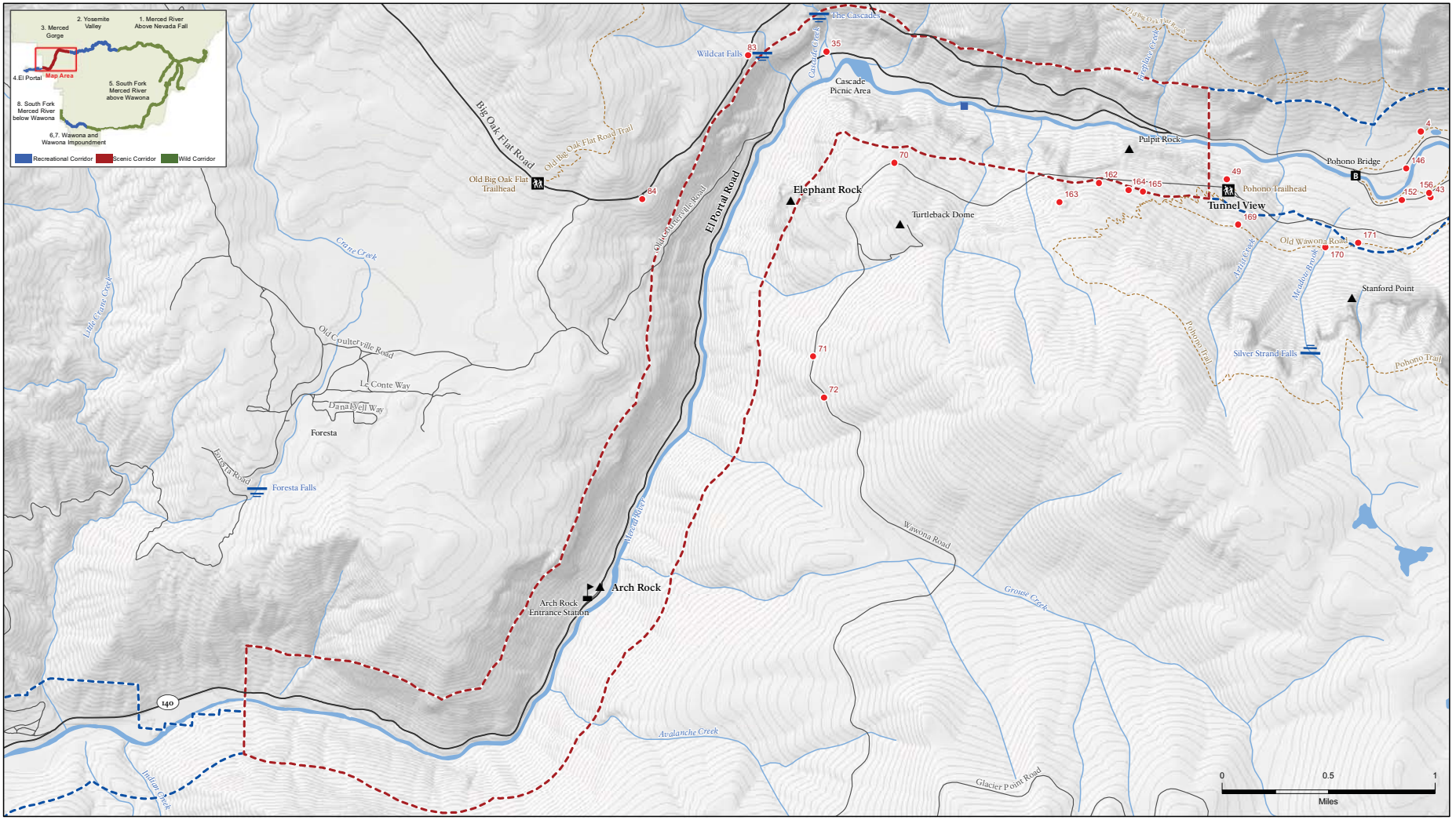

Figure 2.4-4
Scenic ORV - River Segment 3.
Merced Gorge
Scenic WSR Corridor

- Scenic Vista Points
- Scenic WSR Corridor Classification
- Recreational WSR Corridor Classification
- Landmark
- Trailhead
- Arch Rock Entrance Station
- Waterfall
- Road bridge
- Cascades Powerhouse
- Highway
- Road
- Trail
- Stream/River

Note: See Table 2.4-1: Vista Point Summaries for detailed information on scenic vista points.

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection: North American Datum 1983, UTM Zone 10

Date: 2/25/11

File:

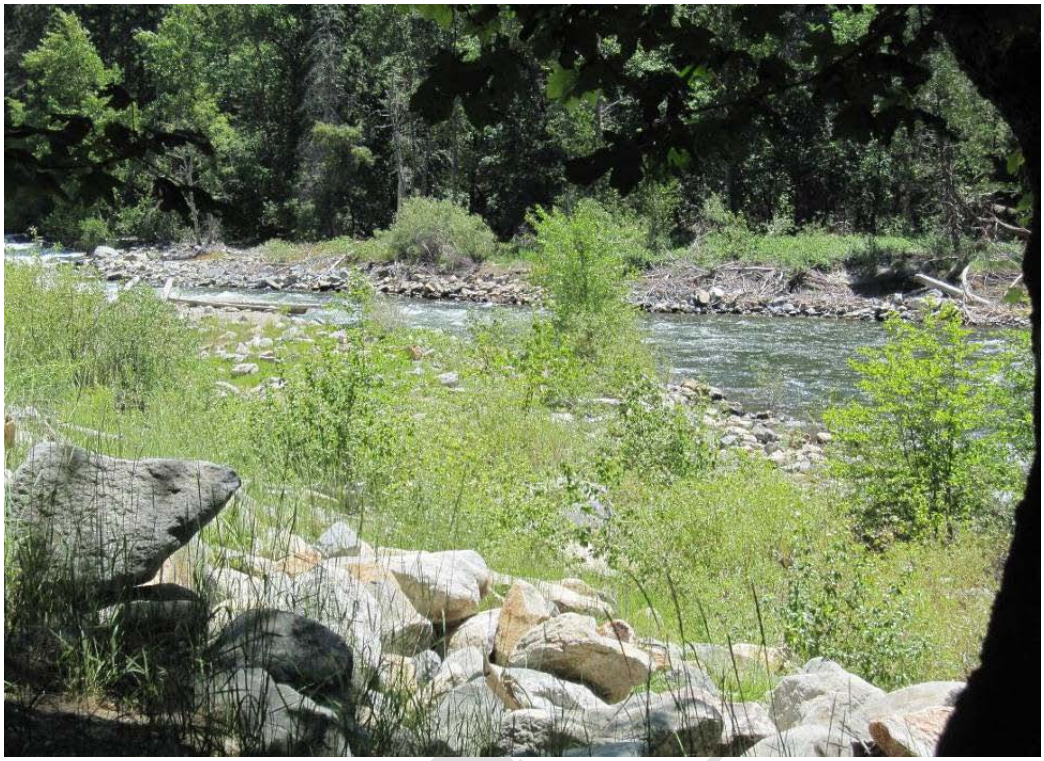

Photo 2.4-15. After Dam Removal (from North Bank) – 2010 (ESA 2010)

Management Considerations

The list below summarizes the management considerations associated with the scenic ORV in River Segment 3:

- There are few visual intrusions in this area; several historic viewpoints have been identified for future treatment.
- Regional air pollution results in occasional haze during the summer months

2.4.7 River Segments 5 and 8: South Fork Merced River, both Above and Below Wawona

As described above in Section 2.4-1, the South Fork Merced River in these stretches is largely inaccessible, with just a few trail crossings above Wawona and none below it (see Figure 2.4-5 and Photos 2.4-16 and Photo 2.4-17).

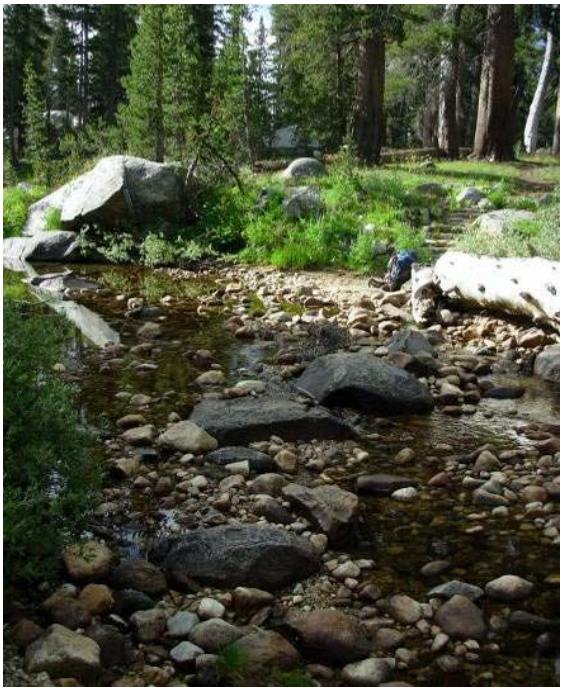

Photo 2.4-16. South Fork Merced River Above Wawona Crossing – 2010 (Yochim 2010)

Photo 2.4-17. South Fork Merced River – 2010 (Yochim 2010)

Condition at the Time of 1987 Designation. Although no formal visual resource studies have 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.

Scenery that could be directly viewed from within the Merced River corridor 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 (see Photo 2.4-18). Views from the river corridor included distant views of forests and granite features such as Wawona Dome, which is a component of the Scenery ORV in this segment. The Merced River corridor below Wawona was limited to brief views from motorists on Wawona Road.

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

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 in Table 2.4-1 above.

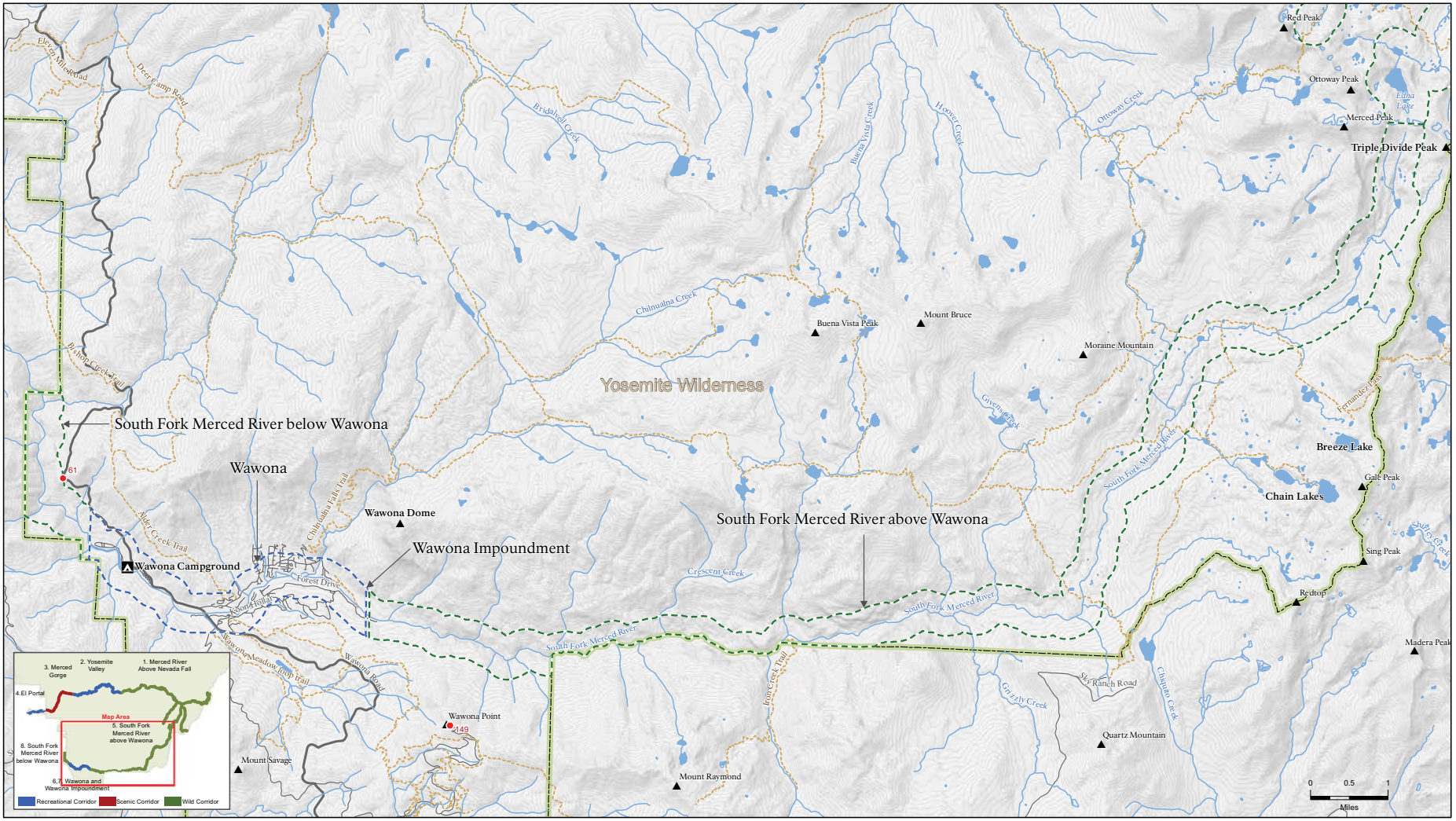

Figure 2.4-5
Scenic ORV - River Segments 5 and 8.
South Fork Merced River Above and Below Wawona
Wild WSR Corridor

Wild WSR Corridor Classification
Recreational WSR Corridor Classification
Yosemite National Park Boundary
Lakes
Scenic Vista Points
Landmark
Campground
Trail
Stream/River
Wawona Road
Road

Note: See Table 2.4-1: Vista Point Summaries for detailed information on scenic vista points.

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection: North American Datum 1983, UTM Zone 10

Date: 2/25/11

File:

Photo 2.4-18. South Fork Merced River Above Wawona from a Ridge between Chain Lakes and Breeze Lake (Yochim 2010)

Management Considerations

The list below summarizes the management considerations associated with the scenic ORV in River Segments 5 and 8:

- There are few visual intrusions in this area
- Regional air pollution results in occasional haze during the summer months

2.4.8 References

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2.5 CULTURAL VALUES

The continuum of human use along the Merced River and South Fork Merced River encompasses thousands of years 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 the prehistoric past, contemporary American Indian ancestral and other ethnic heritage, historic, ethnographic, and cultural landscapes, and ongoing cultural traditions. This landscape, linked through time and space, holds outstandingly remarkable scientific, interpretive, and cultural value for traditionally associated peoples and the public.

2.5.1 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:

Ethnographic resources in Yosemite Valley represent a rare connection of places and people that began before 1851 and continues to the present, with the river at the heart of this cultural system.

Traditionally associated American Indian tribes and groups associate strong cultural and spiritual values with the river and Yosemite Valley, which are reflected in the abundance of names and stories that are attached to geologic and other significant features in the Merced River corridor. The ethnographic resources here include river-related and traditionally used plant species, historic village sites, archeological resources, and spiritual areas. 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 nearly continuous, river-related archeological landscape containing dense concentrations of resources that reflect thousands of years of settlement.

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-Euro-American 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 this 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.

2.5.2 River Segment 4: El Portal

With its temperate climate and abundant subsistence resources, El Portal was a crossroads of life and trade, with the river linking the lifeways of peoples from the historic and prehistoric past, both in California and beyond.

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.

2.5.3 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:

Physical remnants of U.S. Army Cavalry Camp A.E. Wood document the unique Yosemite legacy of the African-American Buffalo Soldiers, who founded their camp near the river's strategic water source and related ecological habitat.

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.

With its year-round water and level terrain for settlement, the Wawona Archeological District is composed of dense clusters of historic and prehistoric river-related sites that provide evidence of 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 as they have for thousands of years.

Built to connect human developments on both sides of the South Fork Merced River, the Wawona Covered Bridge is one of only a few covered bridges in the region.

Built in 1868 by Galen Clark (Yosemite pioneer and informal 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 western region of the National Park Service.

2.5.4 River Segment 5: South Fork Merced Wilderness Above Wawona

Finding seasonal trade, travel, and subsistence opportunities along the South Fork Merced River, American Indians left behind regionally rare, 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.

2.5.5 Cultural Resource Outstandingly Remarkable Values

The Cultural ORV designated for the Merced Wild and Scenic River includes 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 cultural 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 ORV 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.

2.5.6 Literature and Data

Ethnographic, historical, and archeological investigations of Yosemite National Park have been ongoing for more than a century. Some of the earliest publications about the Yosemite region were those documenting the traditions, material culture, religion, mythology, and history of the area's

American Indian inhabitants. Galen Clark wrote of the Miwok people he encountered in the essay *Early Days in Yosemite Valley* (The Docter Press, 1964). C. Hart Merriam's 1917 *Indian Village and Camp Sites in Yosemite Valley* documents the locations, names, and notable characteristics of 53 American Indian sites along the stretch of the Merced River from upper Yosemite Valley to approximately six miles below El Portal. Noted linguist and anthropologist Alfred L. Kroeber contributed to the 1921 *Handbook of Yosemite National Park* with an ethnographic study of the customs, language, and material culture of the area's indigenous inhabitants. Ethnographers Samuel Barrett and Edward Gifford interviewed Miwok informants beginning in 1906 in order to compile a comprehensive catalogue of crafts, tools, and other elements of Miwok material culture (1933).

Formal archeological investigations began in the mid-20th century with University of California, Berkeley archeologist James Bennyhoff's surveys (1952, 1956) to identify and record archeological sites. Bennyhoff developed a cultural chronology for the Yosemite region that, with subsequent modifications, is still in use. In the 1970s, NPS contracted with L. Kyle Napton (of California State University, Stanislaus) to revisit sites recorded by Bennyhoff and to survey additional areas (Napton 1978). Napton's documentation provided the basis for the National Register of Historic Places (National Register) nomination forms for the Yosemite Valley, El Portal, and Wawona Archeological Districts (NPS n.d., 1976, and 1978).

Subsequent historical and archeological research by park personnel has added depth and breadth to the human history of the land and resources within the Merced River corridor. Park-initiated data recovery projects within the Yosemite Valley, El Portal, and Wawona Archeological Districts during the 1980s and 1990s have greatly increased the body of knowledge available about prehistoric settlement in these areas, and have allowed refinement of the statements of significance for the districts (see Ervin 1984, Hull 1989, Hull and Kelly 1995, Mundy and Hull 1988, Riley 1987, and Wickstrom 1988). Linda Greene's 1987 three-volume report, *Historic Resource Study – Yosemite National Park*, provides excellent information on historical resource conditions and planned management strategies as of the publication year—the same year the Merced River was designated as Wild and Scenic. Documentation of the Johnny Wilson Ranch in the El Portal Archeological District (Davis-King 1997) identifies a rare historic-era American Indian homestead and truck farm. Brian Bibby's 1994 *An Ethnographic Evaluation of Yosemite Valley: The Native American Cultural Landscape* presents part of the American Indian history and demonstrates the continued cultural significance of Yosemite Valley to some of the traditionally associated American Indian peoples, providing the basis for understanding the significant ethnographic resources in Yosemite Valley.

2.5.7 Features that Indicate Outstandingly Remarkable Values

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:

- 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-use 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.

- 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. Benchmarks for the integrity of this component of the Cultural ORV in the Yosemite Valley segment include unobstructed views of and access to sacred or significant geologic features, maintenance of and access to healthy populations of traditional ethnobotanical resources, and preservation of archaeological remains or locations of historic, spiritual, or traditional significance.

- 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.

2.5.8 River Segment 2: Yosemite Valley

Yosemite Valley Ethnographic Resources

When Euro-Americans first entered Yosemite Valley in 1851, the Indians living there were most likely a mix of Miwok and Paiute peoples. The upland areas of the Merced River drainage were undoubtedly frequented by Southern Sierra Miwok, possibly the Mono Lake Paiute, and at least traversed by the Western Monos and possibly Chukchansi Yokuts (Bibby 1994). 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, village and burial sites, and spiritual areas. American Indian groups assign strong spiritual value to the Merced River and Yosemite Valley, attaching names and stories to geologic and other features in the river corridor. These American Indian communities continue to practice their religion and conduct ceremonies as they have for thousands of years. 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 gather plants and other resources 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).

Yosemite Valley Archeological District

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 2.5-1**).

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, 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. 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.

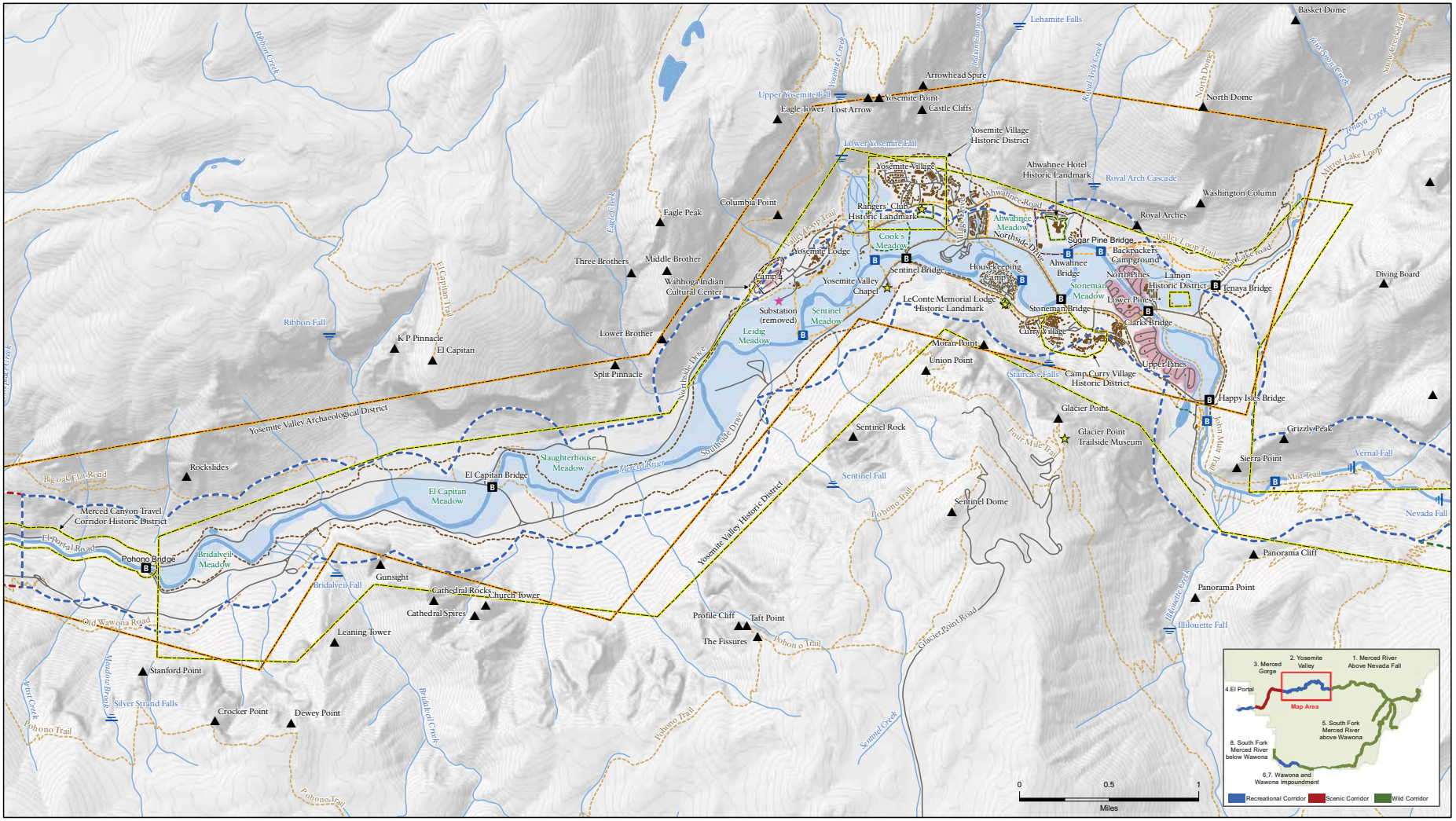

Figure 2.5-1
Cultural ORV - River Segment 2.
Yosemite Valley
Recreational WSR Corridor

Recreational WSR Corridor Classification
Scenic WSR Corridor Classification
Wild WSR Corridor Classification
Building
Campground
100 Year Flood Boundary
Yosemite Valley Archaeological District
Historic District
Historic Landmark
Historic Site
Yosemite Valley Loop Trail
Bike Path
Boardwalk
Trail
Road
Stream/River
National Register of Historic Places
Eligible
Listed
Landmark
Waterfall
Road bridge
Footbridge

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

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection: North American Datum 1983, UTM Zone 10

Date: 2/25/11

File:

Condition at the Time of 1987 Designation. The 1979 National Register nomination form 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). Sites for which information was not updated between the time of National Register nomination and Wild and Scenic River designation are presumed to have changed minimally in the intervening time span; however, because the condition of all district sites was not documented, this assumption cannot be fully confirmed.

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). However, the majority of the impacts to these sites occurred well before the listing of the Yosemite Valley Archeological District and Cultural ORV, and 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 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 social (i.e., 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 (creation of fire rings, 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.).

By 1987, a significant number of archeological sites had also been affected by ongoing natural processes such as tree falls, bioturbation,[1] 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). At least in one location, erosion had exposed previously buried human remains within the District (Hull and Kelly 1995).

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

Despite these three major types of impacts (operations/facilities-related, visitor use, and natural processes), the recorders of the Yosemite Valley Archeological District felt confident that the sites included as 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.

Contributing historical elements of the ethnographic resources component of the Cultural ORV 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 the fact that traditional native land management practices had been discontinued (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.). Through these same vegetation changes, views from the Valley floor to some of the significant geologic features had been blocked or limited (Clark 1964). Historical aspects of the ethnographic resources have also experienced changes as a result of visitor-use and park-related development. (Deur 2007).

Current Condition. 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). As a regular part of ongoing archeological research, inventory, and accountability, Yosemite National Park utilizes the NPS-wide Archeological Site Management Information System (ASMIS). ASMIS is the primary monitoring tool for the condition of archeological sites, documenting site conditions, threats, disturbances, treatments, and management actions, as well as providing descriptions and locations for all known archeological sites in the park (NPS 2005, 2007). The ASMIS condition assessment ("good," "fair," "poor," "unknown," or "destroyed") addresses the stability of a site compared to the previous site visits, but is not an indicator of cumulative impacts over time (Middleton [NPS] 2008). The majority of sampled sites within the Yosemite Valley Archeological District are rated in "good" condition according to their most recent ASMIS scores (Middleton [NPS] 2008).

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). 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 relationships among 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).

The same three major types of impacts that were occurring at the time of designation continue to affect site conditions now. 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 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 these categories are minor (Middleton [NPS] 2008, 2009, and 2010). Following designation of the National Register district, NPS has adopted a management strategy of increased awareness of resources in the context of infrastructure planning, 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 in the face of ongoing development pressure, 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 activities such as hiking, stock use, camping, and bouldering/rock climbing have resulted in impacts such as 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[2] were identified during recent visits as having experienced a moderate to severe degree of impact from visitor use (Middleton [NPS] 2009, 2010).

Recent impacts on sites within the Yosemite Valley Archeological District due to natural forces 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, although at least two sites within this segment experienced flood-related impacts from a high-water event in 1997 (Middleton [NPS] 2009, 2010).

One factor affecting site condition has increased in the period from 1987 to the present; that is, scientific research at known sites. 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), designed to guide archeological investigations and site

[2] 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 National Register the nomination form, dated August 1997).

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 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.).

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).

Management Considerations

The list below summarizes the management considerations associated with the cultural ORV in River Segment 2:

- The majority of archaeological sites in Yosemite Valley retain a high degree of integrity.
- Various types of visitor use such as hiking, stock use, camping, theft and vandalism have been shown to adversely affect the condition of resources that contribute to the ORV.
- Park operations have triggered changes in ethnographic resources by disturbing traditional use areas or changing access to these places, disturbing historic village sites or burial grounds and other archeological resources, or adding or changing the types or frequency of use in those places to which culturally associated American Indians attach cultural and spiritual value
- The park's management strategy of preceding any ground-disturbing activities with a planning process that includes an assessment of potential effects and any need for focused investigations has reduced the likelihood of severe impacts at significant archeological sites.

2.5.9 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 17 known sites, including some of the oldest known deposits in the Sierra Nevada foothills; 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 2.5-2**). 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 surface manifestations provide little indication of the 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 a 19th-century American Indian homestead and cemetery on the south side of the Merced River (Davis-King 1997).

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.

Current Condition. Because this area is used primarily for administrative facilities rather than public services, impacts related to visitor use have been minimal in this river segment. 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 1976). Consequently, the archeological sites in the El Portal Archeological District have generally been well protected since the Wild and Scenic River designation. 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 (Davis-King 1997).

Continued use of the El Portal area for park infrastructure and other facilities, as well as natural erosional processes within the steep Merced River canyon, have had minor to moderate detrimental effects on the condition of the archeological sites within this river segment. Middleton's research into visitor-use and other impacts on archeological sites has included a few examples from the El Portal Archeological District; based on this recent research, at least one site in the district experienced flood-related damage in 1997 and exhibits evidence of moderate visitor-use impacts (social trails, piles of artifacts). Rodent tunneling (bioturbation) was also noted at this site and can be presumed to exist at additional sites within the district (Middleton [NPS] 2009). Other sites in the district exhibited no natural or human-related impacts and retain excellent condition (Middleton [NPS] 2008).

Management Considerations

The list below summarizes the management considerations associated with the cultural ORV in River Segment 4:

- Residential and commercial development has occurred within the archeological district, adversely affecting archeological sites.
- The park's management strategy of preceding any ground-disturbing activities with a planning process that includes an assessment of potential effects and any need for focused investigations has reduced the likelihood of severe impacts at significant archeological sites.

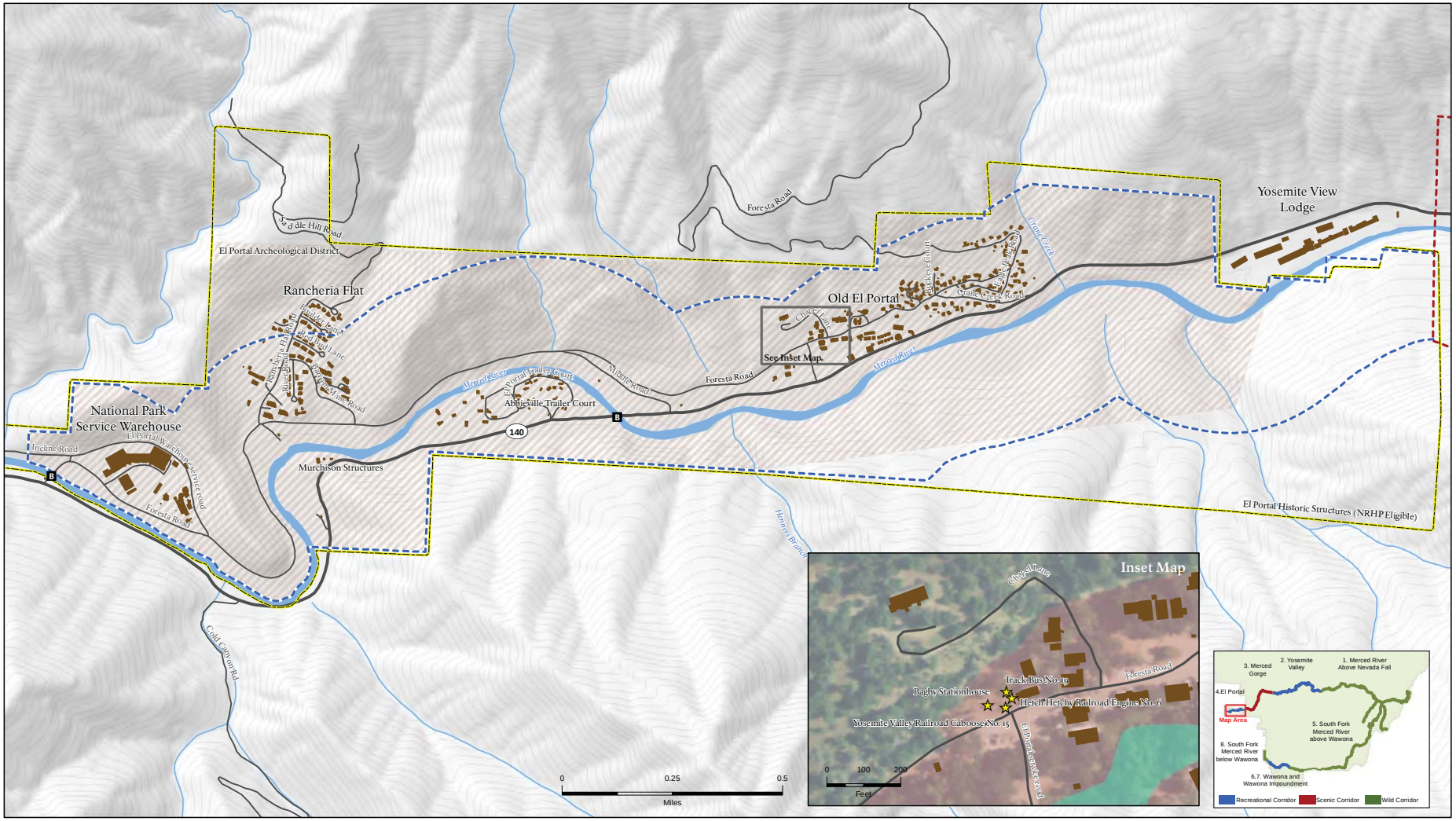

Figure 2.5-2
Cultural ORV- River Segment 4. El Portal
Recreational WSR Corridor

- Recreational WSR Corridor Classification
- Scenic WSR Corridor Classification
- Historic District
- Archaeological District
- Building
- Highway 140
- Road
- Stream/River
- National Register of Historic Places (Listed)
- B Bridge

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

National Park Service U.S. Department of the Interior

Produced by: Yosemite Planning Division

Projection:	North American Datum 1983, UTM Zone 10
Date:	2/25/11
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2.5.10 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 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 cavalry units known as the Buffalo Soldiers (USDI 1906). During their tenure as Yosemite's guardians, these soldiers built roads and trails along with 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 (Johnson 2009). 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. 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 72 archeological sites (NPS 1978), many of which are located within the river corridor (**Figure 2.5-3**). 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 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 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 likely 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 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 (Crane Flat) to historical Miwok (Mariposa). 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).

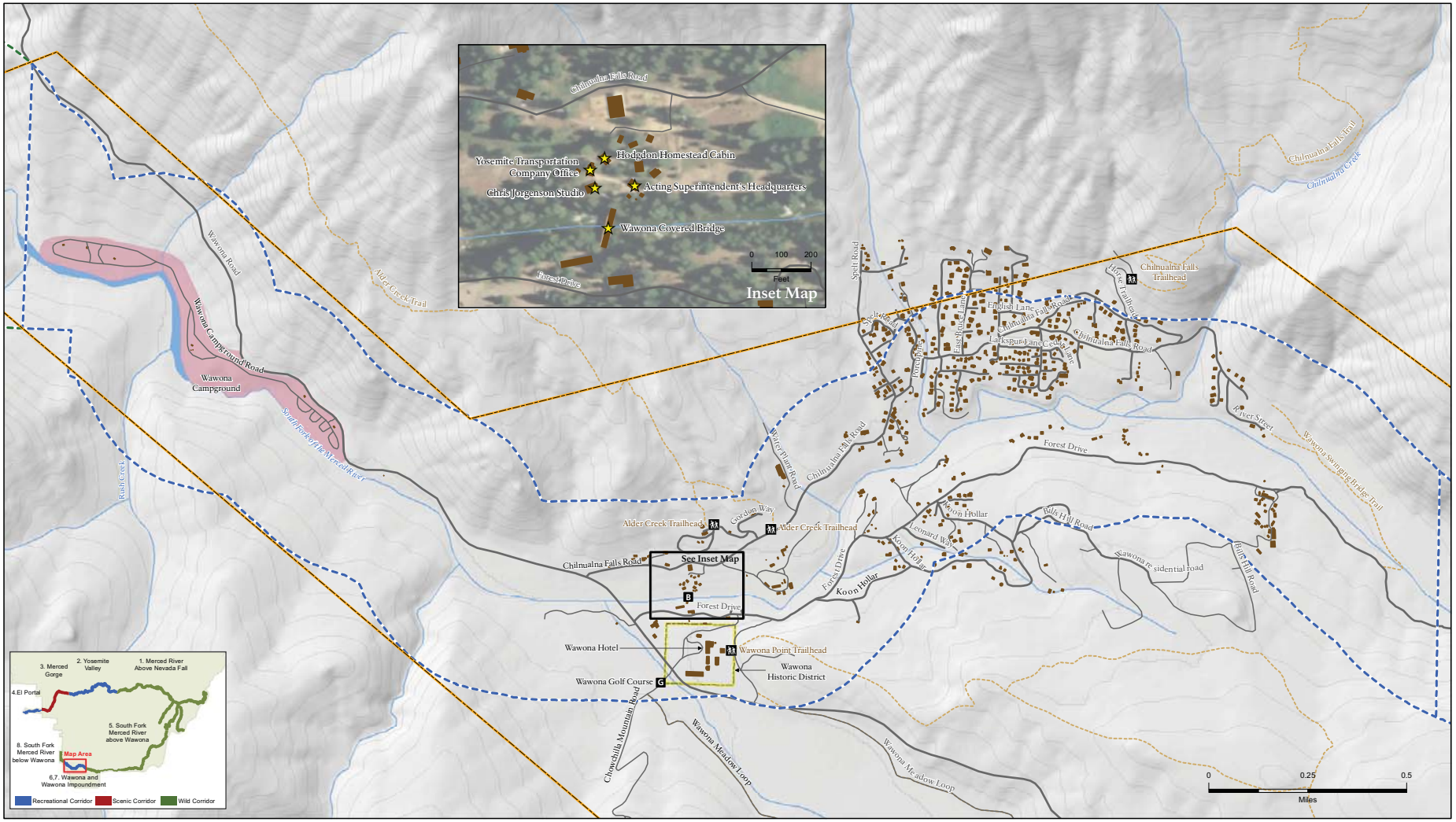

Figure 2.5-3
Cultural ORV - River Segment 7.
Wawona
Recreational WSR Corridor

- Recreational WSR Corridor Classification
- Campground
- Wawona Historic District
- Wawona Archaeological District Boundary
- Building
- G Golf Course
- Trailhead
- B Wawona Covered Bridge
- National Register of Historic Places (Listed)
- Road
- Stream/River
- Trail

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

National Park Service U.S. Department of the Interior

Produced by: **Yosemite Planning Division**

Projection:	North American Datum 1983, UTM Zone 10
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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 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. 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 situated within Loop C of 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 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 within Loop C. 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 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 (1984).

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 concluded that impacts mainly affected surface artifact assemblages and 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 (1984).

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 (**Plate 2.5-1**). Some timbers were replaced in 1961 and again in 1983 when NPS corrected structural safety hazards following an inspection of the bridge (Greene 1987).

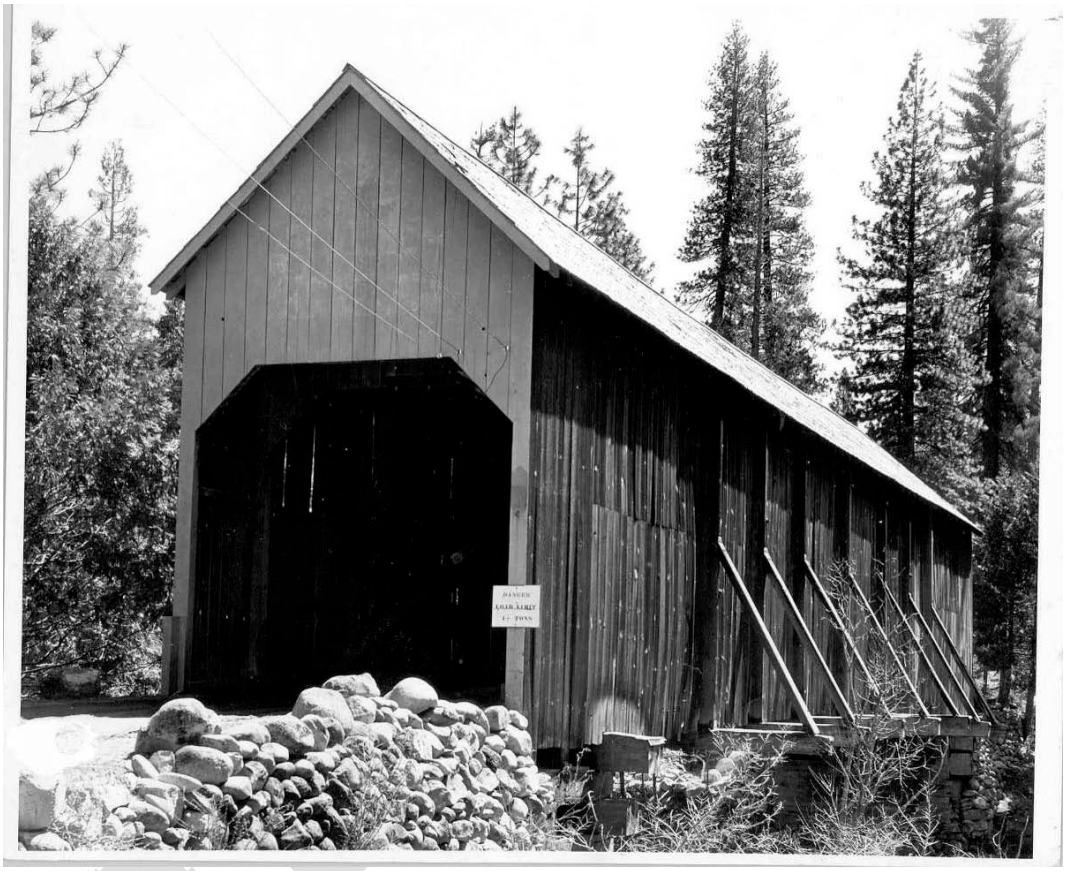

Plate 2.5-1: Wawona Covered Bridge, 1957 (NPS 1957)

Current Condition. 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, it was determined that Camp A.E. Wood and the other examined sites in the district still possessed intact cultural deposits, but that 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).

Of the 29 sites within the Wawona Archeological District 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. However, more than half of the total visited sites (17) still retained at least a fair degree of integrity (Middleton [NPS] 2008, 2009, 2010).

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, **Plate 2.5-2**). 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 in order to resist wind and snow loading
- Replicating hand-hewed timbers using broad axes and traditional craftsmanship from 19th-century practices

Plate 2.5-2: Wawona Covered Bridge, 2005 (NPS 2005)

Management Considerations

The list below summarizes the management considerations associated with the cultural ORV in River Segment 7:

- As with the other archeological districts in the Cultural ORV, 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 social trail creation), camping, bouldering/rock climbing, artifact collection, and vandalism

- Management concerns in this river segment include proper visitor education and preparation of interpretive materials highlighting the importance of Camp A.E. Wood as a rare window into the contribution of African-American soldiers to the park's history, as well as preservation of in situ archeological remains (Kirn 2010)

- Management concerns for the Wawona Covered Bridge include maintaining the historic structure in good condition despite the wear resulting from adverse weather and visitor use.

- The park's management strategy of preceding any ground-disturbing activities with a planning process that includes an assessment of potential effects and any need for focused investigations has reduced the likelihood of severe impacts at significant archeological sites.

2.5.10 River Segment 5: South Fork Wilderness 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 that were created to take advantage of lines of sight along the river and the animals' attraction to local soda springs that contained essential mineral salts. 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. The only documented research on these sites prior to the Wild and Scenic River designation was Knierieman's short paper describing three main varieties of the rock-ring features, 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, according to Knierieman's informant. The sites within this river segment are the first of the three types of rock-ring features described by Knierieman (stacked rock rings with timbers); his report described them 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 recordation 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.

Management **Considerations**

The list below summarizes the management considerations associated with the cultural ORV in River Segment 5:

- Montague (2005) notes that one site located close to the trail is at a higher risk of impacts from hikers, campers, and other park visitors.
- The park's management strategy of preceding any ground-disturbing activities with a planning process that includes an assessment of potential effects and any need for focused investigations has reduced the likelihood of severe impacts at significant archeological sites.

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